



# SINGAPORE

December 2013

## DETAILED ASSESSMENT OF OBSERVANCE—ASSESSMENT OF OBSERVANCE OF THE CPSS-IOSCO PRINCIPLES FOR FINANCIAL MARKET INFRASTRUCTURES

This Detailed Assessment of Observance on the Assessment of Observance of the CPSS-IOSCO Principles for Financial Market Infrastructures on Singapore was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on November 25, 2013. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of Singapore or the Executive Board of the IMF.

The publication policy for staff reports and other documents allows for the deletion of market-sensitive information.

Copies of this report are available to the public from

International Monetary Fund • Publication Services  
PO Box 92780 • Washington, D.C. 20090  
Telephone: (202) 623-7430 • Fax: (202) 623-7201  
E-mail: [publications@imf.org](mailto:publications@imf.org) Web: <http://www.imf.org>

Price: \$18.00 per printed copy

**International Monetary Fund**  
**Washington, D.C.**



INTERNATIONAL MONETARY FUND

# SINGAPORE

## DETAILED ASSESSMENT OF OBSERVANCE

November 25, 2013

### ASSESSMENT OF OBSERVANCE OF THE CPSS-IOSCO PRINCIPLES FOR FINANCIAL MARKET INFRASTRUCTURES

Prepared By  
**Monetary and Capital  
Markets Department**

This Detailed Assessment Report was prepared in the context of an IMF Financial Sector Assessment Program (FSAP) mission in Singapore from July 25–August 7, 2013 led by Karl Habermeier, IMF, and overseen by the Monetary and Capital Markets Department, IMF. Further information on the FSAP program can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

# CONTENTS

<b>GLOSSARY</b>	<b>3</b>
<b>EXECUTIVE SUMMARY</b>	<b>6</b>
<b>I. BACKGROUND, KEY FINDINGS AND FOLLOW UP</b>	<b>9</b>
A. Introduction	9
B. Methodology and Information Used for the Assessment	9
C. Overview of Clearing and Settlement Landscape	10
D. Key Findings and Follow up for CDP-CCP	18
E. Key Findings and Follow up for SGX-DC	23
F. Key Findings and Follow up for MAS	27
G. Recommendations for CDP-CCP	29
H. Recommendations for SGX-DC	30
I. Recommendations for the MAS	31
<b>II. DETAILED ASSESSMENT FOR CDP-CCP</b>	<b>32</b>
<b>III. DETAILED ASSESSMENT FOR SGX-DC</b>	<b>163</b>
<b>IV. DETAILED ASSESSMENT RESPONSIBILITIES AUTHORITIES</b>	<b>277</b>
<b>V. AUTHORITIES' RESPONSE</b>	<b>297</b>
<b>FIGURES</b>	
1. Landscape of FMIs in Singapore	11
2. Organization Structure Group	12
<b>TABLES</b>	
1. Cleared Volumes CDP	12
2. Cleared Volumes SGX-DC	15
3. Ratings Summary of CDP-CCP	22
4. Ratings Summary of SGX-DC	27
5. Ratings Summary Responsibilities of the MAS	28
<b>APPENDIXES</b>	
1. Organization Chart of SGX	298
2. Risk Governance Structure SGX	299

## Glossary

ABS	Association of Banks in Singapore
ACRA	Accounting and Corporate Regulatory Authority
BFSR	Bank Financial Strength Rating
CAS	Client Accounting Systems
CCP	Central Counterparty
CDP	Central Depository (Pte) Limited
CDS	Credit Default Swap
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CFTC	Commodity Futures Trading Commission
CGC	Code of Corporate Governance
CG Regs	Securities and Futures (Corporate Governance of Approved Exchanges, Designated Clearing Houses and Approved Holding Companies) Regulations 2005
CIO	Chief Information Officer
CLS	Continuous Linked Settlement
CME	Chicago Mercantile Exchange
COSMOS	Collateral Submission Management and Optimization System
CPSS	Committee on Payment and Settlement Systems
CRRO	Chief Regulatory and Risk Officer
CSD	Central Securities Depository
DCH	Designated Clearing House under the SFA
DCO	Derivatives Clearing Organization
DRP	Disaster Recovery Plan
DVP	Delivery versus Payment
ERC	Enterprise Risk Committee
ERM	Enterprise Risk Management
ESMA	European Securities and Market Authority
EU	European Union
EXCO	Executive Committee
FMI	Financial Market Infrastructure
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FX	Foreign Exchange
HSVaR	Historical Value at Risk
IBS	Interbroker Settlement
IOSCO	International Organization of Securities Commissions

IRS	Interest Rate Swap
ISIN	International Securities Identification Number
IT	Information Technology
KPI	Key Performance Indicator
KRI	Key Risk Indicator
LC	Letter of Credit
LOU	Letter of Undertaking
MAS	Monetary Authority Singapore
MEPS	MAS Electronic Payment System
MEPS+	New MAS Electronic Payment System
MOS	Mutual Offset System
MOU	Memorandum of Understanding
NDF	Non-deliverable Foreign Exchange Forward
ORM	Organizational Resiliency Management
OTC	Over-the-Counter
OTCF	Over the Counter Financial products
PFMI	CPSS-IOSCO Principles for Financial Market Infrastructures
PS(O)A	Payment Systems (Oversight) Act
PS(O)R	Payment Systems (Oversight) Regulations
RCC	Regulatory Conflicts Committee
RCH	Recognized Clearing House
RMC	Risk Management Committee
RRP	Recovery and resolution plans
RSA	Risk Self Assessment
RTGS	Real Time Gross Settlement System
SAS	Securities Association Singapore
SB	Settlement Bank
SEC	Securities and Exchange Commission
SFA	Securities and Futures Act
SF(CF)R	Securities and Futures (Clearing Facilities) Regulations
SFTP	Secured File Transfer Protocol
SGD	Singapore Dollar
SGX	Singapore Exchange Limited
SGX-DC	Singapore Exchange Derivatives Clearing Limited
SGX-DT	Singapore Exchange Derivatives Trading Limited
SGX-ST	Singapore Exchange Securities Trading Limited
SMX	Singapore Mercantile Exchange Pte Ltd
SMXCC	Singapore Mercantile Exchange Clearing Corporation Pte Ltd
SOP	Standard Operating Procedures

SPAN	Standard Portfolio Analysis of Risk
SRO	Self Regulatory Organization
SSS	Securities Settlement System
STP	Straight Through Processing
TOR	Terms of Reference
TR	Trade repository
USDCCS	United States Dollar Cheque Clearing System
VAR	Value at Risk
WBE	Worst Bank Exposure

## EXECUTIVE SUMMARY

**Singapore has a well developed payment, clearing, and settlement infrastructure, which includes two central counterparties (CCPs) for financial products.** The infrastructure includes a large value payment system operated by the central bank and securities and derivatives clearing and settlement systems operated by the Singapore Exchange Limited (SGX). The two financial CCPs are (i) the Central Depository (Pte) Limited (CDP) that clears equities and corporate debt securities; and (ii) the Singapore Exchange Derivatives Clearing Limited (SGX-DC) that clears exchange traded and over-the-counter (OTC) derivatives. CDP's value of transactions as a percentage of GDP was 94 percent in 2012. Worldwide SGX-DC is the eighth largest clearer of equity index futures. Singapore is also one of the largest trading centers for OTC derivatives in Asia (just under S\$9 trillion in notional value of outstanding contracts). Its systemic importance is expected to increase with the implementation of the G20 reforms comprising the mandatory clearing of all standardized OTC derivatives.

**Financial Market Infrastructures (FMIs) in Singapore are subject to effective regulation, supervision and oversight of the Monetary Authority Singapore (MAS).** The legal framework provides the MAS with sufficient powers to obtain timely information and induce change. MAS' supervision of CCPs and securities settlement systems is guided by the Securities and Futures Act (SFA) and its accompanying regulations. In addition MAS has publicly announced its adoption of the Committee on Payment and Settlement Systems-International Organization of Securities Commissions (CPSS-IOSCO) Principles for Financial Market Infrastructures (PFMI). The relevant regulatory framework and policies are publicly disclosed.

**CDP and SGX-DC are assessed as sound and efficient CCPs that comply with relevant international standards.**<sup>1</sup> They are subject to SGX's comprehensive and transparent risk management framework comprising clear policies, sound governance arrangements, operational systems and default and business continuity procedures that are regularly tested. They are subject to oversight by the MAS.

**Credit and liquidity risk management frameworks enable the CCPs to maintain sufficient financial resources to cover the default of the clearing member and its affiliates with the largest exposure as well as the default of the two financially weakest clearing members.** The CCPs continuously monitor credit exposures during the day. Margin models are risk based and margins are determined twice a day for CDP and four times a day for SGX-DC. Initial margin is calculated with a confidence level of at least 99 percent and a close-out period ranging from one to five days, depending on the liquidity of the contract. The margin models are subject to back testing, sensitivity analysis and in-depth reviews by the internal risk management unit and the MAS. Each CCP has established a clearing fund to cover losses in extreme circumstances. Total financial

---

<sup>1</sup> CPSS-IOSCO Principles for Financial Market Infrastructures, April 2012.

resources are daily stress-tested using conservative historical and other scenarios. The CCPs have defined a risk management waterfall for the use of financial resources in case of credit losses upon member default, which includes their own capital constituting at least 25 percent of the clearing fund. The CCPs manage to obtain a comprehensive estimation of their participants' risk profile by also monitoring positions of large customers as well as exposures of their participants in other markets. They are currently not considered as CCPs of systemic importance in multiple jurisdictions; however, as volumes grow the coverage of financial resources should include the default of the two clearing members with the largest exposures, including their affiliates.

**The mission team has identified several areas that may benefit from further development:**

**SGX's recovery plan should be enhanced in line with ongoing international policy developments to ensure the continuation of critical operations in extreme circumstances.** It is recommended to extend the number and nature of the scenarios considered in the recovery plan, going beyond the default of several clearing members, prolonged business losses and reverse stress tests. The scenarios may cover extreme but plausible events, such as the simultaneous default of settlement banks or the default of a custodian. In addition, reduced liquidity availability in supporting markets, such as the foreign exchange (FX) market, should be considered. Loss sharing arrangements may potentially be developed for the international OTC financial derivatives market.

**The CCPs are encouraged to explore with their members taking Singapore government securities as collateral, instead of cash, to improve access to central bank liquidity in times of stress.** A standing facility is provided by MAS, which allows the CCPs to repo Singapore government securities and other eligible collateral for overnight Singapore dollar (SGD) funding. While the CCPs are able to accept non-cash assets, including government securities, as eligible collateral, this is not well-utilized as members prefer to provide cash as collateral. Efforts should be made to enable the use of MAS' standing facilities on an immediate basis, for example by collecting a part of the collateral in the form of Singapore government securities instead of cash. This will reduce the need for the CCPs to convert cash to government securities in times of stress.

**The global regulatory reforms for OTC derivatives clearing and trade reporting expose SGX-DC potentially to legal risk due to conflicts of laws. MAS is encouraged to continue its efforts to mitigate those risks in close cooperation with foreign authorities.** OTC derivatives reforms in the United States (U.S.) and the European Union (EU) may have extra-territorial implications for SGX-DC as well as market participants.<sup>2</sup> MAS is encouraged to strive for a joint approach with relevant foreign authorities to prevent the negative implications of conflicts of law, such as inconsistencies and legal uncertainty.

---

<sup>2</sup> Under the Dodd-Frank Act SGX-DC would be considered a non-U.S. institution engaged in derivatives transactions with U.S. persons and is subsequently subject to U.S. registration and regulatory requirements. Non-EU CCPs, such as SGX-DC, are prohibited from providing clearing services to entities established in the EU unless they are recognized by the European Securities and Markets Authority.

**Competition risk may rise in the coming years, following increased competition with foreign CCPs, especially for OTC derivatives.** The mandatory clearing obligation will shift bilateral clearing among banks to CCPs, increasing potential clearing volumes and subsequently competition between CCPs. Competition may lead to reduced clearing-related fees and improved clearing services; however, as collateral is costly, the CCP may face market pressures to reduce collateral requirements as well. SGX and MAS are encouraged to continue compliance with international standards and not compromise on the safety of the CCP.

**For CDP the possibility of separating the functions of CCP and central securities depository (CSD) into two distinct legal entities, under the existing holding company structure, could be explored, in line with international best practices.** CDP provides two services with a distinct risk profile as a CSD and a CCP. CDP's own resources including capital are not clearly separated and earmarked between its CSD and CCP functionalities. In times of crisis this could adversely impact the discharge of its roles as a CCP and a CSD. It is recommended that CDP reviews its legal structure to facilitate the potential execution of its recovery and resolution framework.

**Although risks related to the link with the Chicago Mercantile Exchange (CME) are assessed to be low, risk management procedures should be upgraded to be fully in line with international standards.** The letters of credit (LCs)—that are used to cover daily credit exposures that the CME poses to SGX-DC—should be covered by collateral or replaced in full by highly liquid assets with low credit risk. The SGX-DC clearing fund should not be used to cover potential losses related to the link, as this reduces the resources that the CCP holds to address the risks related to the potential default of clearing members.

**The supervision of the securities clearing and settlement systems should be improved by formalizing cooperative crisis management arrangements among the MAS and the relevant U.S. authorities.** The MAS, the U.S. Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) have a memorandum of understanding (MOU) enabling information sharing that also covers the link between SGX-DC and the CME. The MOU should be extended by adding a common crisis management framework that defines the roles and responsibilities of the MAS and the relevant U.S. authorities in crisis scenarios. Such a framework may facilitate effective and timely communication and potentially avoid losses or reduce the size of financial losses following financial or operational crisis events.

# I. BACKGROUND, KEY FINDINGS AND FOLLOW UP

## A. Introduction

### Assessor and objectives

- 1. This report contains the assessment of the CDP as well as the SGX-DC based on the PFMI.** The assessment was undertaken in the context of the IMF's FSAP to Singapore in May 2013. The assessors were Froukelien Wendt of the IMF's Monetary and Capital Markets Department and Gynedi Srinivas of the World Bank's Payment Systems Development Group. The assessors would like to thank the MAS, SGX and other financial institutions for the excellent cooperation and hospitality.
- 2. The objective of the assessment has been to identify potential risks related to CDP and SGX-DC that may affect financial stability.** While safe and efficient CCPs contribute to maintaining and promoting financial stability and economic growth, they may also concentrate risk. If not properly managed, FMIs can be sources of financial shocks, such as liquidity dislocations and credit losses, or a major channel through which these shocks are transmitted across domestic and international financial markets.

### Scope of the assessment

- 3. The scope of the assessment includes CDP, SGX-DC and its authority, the MAS.** The CCPs are assessed using the principles for FMIs. The MAS is assessed using the responsibilities for authorities of FMIs. The CDP has been assessed during the previous FSAP in 2002–03 using the CPSS-IOSCO Recommendations for the securities settlement system (SSS). Other FMIs that were assessed during the previous FSAP are the MAS Electronic Payment System (MEPS) and the MEPS-Singapore Government Securities system. SGX-DC has not been assessed before.

## B. Methodology and Information Used for the Assessment

- 4. The information used in the assessment includes relevant national laws, regulations, rules and procedures governing the CCPs, and other available material.**<sup>3</sup> Important sources of information have been the self assessments of the CCPs against the PFMI as well as the self assessment of MAS. Information was also collected during discussions with MAS, SGX, and main stakeholders.

---

<sup>3</sup> Other available material included annual reports, websites from the regulator, overseers, supervisors, operators and stakeholders and other relevant documents.

## C. Overview of Clearing and Settlement Landscape

**5. Singapore has a well developed payment, clearing and settlement infrastructure, consisting of several FMIs.** Figure 1 illustrates the role of several key FMIs in Singapore. The MAS operates the New MAS Electronic Payment System (MEPS+), which is the real time gross settlement (RTGS) system for interbank large value payments and the SSS for Singapore government securities. In addition, MAS is the CSD for government securities. Corporate securities are settled in the CDP, which is a CSD and SSS for equities and corporate debt securities. The CDP also offers a CCP for all stocks, bonds, and other corporate securities traded on the Singapore Exchange Securities Trading Ltd (SGX-ST). In addition, CDP operates a securities settlement system for corporate bonds traded on the OTC market, but the value of transactions is low. A second CCP in Singapore is offered by the SGX-DC, which clears exchange traded and OTC derivatives.<sup>4</sup> The Singapore Mercantile Exchange Pte Ltd (SMX) offers trading in commodity contracts, which are cleared by the SMX Clearing Corporation Pte Ltd (SMXCC).

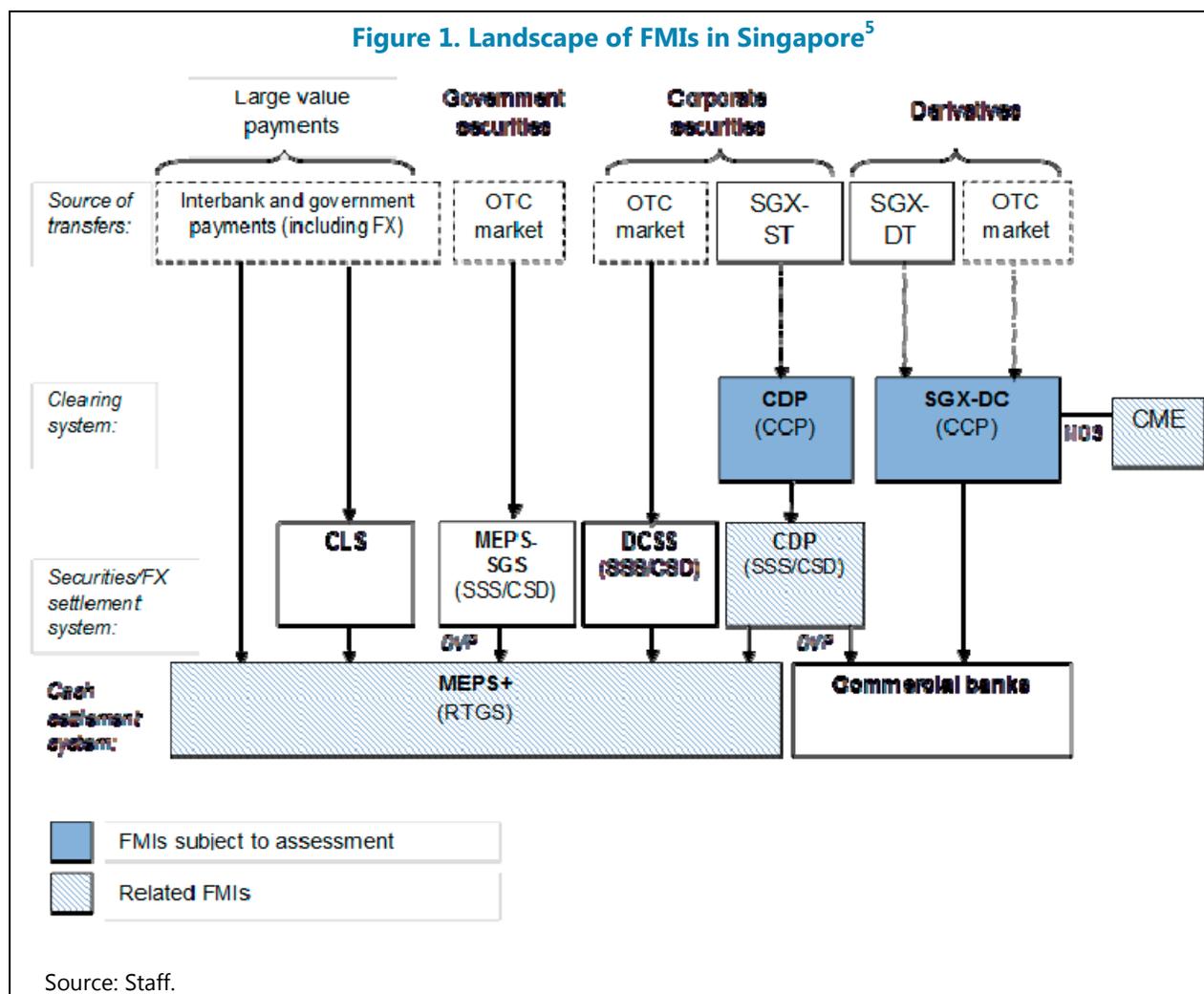
**6. The two CCPs operated by SGX are wholly owned subsidiaries of the SGX Group. Figure 2 outlines the organization structure of the SGX Group.** The holding company SGX is regulated as an approved holding company under the SFA. Both CDP and SGX-DC are wholly owned subsidiaries and are regulated as designated clearing houses (DCHs) under the SFA. CDP is, in addition, regulated as the central depository under the Companies Act. Other key regulated entities in the SGX group are SGX-ST and Singapore Exchange Derivatives Trading Ltd (SGX-DT), which are both regulated as approved exchanges under the SFA, and SGX, which is regulated as an approved holding company under the SFA. SGX-ST and SGX-DT are also wholly owned subsidiaries of SGX. Appendix 1 provides an organization chart of SGX.

### CDP-CCP

**7. CDP, established in 1987, is a systemically important FMI.** It provides integrated clearing, settlement and depository services for the securities market for both equities and fixed income instruments. The value of transactions cleared by CDP as a percentage of Singapore GDP as the end of 2012 was 94 percent. CDP cleared a total value of S\$327,281 million of securities trades, of which shares accounted for 88 percent in value terms and 81 percent in volume terms. In addition, CDP clears and settles other products such as corporate bonds, preference shares, rights, warrants, exchange traded funds, unit trusts (including real estate investment trusts unit trusts), depository receipts (global depository receipts and American depository receipts), and extended settlement contracts (marginable futures contracts). The details of the volumes and values of various products are given in Table 1.

---

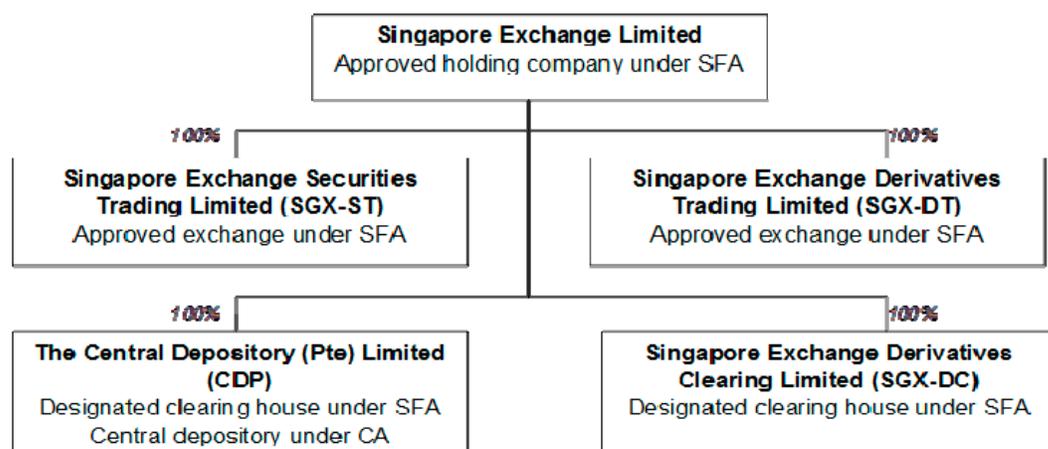
<sup>4</sup> Singapore is one of the largest trading centers for OTC derivatives in Asia (around US\$9.8 trillion in outstanding contracts).



**8. The CDP clearing rules, the delivery versus payment (DVP) rules and other contractual arrangements govern the relationship between CDP and its participants.** These rules and contractual arrangements set out the rights and obligations of CDP and its participants and are governed by Singapore law. Participants of CDP can be clearing members, trading members, and depository agents.

**9. As a CCP, CDP novates the trade and assumes the role of seller to the buying clearing member and buyer to the selling clearing member, on receiving the trade details from SGX-ST and matching it, or when a negotiated trade is reported to CDP for clearing on the trade date.** Settlement happens on a T+3 basis. CDP marks the outstanding positions to the latest available market price at least twice a day, and requires payment of margins from its clearing members whose positions have lost value.

<sup>5</sup> SMXCC is a third CCP, not included in the picture, that clears commodity and financial derivatives traded on the SMX.

**Figure 2. Organization Structure Group**

Source: SGX.

**Table 1. Cleared Volumes CDP**

Product type	Total Value 2012 (S\$ million)	Total Volume 2012 (million units)
Shares	289,777	429,162
Bonds/notes	165	142
Preference shares	340	26
Rights	62	1,900
Warrants	5,825	69,070
Exchange traded funds	5,164	383
Funds	332	730
Unit trusts	23,756	20,580
Stapled securities	1,734	1,359
Depository receipts	42	10
Extended Settlement	84	35
Total	327,281	523,397

Source: SGX.

**10. In general, all trades are settled between clearing members and CDP through inter-broker settlement (IBS). However, CDP also offers institutional customers the option of**

**settling trades directly with CDP, without intermediation of a broker.**<sup>6</sup> Such customers are required to appoint a principal, who in turn must appoint a settlement bank to conduct funds settlement and a depository agent to conduct securities settlement with CDP. The settlement bank guarantees the principal's payment obligations and the settlement bank's obligations are in turn guaranteed by a clearing bank. The IBS settlement accounted for 43 percent of the total money settlement in 4th quarter of 2012, with direct settlement of institutional customers' trades accounting for the remaining 57 percent.

**11. CDP conducts money settlement using commercial bank money with the final inter-bank funds settlement taking place in central bank money.** CDP has rules and risk management frameworks in place to minimize and control the credit and liquidity risks arising from the use of commercial bank money.

**12. Principal risk is eliminated with the securities to be delivered earmarked and blocked in the pre-settlement run on the value date.** On successful completion of earmarking of securities balances for delivery, the final settlement of funds balances happens in the afternoon followed by delivery of securities on the night of value date.

**13. CDP routinely measures and monitors its credit and liquidity exposures, and uses risk-management tools such as margin and a clearing fund.** Stress testing is carried out by CDP on a daily basis to determine the amount and sufficiency of its liquid resources. CDP has liquid resources available which aim to cover the default of the clearing member and its affiliates with the largest exposure and the two financially weakest members. The risk exposures of a participant who plays multiple roles are monitored individually in its respective role and on an aggregated basis daily.

**14. CDP accepts collateral assets with low credit, liquidity, and market risks.** CDP uses the collateral submission management and optimization system (COSMOS), which is also used by SGX-DC, for collateral management purposes. COSMOS also allows clearing members to manage their margin requirements collateral. CDP currently accepts SGD and US\$ cash, Singapore government securities and U.S. treasuries as collateral, although in practice only cash is deposited as collateral.

## SGX-DC

**15. SGX-DC is a systemically important CCP for the capital market in Singapore.** SGX-DC plays a critical role as the key CCP for financial derivatives transactions. Its systemic importance is expected to increase with the implementation of the G20 reforms comprising the mandatory clearing of all standardized OTC derivatives. Singapore ranks 8th in volume traded in exchange

---

<sup>6</sup> The settlement arrangement for institutional investors in CDP, without intermediation of a broker, is called DVP settlement, not to be confused with the internationally used concept of delivery versus payment in FMIIs that describes the securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.

traded equity index futures. In 2012, SGX-DC had an average daily clearing value of US\$25 billion and an average daily outstanding notional value of US\$300 billion (relates to annual GDP with a factor of approximately one).<sup>7</sup>

**16. SGX-DC is the CCP for both exchange traded as well as OTC traded derivatives.**

Transactions cleared by SGX-DC may come from three different sources (i) transactions in derivatives traded on the SGX-DT; (ii) transactions in OTC commodity derivatives, which are reported via the SGX OTC trade registration platform; and (iii) transactions in OTC financial derivatives that are reported via industry-used trade registration systems. SGX-DC guarantees the settlement of all novated transactions. The SGX-DC rules govern its operations, admission requirements and other obligations of its participants. Table 2 provides an overview of the different types of derivatives cleared by SGX-DC, including cleared volumes.

**17. Exchange traded derivatives and OTC commodities are cleared in real time via the SGX systems.**

Novation occurs as soon as a transaction is matched in the trading system of the SGX-DT or upon successful registration of the trade on the registration platform. SGX clearing systems enable straight through processing (STP) from trade execution to clearing members' back-office systems, including dissemination of trade records in real-time and dissemination of reports information. The SGX systems were launched in December 2009 and are based on NASDAQ OMX's clearing system.

**18. OTC transactions in financial derivatives (OTCF) are required to be prefunded by collateral before SGX-DC accepts the clearing obligation.** The SGX-DC clearing system for OTCF connects to multiple trade registration and affirmation platforms. Clearing members submit transactions for clearing and receive clearing statuses via MarkitWire for interest rate swaps (IRS), and MarkitServ FX for non-deliverable foreign exchange forwards (NDFs). SGX-DC clearing system for OTCF is based on Calypso technology.<sup>8</sup>

**19. SGX-DCs risk management waterfall consists of margin, clearing fund and own capital.**

SGX-DC calculates initial and variation margin four times a day. Settlement banks have to confirm the availability of collateral within the stipulated time for both exchange traded derivatives and OTC derivatives. SGX-DC also maintains a separate clearing fund as well as dedicated capital for the SGX-DC legal entity.

---

<sup>7</sup> Values include both listed and OTC derivatives cleared on SGX.

<sup>8</sup> Calypso is a global provider of clearing and treasury market solutions and currently provides OTC clearing systems to CME, Eurex and Tokyo Stock Exchange/Japan Securities Clearing Corporation.

**Table 2. Cleared Volumes SGX-DC**

<b>Type of Derivative</b>	<b>2012</b>	<b>Change 2011–12 (percent)</b>	<b>Underlying Values</b>
• Transactions executed on SGX-DT (nr of contracts traded)			
Equity Index Futures	74,021,190	8	Highest volumes in Nikkei 225, FTSE China A50, MSCI Taiwan and SGX S&P CNX Nifty indices
Equity Index Options	4,728,108	126	Highest volumes in Nikkei 225 and CNX Nifty indices.
Interest Rate/Bond Futures	1,051,770	28	Mini Japanese government bond futures index.
Dividend Index Futures	152,554	143	Nikkei Stock Avg Dividend Pt Dividend Index
Commodity Futures	256,995	-18	Crude palm oil, coffee, rubber, aluminum, copper, and zinc.
<b>Total</b>	<b>80,210,617</b>	<b>11</b>	
• Transactions reported via the SGX Trade registration platform (nr of contracts traded)			
Commodity Swaps	332,465	74	Freight, iron ore, subbit coal, energy, and rubber.
Commodity Options	5,236	-	Freight and iron ore.
<b>Total</b>	<b>337,701</b>	<b>77</b>	
• Transactions reported in OTC Financial Derivatives (notional amount in SGD million equivalent)			
OTC interest rate swaps	131,213.60 (approximately 3,000 trades)	-28	Singapore Dollars Interest Rate Swaps and U.S. Dollars Interest Rate Swaps.
Non-deliverable currency forwards	n/a	-	Chinese Yuan against the U.S. Dollar, Korean Won against the U.S. Dollar, Indian Rupee against the U.S. Dollar, Indonesian Rupiah against the U.S. Dollar, Taiwan Dollar against the U.S. Dollar, Malaysian Ringgit against the U.S. Dollar, Filipino Peso against U.S. Dollar.

Source: SGX.

**20. SGX-DC has an international group of participants, which consists of clearing members that are financial intermediaries and banks.**

Currently, there are 22 general clearing members (which are financial intermediaries) and 15 bank clearing members. Twelve out of fifteen bank clearing members originate from foreign jurisdictions, such as the U.S., the United Kingdom (U.K.), France, Germany, Sweden, the Netherlands, Switzerland, Malaysia and Hong Kong. Direct customers refer to customers who hold accounts directly with the clearing member. The base is diverse and typically includes broker-dealers, banks, asset management companies, hedge funds and other funds, market makers, non-financial corporate entities, and individuals.

**21. Cash settlement is in commercial bank money.** SGX-DC as CCP completes money settlement through commercial banks who are admitted by SGX-DC as settlement banks. SGX-DC and its members maintain accounts with these settlement banks. Money settlements of clearing members, following a margin call, are also effected through settlement banks. Non-cash collateral, such as government bonds and shares, are kept by custodians on behalf of the clearing member.

**22. SGX-DC maintains a link with the CME.** SGX-DC has entered into a mutual offset system agreement (MOS) with the CME since 1984, which allows that transactions in specific contracts<sup>9</sup> executed at one exchange can be allocated to the clearing house of the other exchange for clearing. The MOS link offers market participants the opportunity to trade during extended hours without the need to become member of two clearing houses. SGX-DC will stand in as the intermediary for SGX-DC members and guarantees the settlement of that position towards CME. SGX-DC requires CME to post margin for the positions that CME guarantees on behalf of its members.

### **Regulatory, supervisory and oversight structure**

**23. Both CCPs are supervised by the MAS.** The MAS is responsible for the supervision of payment, clearing and settlement systems, which includes CDP and SGX-DC. A first objective of MAS' supervision is to ensure that FMIs are designed and operated in a safe manner without compromising financial stability. In addition, MAS seeks to ensure that FMIs operate in an efficient manner, keeping costs reasonable while maximizing economic benefits. The MAS has publicly announced its adoption of the PFMI.<sup>10</sup>

**24. The role and responsibilities of the MAS are based on statutory law.** The MAS regulates and supervises systemically important CCPs and SSS as DCH under the SFA and relevant subsidiary legislation. Payment systems in Singapore are subject to supervision based on the Payment Systems (Oversight) Act (PS(O)A). A CCP that seeks to offer its services in Singapore must be authorized by MAS before it may commence operations. MAS supervises the CCPs on an ongoing basis. MAS' supervisory framework includes regular monitoring, meetings with senior management, self

<sup>9</sup> The concerned contracts are Eurodollar Futures, Euroyen TIBOR Futures, Nikkei 225 Index Futures, traded in JPY, U.S. Dollar Nikkei 225 Index Futures, traded in U.S. Dollar and CNX Nifty Index Futures.

<sup>10</sup> See MAS, Supervision of Financial Market Infrastructures in Singapore, January 2013.

assessments and inspections. MAS also approves matters such as new product listings, rule changes and major policies implemented by SGX. MAS has also developed a risk assessment framework to assess the level of risks, and adequacy of controls of the CCPs.

**25. The MAS has delegated several regulatory tasks to the SGX that serves as a self regulatory organization (SRO) for the markets and FMIs that it operates.** SGX works closely with the MAS and the Commercial Affairs Department to develop and enforce rules and regulations. SGX's regulatory objectives are to promote a fair, orderly and transparent marketplace as well as a safe and efficient clearing and settlement system. SGX bears commercial responsibilities in addition to its regulatory duties. Therefore, SGX has established a framework to manage potential conflicts of interest.

### OTC derivatives reforms in Singapore

**26. Singapore is developing its clearing and trade reporting services for OTC financial derivatives.** SGX-DC has launched clearing and settlement services for IRS in November 2010 and for NDF in October 2011.<sup>11</sup> Although Singapore is one of the largest trading centers for OTC derivatives in Asia (just under S\$9 trillion in notional value of outstanding contracts) volumes are still low compared to OTC derivatives markets in Europe and the U.S. Depository Trust and Clearing Corporation (DTCC) is in the process of establishing a trade repository (TR) in Singapore, called DTCC Data Repository Singapore. The trade repository aims to report transactions in all OTC derivative asset classes. The Singapore Foreign Exchange Markets Committee (an industry body) is committed to increase standardization of OTC derivatives, starting with IRS.

**27. MAS is on track with implementing the G20 and Financial Stability Board (FSB) recommendations for the OTC derivatives market.** As a member of the FSB the Singapore government committed itself to improve the regulation and supervision of OTC derivatives markets to strengthen the international financial regulatory system. Legislative amendments to the SFA to mandate reporting and central clearing have been passed into law in November 2012. Basel III capital requirements for banks' exposures to CCPs have been implemented on July 1, 2013. Amendments for the licensing of CCPs and TRs have been implemented on August 1, 2013. MAS has decided not yet to introduce a trading mandate as it is still analyzing the costs and benefits of a trading mandate.

**28. In addition, detailed regulations to implement the clearing and reporting mandate are being developed.** The SFA introduces a requirement for prescribed OTC derivatives to be centrally cleared which covers all asset classes as well as financial and non-financial entities above a specified threshold. The legislation does not contain CCP location requirements, but specifies the recognition

---

<sup>11</sup> Hong Kong Exchanges and Clearing and KRX, the Korean exchange, also plan to offer OTC derivatives clearing, while the Japan Securities Clearing Corporation in October last year started clearing yen-denominated IRS.

criteria for non-local CCPs. MAS expects to implement mandatory reporting in Q4 2013 and to commence mandatory clearing in Q3 2014.

## D. Key Findings and Follow up for CDP-CCP<sup>12</sup>

### General organization (Principles 1–3)

**29. CDP has a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities.** CDP has rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations in relation to collateral arrangements, novation, netting and setting-off arrangements, settlement finality and in protecting the rights and interest of CDP, its participants and their customers in the event of a default backed by the relevant legal statutes in Singapore. This provides a high degree of certainty that actions taken by CDP under such rules and procedures will not be voided, reversed, or subject to stays. CDP articulates the legal basis for its activities to relevant authorities, participants, and, where relevant, to the participants' customers, in a clear and understandable way.

**30. SGX applies governance arrangements that are transparent and support the stability of the financial system.** The roles and responsibilities of its board and management are clearly described and publicly available. SGX's company objectives include the maintenance of safe and efficient clearing and settlement facilities. SGX has established a risk management committee (RMC) and a regulatory conflicts committee (RCC) that includes independent board members to identify, monitor and manage companywide risks as well as CCP related risks. Dedicated risk management units ensure that the risk management framework is executed on an ongoing basis. In addition, SGX has sound internal control policies to provide for independent assessments of the effectiveness of the risk management framework of SGX. Given that CDP discharges the role of a CSD and a CCP, it is suggested to explore the possibility of separating the CCP and CSD functions of CDP into two distinct legal entities under the existing holding company structure.

**31. SGX uses an effective enterprise risk management (ERM) framework to manage companywide risks and CCP related risks.** The framework entails a top-down approach, with annual board decisions on risk types and limits, as well as bottom up assessments of divisions and units of the risks specific to their functions. The governance of SGX, its policies and systems support the enterprise risk framework. The key risks for 2013 include default risks, operational risks, regulatory risks, and competition risk.

**32. A recovery plan is available, which can be further developed.** SGX has identified critical operations as well as scenarios that may potentially prevent SGX to continue operations. It is recommended to extend the number and nature of the scenarios considered, going beyond the default of several clearing members, prolonged business losses and reverse stress tests. The

---

<sup>12</sup> Conclusions for Principles 2, 3 and 17 apply to both CDP and SGX-DC and are discussed in this section.

scenarios may cover extreme but plausible events, such as the default of more than one large bank that fulfill various roles to the CCP, such as settlement banks, liquidity providers but also custodians. In addition, reduced liquidity in supporting markets, such as the FX market should be considered. One of the strategies that SGX-DC may potentially consider for its OTCF clearing activities are loss-sharing arrangements that go beyond the current mutualization of the clearing fund.

### **Credit and liquidity risk management (Principles 4–7)**

**33. CDP has a robust credit risk exposure framework covering credit exposures arising from both current and potential future exposures arising from its payment, clearing, and settlement processes.** The framework identifies sources of credit risk, routinely measures and monitors credit exposures, and uses appropriate risk-management tools to control these risks. CDP covers its current and potential future exposures to each participant fully with a high degree of confidence using margin and other prefunded financial resources such as the clearing fund. CDP determines the amount and regularly tests the sufficiency of its total financial resources available which are deemed adequate to cover the default of the clearing member and its affiliates with the largest exposure and the two financially weakest members. Stress tests covering a wide range of stress scenarios are performed on a daily basis. Appropriate governance arrangements are in place.

**34. CDP accepts collateral assets with low credit, liquidity, and market risks.** It has in place prudent valuation practices and conservative haircut methodologies that are regularly tested and take into account stressed market conditions. Validation rules are built into the COSMOS system to allow only permitted collateral to be accepted into the system. While CDP is able to accept other kinds of collateral such as Singapore government securities and U.S. treasuries, it has only received cash as collateral from members. It is recommended that CDP explores with members the feasibility of receiving a part of the collateral in the form of Singapore government securities, as it has the necessary systems and resources in the form of COSMOS with prudent valuation and stable haircut methodologies. Further, this would enable CDP to use MAS standing facility for repo in times of stress.

**35. The margin system for securities was introduced in January 2013.** CDP has a reliable source of timely price data for its margin model. The initial margin meets an established single-tailed confidence level of at least 99 percent. Intra-day margin calls are made. CDP analyses and monitors its model performance and overall margin coverage by conducting daily back testing and monthly sensitivity analysis. CDP is encouraged to further fine-tune the margin model parameters based on its ongoing evaluation of the model's performance for a more efficient and effective margin requirement in various scenarios.

**36. CDP has a risk management framework to manage liquidity risk from its participants, settlement banks, clearing banks, custodian banks, liquidity providers, and deposit-keeping banks.** Stress testing is carried out by CDP to determine the amount and sufficiency of its liquid resources. CDP has liquid resources available which are deemed adequate to cover the default of the clearing member and its affiliates with the largest exposure and the two financially weakest members. The risk exposure of a participant who plays multiple roles is monitored individually in its

respective roles and on an aggregated basis daily. Daily aggregate monitoring has been introduced from July 15, 2013.

### **Settlement (Principles 8–10)**

**37. CDP's rules and regulations provide for final settlement of securities and funds on the value date.** The final inter-bank settlement of funds takes place through MEPS+ at 4:30 p.m. The securities are earmarked or blocked in the securities account at 12 noon with delivery happening during the batch processing cycle for securities which starts at 8:00 p.m. This time lag has the potential to create settlement risks. It is recommended that the settlement lag for securities settlement be reduced to avoid this possibility.

**38. CDP conducts money settlements using a combination of commercial and central bank money with the final inter-bank funds settlement taking place in central bank money.** CDP has rules and risk management frameworks in place to minimize and control the credit and liquidity risks arising from the use of commercial bank money. CDP should consider using MEPS+ for direct settlements in Singapore dollar. In addition, although a settlement cycle of T+3 is compliant with Annex 3 of the PFMI it is recommended that CDP evaluates the benefits and costs of a settlement cycle shorter than T+3, in line with current international best practices.

### **Central securities depositories and exchange-of-value settlement systems (Principles 11–12)**

**39. Principal risk is eliminated with the securities earmarked and blocked in the pre-settlement run on the value date.** On successful completion of earmarking of securities balances for delivery, the final settlement of funds balances happens in the afternoon followed by delivery of securities on the night of the value date.

### **Default management (Principles 13–14)**

**40. CDP has an effective default management framework with defined rules and procedures to manage a participant default.** The rules and procedures provide for CDP to take timely action to contain losses and liquidity pressures and continue to meet its obligations. It publicly discloses its default procedures and conducts fire drills on a periodical basis.

**41. CDP has segregation and portability arrangements that effectively protect a participant's customers' positions and related collateral from the default of a participant.** In the case of securities transactions, where a member defaults, the member's customers' positions are protected through the process of re-novation, under which CDP settles such positions directly with the defaulted clearing member's customers. In the case of Marginable Futures Contracts (futures contracts that are listed and traded on SGX-ST and which are subject to margin requirements), CDP holds all collateral on trust. Clearing members' collateral, customers' collateral and CDP's own assets are all separately held. In the event of a clearing member's default, all customers' positions are protected through CDP's portability arrangements under the CDP clearing rules. CDP's

integrated back office CAS enables it to identify positions of a participant's customers. Customer collateral is protected in a trust arrangement and the details thereof are publicly disclosed in the CDP clearing rules.

### **General business and operational risk management (Principles 15–17)**

**42. General business risks are managed in accordance with the risk governance structures and the ERM framework.** CDP identifies, monitors, and manages its general business risk and holds sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if these losses materialize for up to six months. It has a capital plan with a range of actions which has been approved by the SGX Board on the recommendation of the RMC.

**43. CDP has a well laid-down custody and investment policy.** SGX has an established overarching policy framework which addresses counterparty credit and concentration risks arising from banks and custodians that CDP uses for safekeeping of financial assets. CDP holds its own cash reserves and cash collateral from its clearing members in either current or short term deposits with banks.

**44. SGX (including CDP and SGX-DC) has in place appropriate systems, policies, procedures, and controls to mitigate operational risk which are reviewed, tested and audited periodically.** Operational risks are reviewed through an annual top-down approach and an annual bottom-up risk self-assessment exercise. These processes are part of SGX's ERM framework. The Board has delegated to the RMC the authority to approve operational risk management strategies. Systems are designed to ensure a high degree of security and operational reliability and have adequate, scalable capacity. SGX has comprehensive physical and information security policies that address potential vulnerabilities and threats.

**45. Business continuity management is ensured through a permanent split-site which is staffed.** SGX's organizational resiliency management (ORM) plan is aligned to the MAS business continuity management guidelines and principles for the financial services industry. All critical systems have a recovery time objective of not more than two hours. An annual industry wide exercise with market participants is conducted to test the recovery procedures. The business continuity management plans are documented and tested. When volumes grow and the systemic importance of the CCPs increases, eventually in multi jurisdictions, SGX could consider to establish a third site to further increase the resilience of the operational systems.

### **Access (Principles 18–20)**

**46. CDP has objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.** CDP monitors compliance with its participation requirements on an ongoing basis and has clearly defined and publicly disclosed procedures for facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, its participation requirements.

**47. CDP has a risk management framework for monitoring and mitigating tiered participation arrangements.** Its rules and procedures allow it to gather information about indirect participation in order to identify, monitor, and manage any material risks from tiered participation arrangements. These measures enable CDP to identify those indirect participants responsible for a significant proportion of transactions and whose transaction volumes or values are large relative to the capacity of the clearing member.

#### Efficiency (Principles 21–22)

**48. CDP’s products and services cater for requirements of various participants and the market.** CDP is efficient and effective in meeting the requirements of its participants and the markets it serves through timely processing of transactions, maintenance of sufficient financial resources to minimize market disruptions in the event of a member default and minimizing systems downtime.

**49. CDP uses internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording activities.** Where necessary, CDP uses proprietary applications or message converters to translate between proprietary messages and SWIFT messages for securities money settlement, corporate actions announcement information and CDP shareholdings position with the foreign and local custodian banks.

#### Transparency (Principles 23–24)

**50. CDP has clear and comprehensive rules and procedures and provides sufficient information to participants enabling them to have an accurate understanding of the risks.** The fees and other material costs they incur by being a participant of CDP are also disclosed. All relevant rules and key procedures are publicly disclosed in English. CDP has completed the CPSS-IOSCO Disclosure framework for FMIs.

**Table 3. Ratings Summary of CDP-CCP**

Assessment category	Principle
Observed	1, 2, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23
Broadly observed	3
Partly observed	
Not observed	
Not applicable	10, 11, 20, 24

## E. Key Findings and Follow up for SGX-DC13

### General organization (Principles 1–3)

**51. SGX-DC has a sound legal basis for its clearing activities and the enforceability of related rights and obligations are established with a high degree of certainty.** The SFA, Securities and Futures (Clearing Facilities) Regulations (SF(CF)R) and the SGX-DC rules govern sufficiently the novation and collateral arrangements, interoperability and default procedures. The SFA provides for a firm statutory foundation for finality, netting, set-off and closing out of positions. There's a high certainty that the rules, procedures and contracts are enforceable in the Singapore and foreign jurisdictions. SGX has identified and mitigated potential conflict of law issues concerning the admittance of non-local clearing members as well as the use of collateral issued by U.S., European and Japanese governments.

**52. The global regulatory reforms related to OTC derivatives clearing and reporting may however expose SGX-DC to legal risk due to conflicts of laws, in particular the U.S. and EU laws. The MAS is encouraged to continue its efforts to mitigate those risks, in close cooperation with foreign authorities.** OTC derivatives reforms in the U.S. and EU, enacted primarily through Title VII of the Dodd-Frank Act and the European Market Infrastructure Regulation (EMIR) respectively, may have extra-territorial implications for SGX-DC as well as market participants and could create complexity, cost, fragmentation, and potentially systemic risk in international markets due to overlapping and contravening legislation in other nations that deal with U.S. and EU institutions. Under the Dodd-Frank Act and current guidelines, the SGX-DC would be considered a non-U.S. institution engaged in derivatives transactions with U.S. persons and is subsequently subject to U.S. registration and regulatory requirements. Non-EU CCPs, such as SGX-DC, are prohibited from providing clearing services to entities established in the EU unless they are recognized by the European Securities and Market Authority (ESMA). Technical standards of EMIR set out aspects of the recognition regime for third country CCPs. MAS should continue its efforts to reach agreement with relevant foreign authorities on a common approach to avoid these legal risks.

### Credit and liquidity risk management (Principles 4–7)

**53. SGX-DC applies a comprehensive credit risk management framework and maintains sufficient financial resources to cover the default of the clearing member and its affiliates with the largest exposure as well as the default of the two financially weakest clearing members.** SGX-DC continuously monitors credit exposures during the day. A clearing fund is established to cover potential losses in extreme circumstances. The total financial resources are daily stress tested, taking into account various conservative historical and other scenarios. SGX-DC has defined a risk management waterfall for the use of financial resources in case of credit losses, which includes its own capital. The legal and regulatory framework supports this framework. SGX-DC is

---

<sup>13</sup> Conclusions for Principles 2, 3, and 17 apply to both CDP and SGX-DC and are discussed in section D.

currently not considered a CCP of systemic importance in multiple jurisdictions; however, in case volumes grow the coverage of its financial resources should include the default of the two largest clearing members.

**54. SGX-DC accepts cash, government securities and shares as collateral to cover credit exposures.** Collateral is subject to conservative haircuts. Government bonds are accepted from the U.S., Singapore, Japan, France and Germany. Shares have only recently been admitted and face a haircut of 30 percent. In practice, the majority of collateral is deposited in cash. Collateral is marked to market on a daily basis. Concentration limits can be defined per clearing member, in addition to the current concentration limits that define a maximum threshold per issue. It is recommended that SGX-DC explores with members the feasibility of receiving a part of the collateral in the form of Singapore government securities, as this would enable the CCP to use MAS standing facility for repo in times of stress.

**55. All products cleared by SGX-DC are subject to an effective margin system. The margin model is risk based and comprises both initial and variation margin.** Initial margin should cover potential future exposures. Variation margins are called to ensure the coverage of current exposures. Margin models apply international standards and are subject to back testing, sensitivity analysis and in-depth reviews by the internal risk management unit and the MAS. The initial margin is calculated with at least 99 percent confidence level with a close-out period varying from one to five days, depending on the liquidity of the contract. SGX-DC allows for offsets in a conservative way. Another conservative feature is that clients are margined on a gross basis, although certain exemptions exist for clients that belong to the same legal beneficiary owner. Clients can benefit from spread claims prescribed by SGX, which is a standard feature of the international used standardized portfolio analysis of risks (SPAN) system. SGX-DC is able to make intraday margin calls, based on updated prices and positions. SGX-DC is encouraged to further reduce the time between the margin calls and the actual deposit of margin.

**56. SGX-DC also has an effective framework for the management of liquidity risks.** SGX-DC is able to identify, measure and monitor its settlement and funding flows on an ongoing basis. SGX-DC monitors its liquidity exposures to both its clearing members as well as servicing banks on a daily basis. If needed SGX-DC can draw on several credit lines provided by several local commercial banks. The liquidity providers need to comply with specific criteria. To manage its multicurrency need, SGX-DC can draw on credit lines which are available in multiple currencies, as well as rely on the FX market in Singapore. SGX-DC does have a central bank account and may obtain SGD liquidity by entering into a repurchase agreement of eligible government securities.

### **Settlement (Principles 8–10)**

**57. Settlement finality is provided for settlements in cash as well as securities that are deposited as collateral.** The SGX-DC contractual arrangements clearly specify the moment of finality. The contractual obligations are set out in the SGX-DC clearing rules, the letter of undertaking (LOU) with the settlement banks and the MOS agreement with the CME. The SFA

supports the enforceability of the contractual obligations at a statutory level. Finality occurs real time as soon as settlements are considered complete in accordance with the contractual obligations.

**58. SGX-DC conducts money settlements through commercial banks that are selected by SGX-DC as settlement banks.** Most settlements are in U.S. dollar and Japanese Yen. SGX-DC has no direct access to the respective central banks of issue. Settlements in Singapore dollar are relatively small and general clearing members do not have access to the MEPS+ system. Settlement bank risk is reduced by applying strict selection criteria for settlement banks, such as capital ratios, creditworthiness, access to liquidity and operational reliability. SGX-DC monitors compliance with these criteria on a regular basis. In addition, SGX-DC monitors its concentration to the settlement banks and reduces its exposures if concentration limits are reached. SGX-DC should consider using MEPS+ for direct settlements in Singapore dollar.

**59. For physical settlements SGX-DC acts as the escrow agent and does not guarantee the delivery of contracts.** Commodity contracts for rubber and oil are accepted for physical delivery. SGX-DC's clearing rules describe the obligations of market participants as well as procedures and controls to manage the delivery process.

#### **Default management (Principles 13–14)**

**60. SGX-DC has well-developed default rules and procedures to manage a participant's default.** The SGX-DC clearing rules comprehensively describe the declaration of a default and risk mitigating actions to be taken by the CCP. The CCP also has appropriate discretionary power to implement these rules. In addition the CCP has internal guidelines and procedures to manage default situations. These procedures are tested on an annual basis with the involvement of clearing members. Key aspects of the default procedures are publicly available. SGX-DC is encouraged to conduct drills for exchange traded derivatives and OTC commodities on an annual basis as well.

**61. Customers' positions and related collateral are protected by segregation and portability arrangements in case of the default of their clearing member.** SGX-DC holds customer and clearing member collateral on trust. Customer collateral is held separately from both clearing members' collateral and SGX-DC's own assets. Customers' positions are administrated in individual and omnibus accounts, with powers for the CCP to collect information on customers' positions that are part of an omnibus structure. Portability arrangements allow customers as well as the CCP to transfer positions and collateral to surviving clearing members if needed. Porting of positions and collateral has been conducted during recent defaults. Customers' positions cannot always be transferred, but will sometimes need to be liquidated. The SGX-DC rules disclose such exceptions and risks to customers.

#### **General business and operational risk management (Principles 15–17)**

**62. The identification, monitoring and mitigation of general business risks is part of SGX's ERM framework and financial and business plans.** New products are analyzed on their risk implications before launching. SGX-DC holds sufficient liquid net assets funded by equity so that it

can continue operations and services as a going concern if it incurs general business losses. The amount of liquid net assets is sufficient to cover at least six months of current operating expenses. If needed SGX is able to raise additional equity if equity falls close to the amount needed.

**63. Competition risk may rise in the coming years, following increased competition with foreign CCPs, especially for OTC financial derivatives.** The mandatory clearing obligation will shift bilateral clearing among banks to CCPs, increasing potential clearing volumes and subsequently competition between CCPs. Competition may lead to reduced clearing-related fees and improved clearing services; however, as collateral to cover CCPs risk exposures is costly, the CCP may face market pressures to reduce collateral requirements as well. SGX and MAS are encouraged to continue compliance with the international standards and not compromise on the safety of the CCP, which should not prevent them from searching for efficiencies in the risk management framework.

**64. SGX-DC holds its own and its participants' assets in supervised and regulated banks and national depositories.** Cash assets are kept in banks, either in current or short term deposits. Non-cash assets, which comprise of selected government securities and SGX-ST listed securities are kept with custodians and not invested. SGX-DC has appropriate selection criteria for banks and custodians and regularly monitors compliance with these criteria.

#### **Access (Principles 18–20)**

**65. Participant's access criteria allow for fair and open access to SGX-DC's services.** Access criteria are publicly disclosed. Procedures are in place to facilitate the suspension and orderly exit of a participant that no longer meets the participation requirements. SGX-DC monitors compliance with its access criteria on an ongoing basis.

**66. SGX-DC has effective measures in place to identify, monitor and manage risks arising from participants' customers.** Rules allow the CCP to gather detailed information on customers to identify and evaluate related exposures. In its review the CCP will evaluate the financial soundness of the customers and the probability and impact of a potential default. Exposures are monitored on a daily basis. Key information is reported to the board on a monthly basis and measures are taken if needed.

**67. Risks related to the link with the CME are daily monitored and mitigated by a LCs issued by a consortium of banks.** Five exchange-traded financial derivatives are eligible to be cleared via the link, which provides clearing members of the SGX-DC and CME with the opportunity to allocate transactions, executed at one exchange, to be cleared by their clearing house of choice. Although risks are assessed to be low, risk management procedures should be upgraded to be fully compliant with the PFMI. The LC should be covered by collateral or replaced in full by highly liquid assets with low credit risk. The SGX-DC clearing fund should not be used to cover potential losses related to the link, as this reduces the resources that the CCP holds to address the risks related to the potential default of clearing members.

### Efficiency (Principles 21–22)

**68. SGX-DC has arrangements in place to consult its participants on a regular basis to address their needs in the design of its operations and services.** SGX-DC has established mechanisms for the regular review of its efficiency and effectiveness, such as customer satisfaction surveys, user groups and internal control procedures. SGX-DC reviews its pricing structure and system-related cost on a regular basis.

**69. Internationally accepted communication procedures and standards are used** for communication between SGX-DC, its clearing members, settlement banks, and other FMIs. SGX’s systems generate SWIFT messages to the members’ settlement banks for money settlement. The SWIFT messages are based on ISO15022 standards.

### Transparency (Principles 23–24)

**70. SGX-DC has disclosed responses to the CPSS-IOSCO Disclosure framework for FMIs, which enables participants to appropriately assess the risks they incur by participating in the CCP.** SGX-DC disclosed its rules and regulations on its website. The website also contains statistics and various descriptions of the risk management and operational systems. Fees are also publicly disclosed.

**Table 4. Ratings Summary of SGX-DC**

Assessment category	Principle
Observed	1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
Broadly observed	3
Partly observed	-
Not observed	-
Not applicable	11, 12, 24

## F. Key Findings and Follow up for MAS

**71. FMIs in Singapore are subject to effective regulation and supervision of the MAS.** MAS’ powers for the supervision of payment systems are derived from the PS(O)A. MAS’ supervision of CCPs, SSS and TRs is governed by the SFA and related regulations. CSDs are regulated under the Companies Act and related regulations. These laws and regulations are publicly disclosed.

**72. The powers and resources of the MAS are considered sufficient.** Under the respective laws the MAS has powers to obtain relevant and comprehensive information in a timely manner and enforce corrective action. The SFA allows MAS to impose conditions or restrictions on activities or

products, issue directions, order cessation or remove officers of a DCH. MAS has sufficient financial and staff resources to fulfill its responsibilities.

**73. MAS' supervisory approach of FMIs is described in a dedicated monograph, which is publicly disclosed.** The monograph 'Supervision of FMIs in Singapore' published by MAS in January 2013 sets out MAS' supervisory objectives, regulatory framework and supervisory approach. The monograph is published on MAS' website along with relevant guidelines and other public documents.

**74. The MAS has publicly announced that it adopts the PFMI.** The monograph 'Supervision of FMIs in Singapore' published by the MAS in January 2013 states that the MAS adopts the PFMI when carrying out its supervision of FMIs. MAS' approach is to adopt the PFMI through compliance of the FMIs with the relevant laws and subsidiary legislation, which encompass specific requirements of the PFMI.

**75. MAS should extend its MOU with the regulators of the CME by adding formalized cooperative crisis management arrangements to the current provisions.** MAS, the SEC and CFTC have an MOU covering information sharing agreements, including on the link between SGX-DC and the CME. The common crisis management framework could define the roles and responsibilities of the MAS and the relevant U.S. authorities in crisis scenarios. The crisis management framework should be regularly tested. Such a framework may facilitate effective and timely communication and potentially avoid losses or reduce the size of financial losses following financial or operational crisis events.

**Table 5. Ratings Summary Responsibilities of the MAS**

Assessment category	Responsibility
Observed	A, B, C, D, E
Broadly observed	
Partly observed	
Not observed	
Not applicable	

## G. Recommendations for CDP-CCP14

List of Prioritized Recommendations				
Principle	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Comments and Priority
2	CDP functions as a CSD and CCP.	The possibility of separating the CSD and CCP functions of CDP into two distinct legal entities under the existing holding company structure could be explored.	CDP, MAS	Long term, medium priority
3	Recovery plan in development phase.	It is recommended to extend the number and nature of the scenarios considered in the recovery plan.	SGX, MAS.	Medium term, high priority
5	Widening the collateral pool to other assets apart from cash.	Explore with members the possibility of widening the collateral pool apart from cash and examine the feasibility of receiving a part of the collateral in the form of Singapore government securities, as this would enable CDP to avail of MAS standing facility for repo in times of stress.	CDP, MAS	Short-term, high priority
6	Securities margining model to be refined further.	Further fine tune the margin model for a more effective and efficient margin requirements in various scenarios.	CDP	Short-term, medium priority
9	SGD settlements conducted in commercial bank money.	CDP should consider using MEPS+ for direct settlements in SGD.	CDP, MAS and market participants	Medium term, medium priority
9	Settlement cycle of T+3.	Although a settlement cycle of T+3 is compliant with Annex C of the PFMI it is recommended that CDP evaluates the benefits and costs of a settlement cycle shorter than T+3, in line with current international best practices.	CDP, MAS, market participants	Long term, medium priority
8	Settlement lag between securities earmarking and delivery.	Settlement lag for securities settlement be reduced.	CDP, MAS	Short-term, high priority

<sup>14</sup> Recommendations for Principles 3 and 17 apply to both CDP and SGX-DC and are discussed in this section.

## H. Recommendations for SGX-DC<sup>15</sup>

List of Prioritized Recommendations				
Principle	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Comments and Priority
1	Legal risk due to conflicts of law, in OTC derivatives market.	MAS is encouraged to continue its efforts to mitigate cross-border regulatory risks.	MAS, and other foreign authorities	Short term, high priority
5	Concentration limits not fully effective.	Collateral concentration limits can be defined per clearing member, in addition to the current concentration limits that define a maximum threshold per issue.	SGX-DC	Medium term, medium priority
5	Widening the collateral pool to other assets apart from cash.	Explore with members the possibility of widening the collateral pool apart from cash and examine the feasibility of receiving a part of the collateral in the form of Singapore government securities, as this would enable SGX-DC to avail of MAS standing facility for repo in times of stress.	SGX-DC, MAS	Short-term, high priority
6	Relatively long time lag between margin call and deposit.	SGX-DC is encouraged to further reduce the time between the settlement bank confirmation and the actual deposit of margin.	SGX-DC, clearing members, settlement banks	Medium term, medium priority.
9	SGD settlements conducted in commercial bank money.	SGX-DC should consider using MEPS+ for direct settlements in Singapore dollar.	SGX-DC, MAS and market participants	Medium term, medium priority
13	Drills for exchange traded derivatives and OTC commodities	SGX-DC is encouraged to conduct drills for the exchange traded derivatives and OTC commodities on an annual	SGX-DC, all clearing members and other	Short term, medium priority

<sup>15</sup> Recommendations for Principles 3 and 17 are discussed in section G.

List of Prioritized Recommendations				
Principle	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Comments and Priority
	conducted once with three clearing members.	basis as well.	stakeholders	
20	Credit exposures covered by LC, which is not considered appropriate collateral by the PFMI. Clearing fund can be used to cover losses from MOS link.	The LC should be covered by collateral or replaced in full by highly liquid assets with low credit risk. The SGX-DC clearing fund should not be used to cover potential losses related to the link, as this reduces the resources that the CCP holds to address the risks related to the potential default of clearing members.	SGX-DC, CME	Medium term, high priority

## I. Recommendations for the MAS

List of Prioritized Recommendations				
Responsibility	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Comments and Priority
E	No formalized crisis management arrangements with regulators of CME in relation to MOS link.	Adapt MOU with the U.S. authorities by including cooperative crisis management arrangements with the relevant U.S. authority.	MAS, CFTC	Medium term, medium priority

## II. DETAILED ASSESSMENT FOR CDP-CCP

<b>Detailed Assessment of Observance of Principles</b>	
<b>Principle 1. Legal Basis</b>	
An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions.	
<p>Key Consideration 1 The legal basis should provide a high degree of certainty for each material aspect of an FMI's activities in all relevant jurisdictions.</p>	<p><b>Material aspects and relevant jurisdictions</b></p> <p>Material aspects:</p> <ul style="list-style-type: none"> <li>• authorization of depository agents;</li> <li>• settlement finality, arrangements for DVP and netting;</li> <li>• novation;</li> <li>• the rights and interests of CDP, participants and clients with particular regard to default procedures; and</li> <li>• collateral arrangements.</li> </ul> <p>Relevant jurisdictions:</p> <p>CDP's activities are primarily conducted in Singapore, and its business rules are governed by Singapore law. CDP currently has general clearing members and bank clearing members. All general clearing members are incorporated in Singapore and are subject to relevant laws in Singapore. The four bank clearing members are foreign-incorporated banks regulated by the MAS, under the Banking Act, through their Singapore branch. In the case of the foreign-incorporated bank clearing members, the relevant jurisdictions of incorporation to-date are: the United States of America, Germany, France and the Netherlands.</p> <p>In relation to collateral arrangements for meeting margin requirements, the following jurisdictions are relevant: (i) the U.S. (as the issuer of U.S. treasury securities, and the location of the custodian for U.S. treasury; and (ii) Singapore (as the issuer of Singapore government securities and the location and place of incorporation of CDP).</p> <p><b>Legal basis for each material aspect</b></p> <p>The applicable legal framework consists of the following three broad segments:</p> <p>(a) statutory and regulatory requirements as contained in the SFA, the Companies Act, the Banking Act, the Bankruptcy Act, and the SF(CF)R;</p> <p>(b) contractual obligations, i.e., contractual agreements between CDP and each clearing member, and between each clearing member and another clearing</p>

member, including the following:

- the CDP clearing rules and the associated directives and circulars;
- a security deed, which, among other things, creates a security interest over the cash collateral and securities collateral of the clearing member that are acceptable to CDP (security deed ) and for settlement by clearing members, a LOU is issued by the settlement bank of a clearing member, undertaking to act on instructions received from CDP to transfer amounts between such clearing member's account and certain designated accounts, ( clearing contractual documents ); and
- common law (i.e., laws of contract, credit and security, trusts and equity).

The legal framework combines to create a high degree of legal certainty in CDP's clearing activities in all relevant jurisdictions. The SFA and SF(CF)R regulate the establishment and amendment of the CDP clearing rules. In Singapore, statute confers further protection as to the enforceability of the CDP clearing rules—section 72(1)(b) of the SFA provides that the CDP clearing rules operate as a binding contract between CDP and each participant; and section 73 of the SFA provides that the Singapore High Court may make an order directing the participant to comply, observe or give effect to the CDP clearing rules. Singapore statutory law also provides that the clearing rules shall have precedence in insolvency proceedings. In particular, section 81F of the SFA provides that, among other things, market contracts, the disposition of property pursuant to a market contract, the provision of market collateral and market charges (including certain transactions relating thereto) shall not be invalid by reason of inconsistency with insolvency law relating to the distribution of assets. It also provides that a court applying insolvency law shall not interfere with the CDP clearing rules or proceedings or other action taken under those rules. The insolvency of a clearing member will therefore not disrupt the clearing and settlement of transactions, including any applicable collateral, netting and set-off arrangements.

In foreign jurisdictions, by virtue of the choice of law clauses in the clearing contractual documents, the contractual obligations that arise thereunder will still be governed by Singapore law. However, if insolvency proceedings are commenced (e.g., if a foreign incorporated bank clearing member becomes insolvent or if a foreign incorporated bank clearing member commences insolvency proceedings against CDP) in the foreign jurisdiction, the insolvency laws of the foreign jurisdiction would apply instead. In that event, there is a potential risk that such foreign insolvency laws may affect CDP's rights over the collateral or netting and set-off arrangements. However, this risk is considered small and sufficiently mitigated by the following factors:

- each of the foreign-incorporated bank clearing members has a Singapore

	<p>branch which is regulated by MAS under the Banking Act and subject to the requirements under the Banking Act;</p> <ul style="list-style-type: none"> <li>• CDP has assessed, based on legal opinions received, that its security interest over the collateral that it holds has been properly attached and perfected in the relevant jurisdictions, and any order made by a foreign court in connection with any insolvency proceedings is unlikely to affect its rights over such collateral, regardless of whether such collateral is held in Singapore or in a foreign jurisdiction; and</li> <li>• in any event, any order obtained in the foreign jurisdiction against CDP in connection with any insolvency proceedings will likely need to be enforced in Singapore, through the Singapore courts. Section 81O of the SFA however provides that a Singapore court shall not recognize or give effect to a foreign order if such order would be prohibited by section 81F of the SFA. CDP has further obtained a legal opinion which concludes that a foreign judgment that would not have been permitted under section 81F of the SFA is not likely to be enforced.</li> </ul> <p>If the order obtained in the foreign jurisdiction relates to collateral held in a foreign jurisdiction, such order will be enforced in the foreign jurisdiction where the collateral is held (i.e., the U.S.). In those circumstances, the collateral that CDP holds in that foreign jurisdiction may be at risk. However, CDP has assessed that this risk is small. As an additional safeguard, when admitting a foreign-incorporated clearing member, CDP requires such clearing member to provide information on the insolvency regimes applicable to them through a questionnaire. Based on the responses to such questionnaires and/or relevant legal opinions, CDP conducts internal analyses on the legal risks relating to enforceability of its collateral, netting and set-off arrangements and has determined to-date that such risks are sufficiently mitigated and managed.</p> <p><b>Provisions relating to collateral arrangements</b></p> <p>Section 81M of the SFA provides that the application by CDP of market collateral cannot be affected by other interests.</p> <p>In relation to collateral arrangements, the CDP clearing rules act as the primary contract between CDP and each of its participants, and are further complemented by the security deed. The security deed, among other things, creates a security interest over the collateral placed with CDP. CDP has obtained legal opinions to ensure that its security interests have been properly attached and perfected in the relevant jurisdictions. Clearing members' and their customers' collateral placed with CDP are held on trust (contractually and in accordance with section 62 of the SFA) by CDP for the clearing member or their customers, as the case may be. The trust arrangements under the SFA allow customers' collateral to generally fall outside of the pool of assets</p>
--	---

	<p>available for distribution during the insolvency of a clearing member or CDP.</p> <p><b>Provisions relating to novation arrangements</b></p> <p>Rule 6.2.2 of the CDP clearing rules provide for the novation arrangement between CDP and its participants.</p> <p><b>Provisions relating to rights and interests</b></p> <p>The CDP clearing rules 8.1.2., 8.2.2., 8.6B, 8.7, 7.1. and 7.8.1 provide for CDP's and its participants' rights and interests in the event of a default by a clearing member including the maintenance of a clearing fund.</p> <p><b>Provisions relating to netting and set-off arrangements</b></p> <p>The CDP clearing rules 6B.3, 6.3, Security Deed, section 88(1) of the Bankruptcy Act, and section 81H of the SFA, provide for netting and set-off arrangements.</p> <p><b>Provisions relating to settlement finality</b></p> <p>The CDP clearing rule 6C and its sub-clauses provide for settlement finality between CDP and clearing members through rules setting out the final settlement point of payment obligations and placement of collateral between clearing members and CDP. The enforceability of the CDP clearing rules is in turn safeguarded by section 72(1)(b) of the SFA which provides that the CDP clearing rules operate as a binding contract between CDP and each participant and allows CDP under section 73 of the SFA to apply to the High Court of Singapore to direct that a participant abides by those rules. Section 81F of the SFA also provides that in the event that insolvency proceedings are commenced, CDP's default proceedings will be given precedence over the operation of insolvency laws and be protected from interference by a Singapore court applying the Singapore law of insolvency. In addition, section 81O of the SFA provides that a Singapore court shall not recognize or give effect to any order made by a foreign court if the order is one which a Singapore court would be prohibited from making under section 81F of the SFA.</p>
<p>Key Consideration 2</p> <p>An FMI should have rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations.</p>	<p><b>Rules, procedures, and contracts</b></p> <p>The rules (and any amendment thereto) are formulated to address any concerns the clearing members or the public may have, which in turn reduces uncertainty and misinterpretation of the rules. For example, pursuant to regulation 22(2) of the SF(CF)R, CDP consults its clearing members in respect of all CDP clearing rule amendments unless such amendment has a limited impact on the clearing members. CDP conducts a public consultation on any amendment that may affect the interests of the general investing public. If a public consultation is conducted, the public consultation document will be</p>

	<p>posted on CDP's website between ten days to one month, with an accompanying press release being issued; and although not mandated, CDP engages in informal discussions with clearing members and other participants at the stage when an amendment is being proposed to solicit feedback.</p> <p><b>Consistency of rules and procedures with relevant laws</b></p> <p>CDP ensures that its rules, procedures, and contracts are consistent with relevant laws and regulations in the following manner; CDP conducts the necessary legal analysis and, where required, obtains legal opinions to ensure that the same are consistent and enforceable under Singapore law. Pursuant to regulation 22 of the SF(CF)R, proposed amendments to the Rules are notified to MAS before they are made, where MAS has the power to disallow, alter or supplement the proposed amendments. To-date there have not been any inconsistencies identified with the relevant laws and regulations.</p>
<p>Key Consideration 3</p> <p>An FMI should be able to articulate the legal basis for its activities to relevant authorities, participants, and, where relevant, participants' customers, in a clear and understandable way.</p>	<p>The rules are published on the SGX's corporate website at <a href="http://www.sgx.com">http://www.sgx.com</a> and freely accessible to the public. All other relevant documentation is made available to a participant who joins as a CDP participant. The rules are supplemented by directives, practice notes and circulars that help to clarify the intention behind the rules, or to provide further directions to CDP participants with regard to the rules and relevant procedures. Rules are communicated to MAS, clearing members, clearing members' customers and the public. CDP also articulates the legal basis for its activities to MAS in various rationale documents and information papers. Where appropriate, CDP shares the existence of relevant legal opinions and the outcomes with appropriate recipients in an effort to promote confidence among participants and transparency in the system.</p>
<p>Key Consideration 4</p> <p>An FMI should have rules, procedures, and contracts that are enforceable in all relevant jurisdictions. There should be a high degree of certainty that actions taken by the FMI under such rules and procedures will not be voided, reversed, or subject to stays.</p>	<p><b>Enforceability of rules, procedures and contracts</b></p> <p>In Singapore, the statute confers protection as to the enforceability of the CDP clearing rules to ensure that they will not be voided, reversed or subject to stays. For instance, section 72(1)(b) of the SFA mandates that the CDP clearing rules operate as a binding contract between CDP and each participant; section 73 of the SFA provides that the Singapore High Court may make an order directing the participant to comply, observe or give effect to the CDP clearing rules; and section 81F of the SFA provides that, among other things, market contracts, the disposition of property pursuant to a market contract, the provision of market collateral and market charges (including certain transactions relating thereto) shall not be invalid by reason of inconsistency with insolvency law relating to the distribution of assets. It also provides that a court applying insolvency law shall not interfere with the CDP clearing rules or proceedings or other action taken under the CDP clearing rules. In foreign jurisdictions, by virtue of the choice of law clauses in the clearing contractual documents, the contractual obligations that arise there under will still be</p>

	governed by Singapore law. For further details, see Key Consideration 1. CDP achieves a high degree of certainty that its rules, procedures and contracts will not be voided, reversed, or subject to stays. So far, there has not been a court in a relevant jurisdiction that has failed to enforce CDP's activities or arrangements.
Key Consideration 5 An FMI conducting business in multiple jurisdictions should identify and mitigate the risks arising from any potential conflict of laws across jurisdictions.	<p><b>Potential conflict of laws issues</b></p> <p>All the contracts dealt with by CDP are governed by Singapore law. However, CDP has identified two areas in which its activities give rise to potential conflict of laws issues and require consideration of foreign legal frameworks. The two areas are:</p> <ul style="list-style-type: none"> <li>• the perfection of security interest in collateral; and</li> <li>• the enforceability of CDP's clearing, settlement and depository arrangements in the event that insolvency proceedings are commenced in a foreign jurisdiction.</li> </ul> <p>The potential conflict of laws issues arising from these two areas have been analyzed and addressed and independent legal analyses have been obtained, as indicated in the response to Key Consideration 1.</p> <p>In addition, CDP's internal control guidelines stipulate that no cross border activities should be undertaken by CDP unless authorized in accordance with the guidelines. Under the guidelines, authorization will only be given if a legal assessment of the proposed cross border activity has been carried out. The assessment must be reviewed annually and on an ad-hoc basis if circumstances change.</p>
Key Conclusions for Principle 1	CDP has a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities. CDP has rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations in relation to collateral arrangements, novation, netting and setting-off arrangements, settlement finality and in protecting the rights and interest of CDP, its participants and their customers in the event of a default backed by the relevant legal statutes in Singapore. This provides a high degree of certainty that actions taken by CDP under such rules and procedures will not be voided, reversed, or subject to stays. CDP articulates the legal basis for its activities to relevant authorities, participants, and, where relevant, to the participants' customers, in a clear and understandable way.
Assessment of Principle 1	Observed
Recommendations and Comments	-

### Principle 2. Governance

An FMI should have governance arrangements that are clear and transparent, promote the safety and efficiency of the FMI, and support the stability of the broader financial system, other relevant public interest considerations, and the objectives of relevant stakeholders.

#### Key Consideration 1

An FMI should have objectives that place a high priority on the safety and efficiency of the FMI and explicitly support financial stability and other relevant public interest considerations.

CDP and SGX-DC are wholly owned subsidiaries of SGX. SGX is a public listed company, with a listing on the SGX-ST. SGX is regulated by the MAS as an approved holding company under the SFA. As a subsidiary of SGX the governance arrangements of CDP and SGX-DC are part of the overall governance arrangements of SGX.

In February 2013 SGX issued a regulatory monograph, which sets out the key regulatory objectives of maintaining fair, orderly and transparent markets, maintaining high quality market intermediaries and issuers, and maintaining safe and efficient clearing and settlement facilities. The monograph is available on SGX's website. The objectives are reflected in the terms of reference (TOR) of the SGX board committees, and included in the policies and procedures governing the SGX group's management and operations, such as the SGX SRO governance handbook.

SGX has to comply with: the Securities and Futures (Corporate Governance of Approved Exchanges, Designated Clearing Houses and Approved Holding Companies) Regulations 2005 (CG Regs); Singapore code of corporate governance (CGC) issued by the MAS for companies listed in Singapore; statutory obligations specified in the SFA, which includes the interests of the public (section 59(1)c).

As required under the SGX-ST listing manual, SGX publishes an annual corporate governance report in its annual report which is available to the public on the SGX website. The corporate governance report intends to demonstrate how the specific principles of the CGC have been complied with.

<p>Key Consideration 2</p> <p>An FMI should have documented governance arrangements that provide clear and direct lines of responsibility and accountability. These arrangements should be disclosed to owners, relevant authorities, participants, and, at a more general level, the public.</p>	<p><b>Governance arrangements</b></p> <p>The SGX board and the various board committees oversee SGX's affairs and are accountable to shareholders for the management of SGX's business and its performance. The board has appointed the chief executive officer (CEO) to manage SGX's businesses and operations and implement the board's decisions. The board assesses the CEO's performance through management of key performance indicators (KPI) which includes regulatory KPIs and key risk indicators (KRI). The president reports to the CEO and is primarily a business owner, responsible for steering and growing SGX's core businesses i.e., securities, derivatives, market data and access, and post-trade services. The executive committee (EXCO) is led by the CEO and comprises nine individuals, which are the CEO, president, chief financial officer (CFO), chief regulatory and risk officer (CRRO), chief operations and technology officer, chief information officer (CIO), head of sales and clients, head of listings and head of human resources. The CEO, with the assistance of the EXCO, has primary responsibility for the implementation of SGX's strategy and management of day-to-day operations within the limits and policies approved by the board and except for matters which have been expressly reserved to the board or its committees.</p> <p>SGX has no majority shareholder. It has only one shareholder with a shareholding of more than five percent of the issued capital, which is a special purpose company named SEL Holdings Pte Ltd. Per the share register as at March 28, 2013, SEL holds 23.36 percent of SGX's issued capital. SEL is set up specifically to hold SGX shares for the benefit of Singapore's financial sector development fund. Under section 11 of the Exchanges (Demutualization and Merger) Act, SEL is, among other things, prohibited from exercising voting power on its shares.</p> <p><b>Disclosure of governance arrangements</b></p> <p>The details regarding the governance structure of SGX are available on the SGX website.</p>
<p>Key Consideration 3</p> <p>The roles and responsibilities of an FMI's board of directors (or equivalent) should be clearly specified, and there should be documented procedures for its</p>	<p><b>Roles and responsibilities of the board</b></p> <p>The board oversees the SGX group's affairs and is accountable to SGX shareholders for the business, management and performance of the group. The functions of the board and the board committees are set out in their respective TORs. The articles of association of SGX also set out the general powers of board directors as well as provisions on the appointment and removal of directors.</p> <p>The principal duties of the board include: approving the appointment of the</p>

<p>functioning, including procedures to identify, address, and manage member conflicts of interest. The board should review both its overall performance and the performance of its individual board members regularly.</p>	<p>CEO, directors and succession planning process; approving broad policies, strategies and objectives of SGX; approving annual budgets, major funding proposals, investment and divestment proposals; approving the adequacy of internal controls, risk management, financial reporting and compliance; approving the policy for managing and/or mitigating perceived or actual conflicts of interest between SGX's regulatory accountabilities and commercial interests; considering sustainability issues of policies and proposals.</p> <p>Five board committees have been established to assist the board in the discharge of its oversight function, which are the audit committee, nominating committee, RCC, RMC and remuneration committee. The TORs set out the duties, authority and accountability of each committee as well as qualifications for committee membership and are reviewed on a regular basis.</p> <p>SGX has internal policies setting forth matters that require board approval.</p> <p>With regard to CDP and SGX-DC the board committee members were briefed in 2011 and 2012 on inter alia, the changes to the code of corporate governance, guidelines on corporate governance for banks, IOSCO's initiatives and exchange-wide global regulatory trends.</p> <p><b>Conflicts of interests for board members</b></p> <p>The key arrangement which SGX has in place for controlling conflicts of interests are the requirements on the independence of directors and board composition, including the requirement that the majority of the board cannot have (had) a business and management relationship with SGX (regulation 6 of CG Regs). In addition, SGX, as a listed company, follows closely the CGC which provides guidance on the composition of the board. SGX must also comply with the SGX-ST listing manual requirements regarding interested party transactions. Specifically, rule 907 of the SGX-ST Listing Manual dictates that disclosure of the aggregate value of interested person transactions entered into during the financial year must be included in the annual report in a specified format. SGX's internal audit and the audit committee also review interested person transactions.</p> <p><b>Self regulatory organization conflicts</b></p> <p>The SFA prescribes a framework for managing regulatory conflicts, or SRO conflicts, through the institution of a board committee, the RCC. Its responsibilities include, among other things, reviewing the adequacy of the arrangements for dealing with any perceived or actual conflict between (i) its regulatory obligations and a public interest duty under the SFA; and (ii) its commercial interests, including any perceived or actual conflicts arising from its</p>
---	--

listing on SGX-ST. SGX employs several measures in dealing with SRO conflicts as laid down in the SFA. SRO conflicts are also addressed under a deed of undertaking by SGX and SGX-ST in favor of the MAS. The deed sets out the arrangement for the supervision by MAS of SGX's compliance with its listing manual and the trading of its shares.

#### **Personal conflicts of interest**

SGX has an internal code of conduct and ethics to manage other conflicts of interest. Personal conflicts of interest exist in instances where SGX's commercial or regulatory obligations could be compromised by an employee's own interests. A code of dealing in securities is also in place to manage actual and perceived conflicts of interests regarding securities interests and misuse of inside information.

#### **Board committees**

***Nominating committee:*** comprises five directors, four of whom (including the chairman) are independent non-executive directors. Regulation 10 of the CG Regs requires the nominating committee to identify candidates and review all nominations or re-nominations for the appointment of (a) each director; (b) each member of each board committee; and (c) the CEO, deputy CEO and CFO. The committee must ensure that the candidate is a fit and proper person for the office and is qualified for the office, taking into account the candidate's or nominee's track record, age, experience, capabilities and such other relevant factors as may be determined by the NC. The NC must also be satisfied as to the independence of directors for the purposes of regulation 11 of the CG Regs.

***Remuneration committee:*** is currently chaired by an independent non-executive director. All four members of the RC are also independent non-executive directors. In terms of its responsibilities, regulation 13(4) of the CG Regs requires the RC to be responsible among other things for recommending (i) a framework for determining the remuneration of directors and executive officers of SGX; and (ii) the remuneration of each executive director and the CEO of SGX.

***Audit committee:*** comprises five members, all of whom are independent non-executive directors. In terms of its responsibilities, regulation 14(2) of the CG Regs requires the committee to be responsible among other things for the adequacy of the external and internal audit functions of SGX, including reviewing the scope and results of audits carried out in respect of the operations of SGX and the independence and objectivity of SGX's external auditors. The audit committee meets on a quarterly basis to review the

integrity of the financial statements including the relevance and consistency of the accounting principles adopted. The committee also reviews and recommends for the SGX's Board approval all quarterly financial statements and corresponding public announcements.

**RMC:** The RMC comprises five directors, three of whom are independent non-executive directors. Of the two non-executive directors who are deemed non-independent, one director is considered independent under the CGC and the PFMI standards. This director is only considered non-independent under the higher standards of the CG Regs, which deems directors who have a relationship with a member of the clearing house to be non-independent, as he is an independent director of a member. The RMC is responsible for the oversight of risk management in SGX, and its responsibilities include reviewing and recommending to the board the type and level of business risk that SGX undertakes to achieve its business objectives, and the appropriate framework and policies for managing risks that are consistent with SGX's risk appetite. The RMC also reviews for the SGX board the adequacy of SGX's long term technology strategy and the adequacy of SGX's resources that are required to carry out its risk management functions effectively. MAS intends to formalize the requirement for a RMC in the CG Regs, and will be publishing a consultation on the revised CG Regs shortly.

**RCC:** comprises of four members, all of whom are independent non-executive directors. Regulation 15(3) of the CG Regs requires that the RCC may make decisions on specific cases involving SRO conflicts that are referred to it. The RCC is accountable to the SGX Board for the arrangements and decisions to address any perceived or actual conflict of interest between SGX's regulatory responsibilities and commercial interests.

SGX has also implemented a detailed process for dealing with conflicts where the CEO and CRO disagree. This process has been reviewed and endorsed by external consultants.

#### **Review of performance**

In line with the board evaluation policy, the nomination committee assesses and discusses the performance of the board as a whole every year and ascertains key areas for improvement and the requisite follow-up actions. Apart from the yearly review, independent consultants are also appointed once every two years to assist the nomination committee in evaluating the SGX board. There is an individual assessment of each non-executive director's contribution by the SGX chairman. Some factors considered in the individual review are directors' attendance and participation in and outside meetings, the

	<p>quality of directors' interventions and special skills and contributions made by directors.</p> <p>The CEO is the only executive director on the SGX board. The assessment of CEO's performance is undertaken by the remuneration committee, together with the chairman of the nomination committee, and the results are reviewed by the board.</p>
<p>Key Consideration 4</p> <p>The board should contain suitable members with the appropriate skills and incentives to fulfill its multiple roles. This typically requires the inclusion of non-executive board member(s).</p>	<p>SGX has a 12-member board which comprises nine independent non-executive directors, two non-independent non-executive directors; and one executive director (SGX CEO). The board comprises industry leaders, both foreign and local, from various sectors. Representatives include the former IOSCO chairperson, the former chairman of the Hong Kong Securities and Futures Commission, present and past CEOs and chairmen of financial institutions and other large multinationals. The skills and core competencies of the board include banking, finance, accounting, business, management experience, industry knowledge, familiarity with regulatory requirements and knowledge of risk management.</p> <p>In selecting suitable candidates, the nomination committee considers whether directors, who have multiple board representations, are able to and have been devoting sufficient time to discharge their responsibilities adequately. With effect from FY2011, and on an annual basis thereafter, each director is required to confirm his ability to devote sufficient time and attention to SGX's affairs, having regard to all his other commitments. SGX is required to seek MAS' approval for the appointment of directors on the SGX Board. In addition, SGX shareholders must approve the election of the newly appointed directors at the next annual general meeting.</p> <p>Non-executive directors of SGX are paid directors' fees which are benchmarked against other SGX-ST listed companies. The director fees, which are subject to SGX shareholders' approval, are reviewed on an annual basis to ensure that they remain competitive.</p> <p>Executive directors however, do not receive directors' fees. SGX's remuneration structure and packages for its key management personnel (which includes executive directors) has been independently reviewed to address the long-term interest and risk policies of the company as well as to retain and motivate the executive directors to provide good stewardship.</p>
<p>Key Consideration 5</p> <p>The roles and responsibilities of management should be</p>	<p><b>Roles and responsibilities of management</b></p> <p>The EXCO has primary responsibility for the implementation of SGX's strategy and management of day-to-day operations within the limits and policies approved by the board, except for matters which have been expressly reserved</p>

<p>clearly specified. An FMI's management should have the appropriate experience, a mix of skills, and the integrity necessary to discharge their responsibilities for the operation and risk management of the FMI.</p>	<p>to the board or its committees. As set out in the EXCO TOR, the EXCO oversees the management of SGX and implements the board's strategic policies. EXCO holds the power to (i) make key decisions on the management and operations of SGX; (ii) manage the business and investments of SGX; (iii) develop SGX's business within the framework of the board-approved strategy; (iv) lead staff and management, and nominate key personnel; (v) oversee SGX's operations, projects, budget, compliance obligations, and financials; and (vi) make recommendations to the board on policies, strategies and financial objectives.</p> <p>The next level of management is the management committee which comprises the heads of each of the SGX functions as set out in the SGX organization chart and selected senior employees.</p> <p>The CEO will assess the performance of EXCO members with regards to their respective commercial and regulatory KPIs. The board assesses the performance of the CEO in relation to the company's performance against his prescribed goals and targets.</p> <p><b>Experience, skills and integrity</b></p> <p>SGX's EXCO members possess varied experience across the exchange, clearing and depository businesses, banking and corporate finance, operations and technology, and regulation. The detailed biographies of the EXCO members are published on the SGX website. Under section 76(1) of the SFA, SGX must obtain MAS' approval for the appointment of the chairman, CEO, any director, and key management, which MAS has specified to be the president, the CFO, and the CRRO.</p> <p>Under section 81A of the SFA, MAS may, where necessary in the interests of the public or for the protection of investors, direct the removal of any officer of SGX. This has not happened so far.</p> <p>The nomination committee will review any proposed termination of EXCO members for approval by the board. The company will make all necessary disclosure to MAS and to the public immediately.</p>
<p>Key Consideration 6</p> <p>The board should establish a clear, documented risk-management framework that includes the FMI's risk-tolerance policy, assigns</p>	<p><b>Risk management framework</b></p> <p>SGX's ERM framework is in place for the identification, monitoring and reporting of enterprise-wide risks, controls and action plans. The framework encompasses five key components, which are (i) risk governance structure; (ii) ERM documented policies; (iii) ERM processes; (iv) risk capabilities and culture; and (v) risk monitoring and reporting. More details are provided in Principle 3.</p>

<p>responsibilities and accountability for risk decisions, and addresses decision making in crises and emergencies.</p> <p>Governance arrangements should ensure that the risk-management and internal control functions have sufficient authority, independence, resources, and access to the board.</p>	<p>The board, with support from the RMC, oversees risks within the organization, including those faced by CDP and SGX-DC. The RMC reviews and recommends to the board the type and level of risks that SGX undertakes in the course of its business. The board has authorized the RMC to approve the risk management strategies of the company, including clearing and counterparty risks, technology risks and any other enterprise risks that may have a significant impact on the reputation, financial position and business operations of the company. The RMC is also authorized to approve the framework, policies, strategies and resources for SGX to identify, measure, manage and report risks.</p> <p>At the management level, the enterprise risk committee (ERC) presides over risk management policy implementation. Chaired by the CRRO, the ERC comprises the president, the chief operations and technology officer, the CFO. The CIO and head of internal audit, compliance, finance, risk management and clearing risk functions are regular attendees.</p> <p>Details of the risk management framework are documented in various policies maintained by the risk management function.</p> <p><b>Authority and independence of risk management and audit functions</b></p> <p>The risk management function comprises the head, one administrative support staff, a derivatives/OTC team of six staff, a securities team of six staff and an enterprise risk team of two staff.</p> <p>The risk management function performs a spectrum of activities to manage clearing risk and enterprise risks. The strategic objectives are: identify, measure, monitor and manage clearing risks from clearing members and take appropriate risk mitigating actions, where necessary; establish and enhance risk policies and frameworks to manage credit, liquidity and market risks; provide independent assessment on risk management capabilities and models proposed by the clearing risk function; ensure continued relevance and compliance against best practices and global regulatory reforms; oversee development and implementation of the default management framework for all products cleared by SGX; work with various functions within SGX and EXCO to ensure that enterprise risks are addressed; report key risk issues to the enterprise risk committee, EXCO, RMC and MAS, where applicable.</p> <p>The internal audit function comprises the head, one administrative support staff, three team leads in the areas of operational and financial risk, technology risk and regulatory and compliance risk respectively, and a pool of five auditors. The roles, responsibilities, authorities and reporting lines of the internal audit function are detailed in the internal audit charter. The head of</p>
---	--

	<p>internal audit reports functionally to the audit committee and administratively to the CEO. The audit committee will approve the following, among others: overall charter of the internal audit function; internal audit risk assessment and related audit plan; all decisions regarding the appointment or removal of the head of internal audit; annual compensation and salary adjustment of the head of internal audit.</p> <p>An external auditor audits the SGX group, which includes CDP and SGX-DC. The external auditor conducts an annual statutory audit on the SGX group and its subsidiaries, which may include opinions on the financial statements of the SGX group and its subsidiaries. Separately, under regulation 20 of the SF(CR)R, the auditor is also engaged to conduct a semi-annual audit on the clearing houses' discharge of its obligations with respect to money and assets placed with the clearing house, including segregation of house origin and customer origin accounts.</p>
<p>Key Consideration 7</p> <p>The board should ensure that the FMI's design, rules, overall strategy, and major decisions reflect appropriately the legitimate interests of its direct and indirect participants and other relevant stakeholders. Major decisions should be clearly disclosed to relevant stakeholders and, where there is a broad market impact, the public.</p>	<p><b>Identification and consideration of stakeholder interests</b></p> <p>Pursuant to regulation 22 of the SF(CF)R, CDP and SGX-DC are required to consult its participants on proposed business rule amendments, unless the proposed amendment would have limited impact on its participants. In addition, SFA guideline 03-G01 sets out the expectations of the MAS that CDP and SGX-DC should consult the public on rule amendments to the business rules that they consider likely to affect the interests of the general investing public. CDP and SGX-DC must provide MAS with a summary of the comments received together with its reasons for accepting or rejecting such comments.</p> <p>CDP and SGX-DC further engage in informal discussions with clearing members and affected participants at an early stage in the development of any proposal to understand the concerns, including compliance concerns, which they may have in relation to a proposed rule amendment. After feedback has been received, CDP and SGX-DC will analyze and publish the market feedback (on an anonymous basis) together with their responses to the issues raised.</p> <p><b>Disclosure</b></p> <p>Market participants are informed of the public consultation through announcements on the MAS website. After the rule amendments are approved by MAS and the board has passed a resolution to effect the rules, members are informed of the effective date of proposed rule amendments by way of circulars. CDP's and SGX-DC's responses to feedback received in the course of the public consultation are also published on the SGX's website.</p>
<p>Key Conclusions for Principle 2</p>	<p>SGX applies governance arrangements that are transparent and support the stability of the financial system. The roles and responsibilities of its board and management are clearly described and publicly available. SGX's company</p>

	<p>objectives include the maintenance of safe and efficient clearing and settlement facilities. SGX has established a risk management committee and a regulatory conflicts committee that are composed of independent board members to identify, monitor and manage companywide risks as well as CCP related risks. Dedicated risk management units ensure that the risk management framework is executed on an ongoing basis. In addition, SGX has sound internal control policies to provide for independent assessments of the effectiveness of the risk management framework of SGX.</p> <p>Given that CDP discharges the role of a CSD and a CCP, it is suggested to explore the possibility of separating the CCP and CSD functions of CDP into two distinct legal entities under the existing holding company structure.</p>
Assessment of Principle 2	Observed
Recommendations and Comments	The possibility of separating the CSD and CCP functions of CDP into two distinct legal entities under the existing holding company structure could be explored.

### Principle 3. Framework for the Comprehensive Management of Risks

An FMI should have a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

<p><b>Key Consideration 1</b></p> <p>An FMI should have risk-management policies, procedures, and systems that enable it to identify, measure, monitor, and manage the range of risks that arise in or are borne by the FMI. Risk-management frameworks should be subject to periodic review.</p>	<p><b>Risks that arise in or are borne by the FMI</b></p> <p>CDP in its role as a CCP is exposed to the following risks from its clearing members, its clearing members' customers, and other entities:</p> <ul style="list-style-type: none"> <li>• credit and liquidity risks of clearing members, their trading members and customers arising from clearing and settlement obligations;</li> <li>• credit and liquidity risks of settlement banks arising from the (i) settlement between CDP and clearing members and (ii) guarantee of DVP payments;</li> <li>• credit and liquidity risks of commercial banks holding margin monies and default fund contributions that CDP receives from its clearing members;</li> <li>• custody risks of custodian banks holding non-Singapore government securities placed by clearing members as collateral with CDP (no custody risk for Singapore government securities or SGX-listed securities as they are held at CDP); and</li> <li>• non-clearing credit and liquidity risks of commercial banks holding CDP's cash.</li> </ul> <p>Risks that arise within CDP are operational risks, including business continuity risks; and technology risks, including system stability, security and outsourcing and services provided by external suppliers. The other risks that CDP faces are</p>
---	---

	<p>legal risks, e.g., inadequate rights to collateral or to enforce members' compliance in normal, as well as stressed conditions; reputation risks, e.g., questions on CDP's efficiency, safety, and judgment; regulatory risks, pertaining to the failure to meet regulatory standards, or requirements; staffing risks, focusing on employee retention and skill gap issues; fraud risks, encompassing the unlikely instances of corruption and asset misappropriation; and competition risks, pertaining largely to the lack of product and membership growth vis-à-vis other competitors.</p> <p>CDP poses the following risks to its clearing members and its clearing members' customers:</p> <ul style="list-style-type: none"> <li>• risk that clearing members' contribution to the default fund is utilized in a default of another clearing member;</li> <li>• risk that CDP may not return collateral in a timely manner arising from failure at a commercial or custodian bank holding the collateral; and risk that CDP will require the member to put up fresh collateral because the original is inaccessible, which may lead to a member default;</li> <li>• liquidity risk from delayed settlement arising from disruption to CDP's clearing and settlement operations; and</li> <li>• risk that CDP defaults, resulting in unsettled transactions, loss or inaccessibility of collateral held by CDP, inability to manage positions and market instability.</li> </ul> <p><b>Risk management policies, procedures and systems</b></p> <p>SGX has a comprehensive risk management framework to manage the risks that it has identified. Key components of the risks management framework are:</p> <ul style="list-style-type: none"> <li>• A governance structure</li> <li>• SGX ERM framework</li> <li>• CDP CCP risk management framework</li> <li>• Framework for CDP's DVP settlement facility</li> <li>• SGX operational risk management framework</li> <li>• Other risk policies, procedures and manuals</li> <li>• Systems</li> </ul> <p><b>Governance structure</b></p> <p>SGX has established a risk governance structure to provide oversight and management of risks and to ensure that responsibilities and accountabilities are clearly defined (see Appendix 2). Detailed information is provided in Principle 2.</p>
--	--

Key players in SGX governance structure are:

- SGX board, which is responsible for the establishment of the RMC and the approval of the key risks and risk tolerance.
- The RMC, which is responsible for the review and approval of the type and level of business risks (risk appetite) that SGX undertakes on an integrated basis to achieve its business strategy. It also approves frameworks and policies for managing risks that are consistent with SGX's risk appetite.
- The RCC, which is accountable to the SGX board for the arrangements and decisions to address any perceived or actual conflict of interest between SGX's regulatory responsibilities and commercial interests.
- The EXCO, which exercises executive decision powers over risk matters. EXCO also plays a central role in the review of key risk management policies submitted to the RMC for approval. Accountability for risk propagates down to function heads, which are responsible for enterprise-wide risks that come under their purview and for their functional risks.
- The ERC is a management committee established by the EXCO to address risk issues. Its primary function is to take a holistic view that risks are being managed by appropriate functions, monitored and reported.
- The risk management and regulation group consists of the units that operate under the EXCO, i.e., the risk management unit, clearing risk unit, member supervision and regulatory policy and development unit.
- The internal audit and compliance unit are two independent units also involved in the risk management governance structure. Compliance identifies the key regulatory requirements and rates them in accordance with the risk self assessment (RSA) methodology for risk impact, risk probability, control design and control effectiveness.

#### **SGX ERM framework**

- The ERM Framework is an overall framework of SGX for the identification, measuring, monitoring and management of risks. This addresses legal, credit, liquidity, operational and other risks, such as general business risk. The framework sets the tone from the top regarding risk culture, governance and risk appetite.
- The key risks, which have enterprise-wide implications at SGX are identified annually and are reported to the SGX board and RMC. The cascading of risk identification and accountability from the SGX board level down the risk governance hierarchy to the functional unit level provides for the management of key risks, via existing controls or additional action plans. The key risks for FY2013 include default risks, technology risks, and regulatory risks, operational risks, reputation risks, competition risks, fraud risks and staffing risks.
- At the start of each financial year the risk management unit works with the EXCO to identify SGX's key risks. The annual exercise involves various focus

	<p>groups and brainstorming sessions with both EXCO and function heads, such that all relevant internal developments and external market and environmental changes are taken into account. Where appropriate, external consultants are appointed to assist with this exercise. These key risks are then cascaded into component risks for which risk owners at EXCO level are identified. Component risks are further broken into risks to be owned by various function heads for greater granularity.</p> <ul style="list-style-type: none"> <li>• The specific risk areas are managed by the respective risk owners in accordance with the overarching risk policies delineated in the ERM framework. These risk owners establish the necessary frameworks, policies, and procedures to manage the risks, allowing for decentralized risk management by the parties with the relevant expertise.</li> <li>• As part of this annual risk assessment exercise the risk management unit works with the various risk owners to identify risk tolerance thresholds and KRIs. KRIs measure adherence to risk tolerance levels in each area that is being monitored. Risk owners monitor the relevant functions' performance against these KRIs.</li> <li>• In addition to the above top-down approach, in a separate bottom-up RSA process, the risk management unit assists and facilitates the various functions within SGX to identify risks within their functions. All SGX functions appoint a 'risk champion'. The risk management unit works closely with the risk champion and functional head to identify risks within each function.</li> <li>• At the end of the RSA process, the risks, controls and action plans are recorded in the enterprise risk assessor system (the same platform as used for key risks) for centralized tracking. The risk champions within each function are accountable to monitor that the action plans are applied and that the risks are prudently mitigated and managed.</li> </ul> <p><b>CDP risk management framework</b></p> <p>As a CCP, CDP's risk management framework includes the full scope of risk management tools and processes to address counterparty credit and liquidity risks that CDP faces. The two risk functions, i.e., the risk management and clearing risk functions, and the member supervision function engage in risk policy formulation, obtaining the necessary EXCO, RMC/SGX Board and MAS approvals before the policies are operationalized.</p> <ul style="list-style-type: none"> <li>• The risk management, clearing risk and member supervision functions carry out clearing risk management in accordance with the guiding principles which are: (i) admission criteria for members; (ii) early detection and pro-active risk management; (iii) risk identification and measurement; (iv) margin and collateral management; (v) default management procedures; (vi) orderliness, fairness and transparency of market; and (vii) close communication with regulator.</li> <li>• In admission of clearing and trading members, the member supervision</li> </ul>
--	--

function is responsible for scrutinizing the institution. The member supervision function evaluates a range of criteria including prudential standards, fit and proper key personnel, risk management and operational systems and ability to undertake the operations of clearing and settlement. On an ongoing basis, the financial strength, operational capability and conduct of members are monitored. The member supervision function conducts on-site inspections, compliance visits and self-assessment questionnaires to assess adequacy in areas such as credit risk management and other risk practices, operational capability and business continuity arrangements, financial reporting, executive management and compliance.

The risk management and clearing risk functions perform a spectrum of activities to manage counterparty credit and liquidity risks. These are: (i) identify, measure, monitor and manage direct clearing risks from clearing members, and indirect clearing risks from trading members and their customers; (ii) take appropriate and prompt risk mitigating actions, where necessary; (iii) perform daily stress testing to monitor adequacy of the default fund and credit lines for default management; (iv) perform quarterly sizing of the default fund and credit lines for default management unless unusual market conditions warrant a more frequent review; (v) review, calibrate and set margin rates; (vi) back test margin rates; (vii) administer risk limits within the risk appetite and tolerance established by the RMC/SGX Board; (viii) establish risk models and parameters for new products and services; (ix) ensure continued relevance and compliance against best practices and global regulatory reforms, make regulatory submissions to MAS and report on risk to the RMC and EXCO and (x) oversee development and implementation of default management for all products cleared by CDP.

A division of roles between the two risk functions has resulted in a dual control structure with the clearing risk function developing risk models for margining, stress testing and collateral valuation and the risk management function providing independent initial validation and annual review in accordance to the Risk Model Validation Framework.

The operations function is responsible for the day-to-day operation of clearing and settlement processes. Its clearing, margining, collateral management and payment systems support its scope of risk control activities.

#### **Framework for CDP's DVP settlement facility**

CDP provides a DVP settlement facility allowing institutional customers to settle their trades directly with CDP rather than through their clearing member. Participants of CDP's DVP settlement facility are governed by the CDP DVP rules. The risk that the payment is not made is fully covered by the two-tier bank guarantee arrangement provided by the DVP settlement banks and the

	<p>DVP clearing bank. The risk that securities are not delivered is fully covered. The system validates that there are sufficient securities for delivery and earmarks these securities before a DVP instruction can be accepted for settlement. The DVP rules and system together frame the conduct of DVP settlement.</p> <p><b>Framework of management of SGX operational contingencies</b></p> <ul style="list-style-type: none"> <li>• This framework consists of a set of contingency policies and plans in place, consolidated under an overarching framework for management of SGX operational contingencies.</li> <li>• SGX ORM policies and guidelines: over-arching framework that defines SGX's overall strategy to ensure continuity in business operations by minimizing the impact of disruptions. Key elements are: (i) developing crisis management procedures and business continuity plans, business impact analysis and information technology (IT) disaster recovery plans (DRPs) to facilitate timely resumption of business operations after any disruption; and (ii) conducting regular tests to validate the adequacy of the plans.</li> <li>• IT DRP and incident management procedures: seeks to minimize the impact of a disruption on SGX's critical applications by identifying critical applications, and recovery plans; and conducting regular tests to validate the adequacy of the plans.</li> <li>• Default management framework: codifies a structured approach to the management of a default by one or more clearing members.</li> <li>• Suspension of clearing and settlement policy: provides guidance on suspension of clearing activity when it is no longer prudent for clearing and settlement to continue.</li> <li>• Market closure policy: sets out key considerations for the closing of the markets.</li> </ul> <p><b>Other risk frameworks, policies, and procedures</b></p> <p>In addition to the ERM and the CCP risk management framework SGX has developed dedicated frameworks, policies and procedures for specific types of risk:</p> <ul style="list-style-type: none"> <li>• Risk limit policy: addresses counterparty credit risk and market risk beyond the scope of the CCP's risk management framework, which addresses risks from clearing members and their customers. The policy specifies limits for bank counterparties and custodians. It also specifies market risk limits.</li> <li>• Liquidity risk management framework: provides the over-arching policy for managing SGX's liquidity risk arising from the clearing and settlement functions of SGX's clearing house subsidiaries, namely SGX-DC and CDP.</li> </ul>
--	--

- Technology management framework: the SGX technology unit established a set of IT management policies that set out overarching principles to be reflected in all other technology guidelines, controls and procedures. Key areas are IT management policies and controls and the IT security policy.
- SGX outsourcing policy: governs all outsourcing engagements undertaken by SGX.
- Incident management: covers communications of incidents to external stakeholders (MAS) and internal stakeholders (EXCO, audit committee).

### **Risk management system**

The risk management function actively identifies, monitors, and manages CDP's risk exposures to clearing members, trading members and their customers. For this, it uses a Risk Management System which provides accurate and frequent measurement of risk exposures.

The Risk Management System receives outstanding trades directly from CDP's clearing system, which reflects in real-time the complete positions of CDP. Updates to the Risk Management System occur intra-day, and at the end of each day. The system also receives collateral held and margins required. In terms of the more static data, the system receives periodic updates of clearing members' financial resources, bank balances and available credit facilities for comparison against exposures. Any change to their credit facilities, including reduction, addition or termination are reported to risk management function immediately. The system in turn aggregates risk exposures and generates risk reports. Through risk reports, the risk management function assesses any significant exposures to clearing members, trading members, customers and products and the potential impact of shocks, through: daily stress tests that shock current positions to assess adequacy of the default fund to cover losses in the event of a clearing member default; daily liquidity analysis to evaluate clearing members' own funding abilities to meet their obligations to CDP; and large exposures and risk concentrations are monitored daily to identify potential risk concerns.

Exposures to commercial banks are monitored, in particular arising from the settlement process, placement of margin and default fund monies, placement of CDP's own cash holding, as well as from monies received by CDP from issuers for processing of corporate actions. Limits are established under SGX's Bank Counterparty Risk Limit Policy.

SGX is developing a new multi-asset Risk Management System that will receive positions of both SGX-DC and CDP. This enables risk exposure of common clearing members to be aggregated automatically across both clearing houses.

<p><b>Review of risk management policies, procedures and systems</b></p> <p>All initiatives that have potential material impact on SGX’s risk profile require RMC approval. Generally, this includes: (a) clearing risks; (b) non-clearing financial risks; (c) technology risks; (d) operational risks; and (e) other enterprise risks that may have a significant impact on the reputation, financial position and business operations of SGX.</p> <p><b>Project Management</b></p> <p>Projects go through a standard lifecycle that is structured in the following phases: Opportunity Assessment; High Level Feasibility Study; Project Definition; Delivery and Deployment; and Post Implementation Review. SGX policies detail the level of approving authority and minimal criteria required to determine if a project should proceed to the next phase of the project lifecycle. All projects are required to maintain a risk register to capture project risks, and mitigating actions, to reduce the possibility of impact on planned delivery. Sign-offs from the relevant function heads are required to signify that key risks have been managed to appropriate levels.</p> <p><b>Compliance and audit</b></p> <p>The compliance program is aligned with ERM’s key risks identified for the year to provide assurance to EXCO of adequacy and effectiveness of the relevant risk management policies, procedures, systems and controls with regard to regulatory issues. The audit committee is updated on the outcome of these reviews and action plans to be undertaken, if required.</p> <p>SGX’s external auditor, conducts half-yearly confirmation of CDP’s and SGX-DC’s reports on whether clearing members’ margins, default fund contributions and financial resources are managed in the manner required by applicable laws and regulations.</p> <p>A self-assessment exercise, as required under Regulation 11(1)(c) of the SF(CF)R is conducted on an annual basis. This serves as a report to MAS on how CDP has discharged its CCP responsibilities under the SFA and the SF(CF)R during the preceding financial year including statutory obligations. CDP’s roles as SSS and CSD are also part of this self-assessment. The self-assessment exercise is managed by the Compliance function.</p> <p>In accordance with the CGC issued by MAS and as set out under SGX-ST Listing Manual (Rule 1207(10)), the SGX Board, with the concurrence of the audit committee, is required to give an opinion on SGX’s internal controls in relation to financial, operational and compliance risks in the annual report. The Annual</p>
---

	<p>Report also provides an assessment of the adequacy of SGX's governance arrangements including the role of the SGX Board in risk management.</p> <p>MAS has a program for annual inspection and will include aspects of risk management, operations and technology as relevant.</p>
<p>Key Consideration 2</p> <p>An FMI should provide incentives to participants and, where relevant, their customers to manage and contain the risks they pose to the FMI.</p>	<p><b>Information</b></p> <p>CDP provides clearing members and trading members with relevant information in a timely manner to facilitate management of their credit and liquidity risks. CDP clearing members can subscribe to a real-time data feed that contains trades done by their trading members.</p> <p>To help clearing members mitigate the risk of their customers failing to deliver shares on settlement date, CDP provides clearing members with reports of potential fails one day ahead of settlement date so that clearing members may make the necessary arrangements. On settlement date, clearing members can also access online enquiries for settlement details.</p> <p>CDP also provides clearing members with the following information/reports which they can apply in their risk management:</p> <ul style="list-style-type: none"> <li>(i) For marginable futures contracts, reports at each clearing cycle detailing variation and maintenance margin requirement for each account;</li> <li>(ii) For cash securities, reports at each clearing cycle detailing variation and maintenance margin requirement for each clearing member;</li> <li>(iii) Clearing members have online access to CDP's collateral management system COSMOS to view their latest collateral information and margin requirements;</li> <li>(iv) Reports detailing the collateral posted. Clearing members can use the mark-to-market price for every single security/issue to value the collaterals they received from their customers;</li> <li>(v) Changes to margin rates are disseminated to clearing members via circulars, at least two days before the effective change. In a crisis, CDP can change rates immediately.</li> </ul> <p>Though not part of CCP service, CDP provides a system (CAS) for clearing members and SGX-ST trading members to perform their post-trade back-office functions. All trades matched through or reported to SGX-ST's trading engine will be routed in real-time to this system. There is therefore sufficient information for trading and clearing members to manage risks at their customer level.</p> <p><b>Incentives</b></p> <p>Clearing and trading members are required to meet risk-based capital</p>

requirements to support the risks they bear, and other requirements to manage risk. Any breaches/failure to meet requirements attracts possible disciplinary action. If clearing members fail to comply with the risk-based capital requirements, CDP may direct the clearing member to liquidate positions, cease any increase in positions for any account carried by the clearing member; or liquidate or transfer all or part of any customer's positions, margins, collateral, assets and accounts to one or more other clearing members. Fines are imposed in cases where there are repeated late payments by members to meet their settlement and margining obligations.

CDP's loss sharing arrangements are proportionate to clearing members' traded values. Specifically, clearing members' collateralized contribution to the default fund is 0.5 bps of their past 12 months traded value while their contingent contribution is 0.4 bps of their past 12 months traded value, subject to the respective minimum levels. In a default situation, losses are apportioned to clearing members in proportion to their required contributions as prescribed in the CDP clearing rules.

CDP's disciplinary sanctions range from warnings, financial penalties to a charge brought before SGX's Disciplinary Committee which deals with disciplinary matters in relation to members of SGX-ST and CDP. Above the Disciplinary Committee is an Appeals Committee comprising market representatives and legal experts. For purposes of transparency, the grounds of decision for each Disciplinary Committee and Appeals Committee hearing are published on the SGX website.

#### **Effective policies and systems**

CDP requires clearing members to meet requirements in four major aspects of risk management at all times. These pertain to certain prudential requirements, notification to CDP of large exposures, credit controls and operational risk management. Clearing members are also required to provide CDP with timely and regular information, including early warning indicators and notifications, so that CDP can monitor and review.

In designing policies and systems, CDP engages its clearing members and relevant industry participants so that their requirements and feedback can be considered. CDP attends meetings held by Securities Association of Singapore (SAS) and National Securities Practice Group to discuss and gather feedback on clearing, settlement and depository related issues. CDP also monitors global and regional regulatory and market developments and takes into account these developments while reviewing and updating its practices against these developments.

<p>Key Consideration 3</p> <p>An FMI should regularly review the material risks it bears from and poses to other entities (such as other FMIs, settlement banks, liquidity providers, and service providers) as a result of interdependencies and develop appropriate risk-management tools to address these risks.</p>	<p><b>Material risks</b></p> <p>As a CCP, the key risk which CDP faces is direct counterparty credit risk to its clearing members, and indirect counterparty credit risk to its trading members and their customers.</p> <p><b>Risk-management tools</b></p> <p>Counterparty credit risk from clearing members is managed through stringent membership requirements, margining, stress testing and monitoring of exposures as set out under the CDP risk management framework. In addition, CDP has established default management policies, procedures and rules to contain losses and liquidity pressures and liquidity risk management arrangements. The framework for management of operational contingencies, including extensive business continuity plans, addresses operational disruptions.</p> <p>To ensure the robustness and resilience of IT systems and core infrastructure, SGX Technology function has designed its critical IT systems with high availability and robustness in place. Data is synchronized in real-time across the two data centers. These arrangements facilitate a swift restoration of critical services and resumption of business operations to normal conditions should systems at the primary site fail. A failure of the infrastructure or application at the primary will cause a failover to their respective standby server at the secondary data centre with no loss of data.</p> <p>SGX has established an alternate site with permanent staffing from relevant critical business and support units in order to continue business should a sudden high impact event strike SGX. The alternate site is also the business recovery centre with adequate capability for other business and support functions to continue operation, should the primary location become unavailable.</p> <p><b>Risk management tools</b></p> <p>Periodic reviews of CDP's risk practices and fire-drills and exercises are conducted to assess the effectiveness of CDP's risk management tools that address interdependencies. SGX conducts annual default management fire-drills and BCM exercises that involve relevant market participants, and participates in the periodic financial industry crisis management exercise conducted by ABS and MAS. SGX employs external observers to assess and provide feedback on SGX's performance. SGX conducts post-exercise reviews which provide assessment of and learning points for the effectiveness of SGX's risk management tools that address interdependencies.</p>
---	---

<p>Key Consideration 4</p> <p>An FMI should identify scenarios that may potentially prevent it from being able to provide its critical operations and services as a going concern and assess the effectiveness of a full range of options for recovery or orderly wind-down. An FMI should prepare appropriate plans for its recovery or orderly wind-down based on the results of that assessment. Where applicable, an FMI should also provide relevant authorities with the information needed for purposes of resolution planning.</p>	<p><b>Scenarios that may prevent an FMI from providing critical operations and services</b></p> <p>Contingency plans are in place to support the continuation of CDP's functions in conditions of stress or disruption. Should these plans fail to arrest the problem and CDP's viability is at risk, the recovery and resolution plan (RRP) applies.</p> <p>SGX has identified the extreme scenarios which may potentially trigger RRP for CDP. They fall into three main categories: (i) systemic risk scenario of multiple defaults of members (ii) business stress scenario of sustained low volumes; and (iii) reverse stress testing scenario of the largest CDP loss that SGX can absorb.</p> <p><b>Recovery and orderly wind-down plans</b></p> <p>The RRP for CDP is in an early stage of development. It is intended to support the continued provision of critical operations and services in the event of a recovery or an orderly wind-down of operations. The time frame and associated operating costs of a recovery or orderly wind-down will depend on the underlying scenario and the recovery or resolution measures taken. It will be reviewed and refined going forward.</p> <p>Once CDP enters the resolution stage, the MAS will be the Resolution Authority to oversee the implementation of the resolution plan by CDP. Section 80A of the SFA provides for the power of MAS to appoint a statutory adviser for this purpose. The MAS also has powers under the MAS Act to impose a resolution regime on CDP. The Crisis management team of CDP will work closely with MAS to implement any resolution measures as directed by MAS.</p>
<p>Key Conclusions for Principle 3</p>	<p>SGX has a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks. SGX has an ERM framework, procedures, and systems in place that enable it to identify, measure, monitor, and manage the entire range of risks. The risk-management frameworks are periodically reviewed and updated. CDP has identified scenarios that could potentially prevent it from being able to provide its critical operations and services as a going concern. CDP has provided the details of its recovery and resolution framework to the authorities. However, there is a need to further improve upon the existing recovery plan by building in additional scenarios taking into account crisis developments incorporating local and international developments.</p>
<p>Assessment of Principle 3</p>	<p>Broadly Observed</p>
<p>Recommendations and Comments</p>	<p>There is a need to further improve upon the existing recovery and resolution framework. It may be further enhanced and developed by taking into account</p>

	the initiatives of the international standard setters and by building in additional scenarios that could impair CDP in continuing to provide and carry-out its critical activities.
--	---

<b>Principle 4. Credit Risk</b>	
<p>An FMI should effectively measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes. An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions.</p>	
<p><b>Key Consideration 1</b></p> <p>An FMI should establish a robust framework to manage its credit exposures to its participants and the credit risks arising from its payment, clearing, and settlement processes. Credit exposure may arise from current exposures, potential future exposures, or both.</p>	<p>CDP's framework to manage credit exposures consists of:</p> <ul style="list-style-type: none"> <li>• Regulations, rules and policies;</li> <li>• Tools to identify measure, monitor and reduce the credit risk exposures;</li> <li>• A governance structure dedicated to handle the daily credit operations; and</li> <li>• Escalation tools and default procedures.</li> </ul> <p><b>Regulations, rules and policies</b></p> <p>CDP's framework to manage credit risk is based on regulations and rules and related practice notes as well as capital conditions imposed by MAS. Its framework is laid down in several policies of the credit risk function and the finance function.</p> <p>CDP rules are available to the public on the SGX web-site and handbooks are available to CDP clearing members. Any amendments to the rules or handbooks are updated accordingly. For any change to the clearing fund structure and/ or rules, SGX goes through a formal process of public consultation. The rules are then formulated upon the no objection of the MAS</p> <p><b>Tools</b></p> <p>CDP uses the COSMOS, an electronic system, for clearing members to manage collaterals placed with the CCPs. Validation rules are built into COSMOS to allow only permitted collaterals to be accepted into the system.</p>

	<p>CDP also uses the pre-settlement and matching system.</p> <p><b>Governance structure</b></p> <p>CDP has developed governance arrangements for mitigating credit risk, involving the SGX board, CEO, EXCO and MAS as well as the head of the risk management function and the CRRO.</p> <p><b>Escalation tools and default procedures</b></p> <p>CDP has developed escalation tools and default procedures to manage crisis situations related to credit events, see Principle 13.</p>
<p>Key Consideration 2</p> <p>An FMI should identify sources of credit risk, routinely measure and monitor credit exposures, and use appropriate risk-management tools to control these risks.</p>	<p><b>Identification of sources of credit risk</b></p> <p>CDP is the clearing house for cash securities and marginable futures contracts which are traded on SGX-ST. CDP therefore faces current and potential future exposure from its clearing members for:</p> <ul style="list-style-type: none"> <li>• Outstanding buy and sell transactions on cash market. Ready market trades settle on a T+3 basis. Should a member default, CDP would face current and potential future exposures from unsettled trades;</li> <li>• Outstanding sell transactions that have failed to deliver on settlement date; and</li> <li>• Open positions in marginable futures contracts (forward contracts).</li> </ul> <p>CDP is also faced with credit risk of commercial banks with which CDP deposits margin monies received from its clearing members as well as contributions to CDP clearing fund. CDP also faces credit risks of settlement banks and clearing bank arising from the (i) settlement between CDP and clearing members; and (ii) guarantee of DVP payments and (iii) credit risk of commercial banks holding CDP's cash.</p> <p><b>Framework to manage credit risks to clearing members</b></p> <p>CDP has in place a risk management framework to manage credit risks of its clearing members comprising:</p> <ul style="list-style-type: none"> <li>• admission criteria, daily on-going monitoring of clearing members,</li> <li>• risk limits to manage risk exposure and risk concentration,</li> <li>• financial resources.</li> </ul> <p>SGX risk management unit performs daily monitoring of clearing risk exposures and takes additional risk mitigating measures where required.</p> <p>CDP admits only financially sound clearing members that meet minimum financial requirements. In terms of CDP clearing rule three—Membership,</p>

	<p>clearing members are also required to have adequate operational capacity and robust internal controls. On an on-going basis, clearing members must comply with rules on capital adequacy, risk management and reporting requirements at all times.</p> <p>Credit exposures arising from clearing members are managed by requiring maintenance and variation margins <i>CDP clearing rule 6A—Margin Requirements</i>. CDP requires variation margins to cover the current exposure. In addition, maintenance margin requirement will cover potential future exposure. Potential future exposure is covered by setting maintenance margins at a high confidence level. CDP's margin framework is designed to cover at least a single-tailed 99 percentile movement in the market. This includes the ability for CDP (as a CCP) to require additional margin (i.e., concentration risk, specific security risk and credit risk add-on) when necessary.</p> <p>CDP maintains clearing fund resources to cover its credit risk exposure to clearing members at all times. CDP conducts daily stress testing using extreme but plausible scenarios, and maintains resources to cover the default of the largest member and its member affiliates as well as two financially weaker members at all times.</p> <p>CDP does not extend credit to its clearing members. CDP does not pay for sale transactions that fail to settle on settlement day. These sales proceeds are withheld, and paid only upon the delivery of shares.</p> <p>Shares meant for settlement with CDP are earmarked at the start of settlement process. At noon on T+3, CDP first ascertains that shares to be used for settlement are available, and earmarks them so that they cannot be used for other purposes other than to meet the clearing member's settlement obligation.</p> <p>CDP conducts money settlement with its clearing members on a net basis to reduce settlement risks, i.e., amount due to clearing member (sell transactions) is netted with amount due from clearing member (buy transactions).</p> <p>CDP has in place, a fails management framework to mitigate credit risks from settlement with its clearing members. Under the framework:</p> <ul style="list-style-type: none"> <li>• all failed deliveries are subject to compulsory buy-in, which commences in the afternoon of the settlement day;</li> <li>• CDP requires margins on all sell transactions that fail-to-deliver;</li> <li>• by the close of the 2<sup>nd</sup> business day (Settlement Day+2), CDP will require the</li> </ul>
--	--

	<p>clearing member to procure the securities if CDP fails to complete the buy-in;</p> <ul style="list-style-type: none"> <li>• CDP's punitive fines on clearing members for delivery failure (fines S\$1,000 or five percent of contract values of the undelivered securities, whichever is higher), has reduced failure-to-deliver to a minimal level.</li> </ul> <p>Credit risk exposure is measured as the sum of current exposure and potential future exposure. CDP uses the mark-to-market as a measure for current exposure and maintenance margins as determined by various methodologies as the measure for potential future exposure. CDP calculates current credit exposures to clearing members twice a day using outstanding trade positions and prices at 11:30 a.m. and 5:30 p.m. respectively. Variation and initial margins are called after each cycle. CDP can trigger additional calculation and margin call cycles to mark-to-market the outstanding positions in the event of adverse market movement on intra-day basis. The stress test framework includes relevant, extreme but plausible historical and forward looking scenarios and is used to determine potential credit exposures under stressed circumstances. Stress testing is conducted at least once a day and more frequently if required under adverse market circumstances. The stress test framework is discussed in greater detail in Key Consideration 6.</p> <p>CDP also takes the following risk mitigating measures when required:</p> <ul style="list-style-type: none"> <li>• imposes credit add-ons and concentration add-ons to mitigate credit concerns, (e.g., deteriorating credit rating of member or its parent), or concentration of outstanding positions in particular security respectively;</li> <li>• requires clearing members to make additional information submissions, including the spread of customers behind a large block of transactions;</li> <li>• requires clearing members to limit outstanding positions; and</li> <li>• suspends trading and clearing activities of the clearing members.</li> </ul> <p>CDP maintains adequate financial resources to cover credit exposure of members at all times. CDP takes a consolidated view of total available resources to cover the exposures arising from a participant's default. These measures comprise:</p> <ul style="list-style-type: none"> <li>• Marking-to-market a member's portfolio of outstanding positions. Mark-to-market losses (i.e., variation margins) are collateralized;</li> <li>• Requiring initial margin covers the potential future exposure (of the participant's outstanding portfolio of transactions);</li> <li>• CDP conducts two margin call cycles, the intra-day and end-of-day margin cycles daily, to prevent the build-up of risks; and</li> </ul>
--	--

- Fully funded clearing fund resources cover the liquidation of contracts under extreme market conditions.

CDP does not extend intra-day credit, and shares must be fully paid for before they can be moved out of the securities account. CDP delivers securities only if they are fully paid for by the clearing members to mitigate credit risks. CDP subjects failed deliveries to compulsory buy-in and margin such transactions.

#### **Framework to manage credit risks to banks**

SGX has in place a bank counterparty risk limit policy, approved by the SGX Board and RMC, to manage credit risk exposure to banks. Under the bank counterparty risk limit policy, SGX (including CDP) only use supervised and regulated banks which meet the admission and ongoing criteria such as a minimum Moody's Bank Financial Strength of a C rating. The policy also sets the terms and settlement limits for day-to-day operations and management by operations and finance functions. Limits are monitored on a daily basis and independently reviewed by the risk management functions and CFO on a weekly basis.

#### **Framework to manage credit risk to participants in DVP settlement**

Under the DVP settlement, upon matching of settlement instructions, shares to be delivered are ear-marked, and cannot be transferred out of the securities account. Shares purchased will be delivered only upon successful settlement of money. CDP offers the DVP option for institutional customers to settle their trades directly with CDP through a principal. The principal must appoint a depository agent. It must also appoint a settlement bank to be its agent to make and receive payments in DVP settlement, and to guarantee the DVP payments.

A two-tier bank guarantee fully mitigates CDP credit risk exposure to the principals in DVP payments. Each principal is required to appoint a settlement bank to guarantee its money settlement obligation. In addition, each settlement bank is guaranteed by the clearing bank. The two-tier bank guarantee structure fully mitigates CDP's payment exposure to the principals.

Settlement banks set principal net debit caps to limit its potential exposure to the principals. The principal net debit caps are enforced by the validation of all DVP instructions in the pre-settlement and matching system when they are being submitted for matching. If an instruction to be matched results in a net debit balance to exceed the net debit cap, the instruction will be rejected by pre-settlement and matching system. The clearing bank in turn sets a settlement bank net debit cap for each settlement bank.

	<p><b>Review</b></p> <p>The risk functions have in place a process to review and update risk management policies, procedures on a regular basis, and to update the models and bank limits annually, and sooner if conditions so require. In addition, the stress test framework is reviewed quarterly to take into consideration the market and member conditions to ascertain that the stress test scenarios are adequate. Interactions with members, regulators and wider industry peers provide insights of latest industry best practices, expectations of regulators and market developments.</p>
<p>Key Consideration 3</p> <p>A payment system or SSS should cover its current and, where they exist, potential future exposures to each participant fully with a high degree of confidence using collateral and other equivalent financial resources (see Principle 5 on collateral). In the case of a DNS payment system or DNS SSS in which there is no settlement guarantee but where its participants face credit exposures arising from its payment, clearing, and settlement processes, such an FMI should maintain, at a minimum, sufficient resources to cover the exposures of the two participants and their affiliates that would create the largest aggregate credit exposure in the system.</p>	<p>NA</p>

<p>Key consideration 4</p> <p>A CCP should cover its current and potential future exposures to each participant fully with a high degree of confidence using margin and other prefunded financial resources (see Principle 5 on collateral and Principle 6 on margin). In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the</p>	<p><b>Coverage of current and potential future exposures to each participant</b></p> <p>CDP covers its current and potential future exposure to each participant with high degree of confidence with margins and clearing fund resources.</p> <p><b>Margin</b></p> <p>CDP requires all variation losses on all outstanding positions to be collateralized. Maintenance margin is calculated to at least 99 percent confidence interval with respect to the distribution of the future exposure of the portfolio.</p> <p>CDP's margin framework and its rationale are documented in its margin framework for securities market, maintained by the clearing risk function. The requirement to post margins and collateral requirement for holdings of margin and clearing fund are documented in the CDP clearing rules 6A (including the practice note). All CDP rules are available to the public on the SGX web-site.</p> <p><b>Stress testing</b></p> <p>CDP conducts daily stress testing of its clearing member's outstanding position. CDP's financial resources must be adequate to cover the stress test losses of top clearing member (and its affiliates) plus two financially weaker clearing members at all times.</p> <p><b>Composition of financial resources</b></p> <p>Margin: Clearing members meet their variation and initial margin requirement (at least 99 percent confidence level) with the following liquid assets:</p> <ul style="list-style-type: none"> <li>• Cash, including SGD and US\$;</li> <li>• Singapore and U.S. government securities; and</li> <li>• selected component stocks of the FTSE Straits Times and MSCI Singapore indices.</li> </ul> <p>The composition of collateral is subject to a collateral ranking rule to assure that there is no over concentration of an asset type from its members. Collateral is revalued daily, and is subject to haircuts to reflect the market risk volatility of the asset.</p> <p>Clearing Fund: The CDP clearing fund comprises pre-funded financial resources to cover current and potential future exposures. The pre-funded resources are in cash (SGD) which is the most liquid asset as follows:</p> <ul style="list-style-type: none"> <li>• CDP's contribution of SGD30m in the first layer of the fund,</li> <li>• Clearing members' contribution in the 2<sup>nd</sup> layer, based on 0.5bps of the past</li> </ul>
--	--

<p>participant and its affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. In all cases, a CCP should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount of total financial resources it maintains.</p>	<p>12 months trading turnover, subject to minimum of S\$500,000 per clearing member, and S\$40 million in aggregate; and</p> <ul style="list-style-type: none"> <li>• CDP's contribution of another S\$30 million in the final layer.</li> </ul> <p>In addition, there is a further contribution from members' unfunded portion (which are uncollateralized contribution) accounting for about 45 percent of members' total contribution, that can be called upon, when required. These contingent contributions are not considered as qualifying clearing fund resources.</p> <p>Margin and clearing fund resources are directly held by CDP, on trust, and are readily accessible when required.</p> <p><b><i>Margin for all securities products other than Marginable Futures Contracts</i></b></p> <p>Margin requirement is based on a member's outstanding portfolio. Maintenance margin is determined by measuring the rolling six-month volatility based on at least 99 percent confidence level of selected indices of the Singapore securities market. The reference indices are the benchmark FTSE Straits Times Index with contributions from sector indices, namely the FTSE Straits Times Mid Cap Index and the FTSE Straits Times Small Cap Index, with a one-day close-out period. Margins are back-tested daily. Refer to the response to Principle 6 on margins for more discussion of CDP's margin methodology. Current exposures are covered through intra-day and end-of-day cycles, with full revaluation at latest prices.</p> <p><b><i>Margin for Marginable Futures Contracts</i></b></p> <p>The variation margin are calculated based on current mark-to-market prices, and the initial margin required to be posted with CDP is calculated to at least 99 percent confidence level for each underlying security. Margins for marginable futures contracts are back-tested monthly as the exposure is insignificant. Refer to the responses to Principle 6 on margin for more details.</p> <p><b><i>CDP clearing fund resources</i></b></p> <p>The clearing fund resources are required to cover 100 percent of the time, the potential stress test losses (including securities and marginable futures contracts) of the clearing member and its affiliates with the largest exposure, and two financially weakest members at all times. CDP maintains a buffer of sizing CDP clearing fund based on the maximum loss for the past one year. The minimum clearing fund size must be agreed with the MAS. CDP's stress test covers an equivalent of a wide range of potential stress scenarios. The sufficiency of clearing fund resources is evaluated at least once daily. CDP is required to comply with the capital conditions as imposed by the MAS. The conditions stipulate that CDP must contribute a minimum of 25 percent of</p>
---	---

the total clearing fund size in cash, of which a minimum 15 percent CDP's contribution must be in the first layer. The clearing fund shall contain resources to meet any potential financial losses that may arise from default of the clearing member and its affiliates to which it has the largest exposure and the two financially weakest clearing members. The stress test framework for ascertaining the size of the clearing fund is documented in the policy and standard operating procedures (SOP) document repository. In addition, member's collateral requirements for clearing fund resources are stated in the CDP clearing rules 7.3.

To assure member's and their customers' entitlement to margins and clearing fund resources, CDP holds members' collateral (house and customer origin) in trust accounts with banks, off the balance sheet of CDP. In the unlikely event that CDP becomes insolvent, CDP's creditors cannot lay claim to the collateral as the monies and assets do not belong to CDP. The collateral will be returned to the clearing member, subject to any entitlement to the collateral which CDP may have. Member's collateral are governed by CDP Clearing Rule 6B.

***Risk profile and systemic importance in multiple jurisdictions***

CDP is not deemed to be systemically important in multiple jurisdictions or involved in activities with complex risk profiles. CDP clears products with non-complex risk profile. The main types of securities clearing by CDP clearing house includes ordinary company shares, company warrants. Other securities like exchange traded funds and exchange traded notes, American depository receipts, global depository receipts and structured warrants are structured like a security that settles within three days, and do not have complex risk profile. Although the customer profiles are a mix of retail and institutional customers, the size of transactions cleared by CDP is not significant in the global context. CDP clearing house operates entirely locally in Singapore; and CDP clearing house derives 100 percent of its revenue locally through its operations in Singapore.

**Additional financial resources**

The clearing fund has a minimum size but is scalable as risk increases in the clearing system. In addition to CDP's own contribution of at least 25 percent of the fund size (CDP currently contributes S\$30 million to the first loss layer and another S\$30 million as the final layer), the fund is sized using members' contributions to a fully funded Member's contribution of up to 0.6bps of its past 12 month's traded (buy and sell) value.

In the event that additional financial resources are required:

- CDP clearing house has the power to call on non-defaulting clearing members'

	<p>uncollateralized contribution to clearing fund;</p> <ul style="list-style-type: none"> <li>• CDP Clearing Rule 7.10 stipulates that CDP has the power to require non-defaulting clearing members to top-up any deficiency in its contribution as a result of any drawdown in a default;</li> <li>• SGX has broad RRP in place to enable the safeguard of CDP’s critical clearing and settlement functions in various stressed scenarios. Within the RRP, SGX Capital Plan provides for capital to sustain the clearing functions in stressed scenarios.</li> </ul> <p>The risk management function performs stress testing on a daily basis to determine adequacy of the CDP clearing fund.</p> <p><b>Supporting rationale and governance arrangements</b></p> <p>CDP’s margin framework and stress test framework are documented and approved by the SGX EXCO, the RMC, and MAS where relevant. The frameworks are reviewed annually and updated as necessary. CDP is required to comply with the capital requirements laid down by MAS which include requirements on its clearing fund contributions.</p> <p>The investment of margin collateral by CDP is governed by section 64 of the SFA. CDP is bound to observe those statutory requirements. In addition, to protect clearing members’ entitlement to margins and clearing fund resources, CDP holds clearing members’ collateral (house and customer origin) in trust accounts with banks. This collateral is not taken onto CDP’s balance sheet and is therefore protected should CDP become insolvent.</p> <p>Provisions relating to margin and collateral requirements are contained in the CDP clearing rules and in the relevant practice notes. These are available to the public on the SGX website. Handbooks are also available to clearing members.</p> <p>Every month, SGX reports on the adequacy of the clearing fund to the Board, the RMC, the EXCO and MAS.</p> <p>Regular review of Clearing Fund: A quarterly review of clearing fund size is undertaken which takes into account any change in the market structure or environment, decrease in membership, change in stress test scenarios because of increased market volatility, etc. Regular reporting of adequacy of clearing fund is submitted to the RMC, EXCO and MAS on a monthly basis. The SGX Board is also presented with the risk dashboard to enquire or initiate review for need of action.</p>
--	---

<p>Key Consideration 5</p> <p>A CCP should determine the amount and regularly test the sufficiency of its total financial resources available in the event of a default or multiple defaults in extreme but plausible market conditions through rigorous stress testing. A CCP should have clear procedures to report the results of its stress tests to appropriate decision makers at the CCP and to use these results to evaluate the adequacy of and adjust its total financial resources. Stress tests should be performed daily using standard and predetermined parameters and assumptions. On at least a monthly basis, a CCP should perform a comprehensive and thorough analysis of stress testing scenarios, models, and underlying parameters and assumptions used to ensure they are appropriate for determining the CCP's required level of default protection in light of current and evolving market conditions. A</p>	<p><b>Stress testing</b></p> <p>The total financial resources available in the event of a default or multiple defaults are in the form of margins and the clearing fund resources. The adequacy of margins is assessed through back testing.</p> <p>The adequacy of the clearing fund is assessed through CDP's daily stress testing. When stress test loss exceeds the clearing fund size, the cause of the exception is reviewed to determine the cause. Appropriate risk mitigating actions, including requiring additional collateral from the clearing members, either through margins or additional clearing fund contributions are taken to address exceptions in the review. Where action is taken, the clearing member that has triggered this exception is informed. CDP stands ready to top up such shortfall in clearing fund resources when needed.</p> <p>CDP clearing fund resources must cover the clearing member and its affiliates with largest credit exposure, and two financially weakest members at all times. At a minimum, CDP clearing fund is expected to cover the maximum loss for the past one year. In addition, a minimum clearing fund size must be agreed with MAS. CDP's stress test framework is discussed in greater detail in Key Consideration 6.</p> <p>For securities, the stress tests are evaluated for all outstanding positions at a member level net of collateral.</p> <p>On a monthly basis, stress test results and adequacy of CDP clearing fund resources are also reported to the Board, the RMC, the EXCO and MAS.</p> <p><b>Review and validation</b></p> <p>CDP's stress testing framework covers scenarios with relevant peak historic moves and forward looking hypothetical scenarios. These scenarios are extreme and take into account price volatility and changes in market liquidity. For a surge in market volatility, CDP uses a variety of triggers to review the need to revise stress test scenarios.</p> <p>The products CDP clears are standard and do not exhibit high model risk. CDP performs review of the stress testing scenarios at least quarterly and a full assessment and validation annually. In addition, ad-hoc stress test reviews are done when there is increase in market volatility and/ or member conditions or whenever the situation requires.</p> <p>SGX has in place a dual control structure with clearing risk function developing risk models for margining, stress testing and collateral valuation, and Risk Management function providing independent initial validation of the model</p>
--	---

<p>CCP should perform this analysis of stress testing more frequently when the products cleared or markets served display high volatility, become less liquid, or when the size or concentration of positions held by a CCP's participants increases significantly. A full validation of a CCP's risk-management model should be performed at least annually.</p>	<p>and periodic review.</p> <p>On a quarterly basis, clearing risk function reviews the adequacy of stress tests. The review takes into consideration the market and member conditions to ascertain if the existing scenarios are adequate. Various triggers and statistical tools and analysis are used to generate stress tests giving more weight to current market conditions as a signal for increasing market risk. On an annual basis, CDP under-takes a comprehensive review of its entire stress test framework.</p>
<p>Key Consideration 6</p> <p>In conducting stress testing, a CCP should consider the effect of a wide range of relevant stress scenarios in terms of both defaulters' positions and possible price changes in liquidation periods. Scenarios should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions.</p>	<p><b>Stress test scenarios</b></p> <p>CDP adopts a framework that splits stress testing scenarios into two main groups—core and extended. Each of these groups has both forward-looking and historical scenarios. A scenario is included if it satisfies the tests for condition of being relevant, comprehensive and extreme but plausible. All the products that CDP clears are subject to stress testing.</p> <p>The core stress tests are designed to cover relevant, extreme but plausible scenarios. This includes relevant peak historic volatilities and forward-looking hypothetical scenarios that cover for risks that have not been exhibited in history but could emerge in future. The core stress tests are designed to be conservative and are used to size the clearing fund on a daily basis.</p> <p>The extended set of stress tests is used for monitoring and risk identification. The extended scenarios are those which might not be relevant at all times for fund sizing but useful for identifying potential risks and act as early warning signals for appropriate risk mitigating actions.</p>

<p>Key Consideration 7</p> <p>An FMI should establish explicit rules and procedures that address fully any credit losses it may face as a result of any individual or combined default among its participants with respect to any of their obligations to the FMI. These rules and procedures should address how potentially uncovered credit losses would be allocated, including the repayment of any funds an FMI may borrow from liquidity providers. These rules and procedures should also indicate the FMI's process to replenish any financial resources that the FMI may employ during a stress event, so that the FMI can continue to operate in a safe and sound manner.</p>	<p><b>Allocation of credit losses</b></p> <p>CDP clearing rules 7.9 details the following:</p> <ul style="list-style-type: none"> <li>• order of utilization (waterfall) of CDP clearing house and clearing members' contributions to the clearing fund in the event of any member's default;</li> <li>• the requirements for non-defaulting clearing members to replenish their clearing fund contributions after a drawdown;</li> <li>• that CDP clearing house will replenish its contribution at least in accordance with capital conditions as set out by the MAS;</li> </ul> <p>CDP rules allow for application of the replenished fund to meet further losses from the current and subsequent defaults. If CDP clearing house draws down on any lines of credit or liquidity resources available to CDP clearing house, it shall be entitled to be reimbursed for this amount and all its costs. In addition, the obligation of the principals, settlement banks and clearing bank are stipulated in the DVP rules. The settlement banks guarantee provides the committed liquidity to meet the settlement obligation of the principals and the clearing bank guarantee provides the committed liquidity to meet the settlement obligations of the settlement banks. The clearing bank deed and clearing bank agreement stipulates the obligation of the clearing bank to CDP to meet payment obligations of the settlement banks on a committed basis.</p> <p><b>Replenishment of financial resources</b></p> <p>CDP notifies a clearing member in writing whenever its contribution (or part thereof) is applied. If any amount is paid out of a clearing member's contributions, the clearing member is required to, upon demand by CDP, top-up the deficiency. The replenishment of CDP's contribution to clearing fund is as provided in SGX's capital plan. The settlement bank and clearing bank guarantees provide the committed resources required by the participants. Agreement with the banks cannot be terminated by the settlement banks or clearing bank unless agreed by CDP.</p>
<p>Key Conclusions for Principle 4</p>	<p>CDP has a robust credit risk exposure framework covering credit exposures arising from both current and potential future exposures arising from its payment, clearing, and settlement processes. The framework identifies sources of credit risk, routinely measures and monitors credit exposures, and uses appropriate risk-management tools to control these risks. CDP covers its current and potential future exposures to each participant fully with a high degree of confidence using margin and other prefunded financial resources such as the clearing fund. CDP determines the amount and regularly tests the sufficiency of its total financial resources available which are deemed adequate to cover the default of the single largest participant (and its affiliates) and the two financially weakest members. Stress tests covering a wide range of stress</p>

	scenarios are performed on a daily basis and analyzed and necessary follow-up measures taken. Appropriate governance arrangements are in place.
Assessment of Principle 4	Observed
Recommendations and Comments	-

### Principle 5. Collateral

An FMI that requires collateral to manage its or its participants' credit exposure should accept collateral with low credit, liquidity, and market risks. An FMI should also set and enforce appropriately conservative haircuts and concentration limits.

**Key Consideration 1**  
An FMI should generally limit the assets it (routinely) accepts as collateral to those with low credit, liquidity, and market risks.

Currently, CDP collects collateral from its clearing members in two forms: (i) margins for securities market trades and extended settlement contracts. Acceptable cash collateral are SGD and US\$ deposits, U.S. and Singapore government securities and selected securities traded on SGX Securities Trading Limited. Only component stocks, including listed business trusts, of Singapore's key stock market indices (MSCI Singapore Free Index and FTSE Straits Times Index) (collectively known as Singapore shares) are accepted. Additionally, these must meet (i) minimum market capitalization and liquidity requirements; and (ii) Clearing fund contributions where only cash (SGD) is accepted.

Margin and financial requirement collateral are managed using the COSMOS system. CDP uses COSMOS which allows clearing members to manage margin and financial requirement collateral placed with CDP (including submitting electronic requests to deposit or withdraw collateral). Validation rules are built into COSMOS to allow only permitted collateral to be accepted into the system. For cash deposits and government securities, the specific currencies and types of government securities that are allowed under the guidelines are set up in COSMOS and clearing members are only able to deposit these specific types of assets/collaterals that meet the prescribed criteria. In addition, the concentration limits for each government securities are set up in COSMOS such that deposits above the concentration limit will not be accepted.

For Singapore shares, validation of collateral deposit requests is performed outside of COSMOS by the operations unit staff. Processes are in place to validate adherence to the acceptance criteria. Singapore shares that fail validation will be rejected. Currently no clearing member has pledged Singapore shares and government securities as collateral. Cash accounts for 100 percent of the margin pool.

	Cash and government securities which CDP accepts are liquid assets that do not suffer from wrong-way risk.
<p>Key Consideration 2</p> <p>An FMI should establish prudent valuation practices and develop haircuts that are regularly tested and take into account stressed market conditions.</p>	<p><b>Valuation practices</b></p> <p>CDP values collateral daily against prices obtained from public sources.</p> <p><b>Haircutting practices</b></p> <p>For government securities, haircuts are determined through a volatility-based approach to reflect the price movements of the underlying government securities. To ensure robustness and to account for time-zone differences that may affect market liquidity, haircut rates are based on the 99.9th percentile price decline (0.1th percentile) over a two-day holding period, evaluated on a historical sampling period of 10 years.</p> <p>For Singapore shares, a standard 30 percent haircut rate applies. This haircut must be sufficient to cover the 99.9th percentile price decline (0.1th percentile) over a two-day holding period, evaluated on a historical sampling period of 10 years.</p> <p>For margin collateral, a cross-currency haircut is applied if collateral in one currency is used to cover exposures denominated in another currency. This cross-currency haircut is imposed on top of asset type haircuts. Cross-currency haircuts are determined through a volatility-based approach. The haircut for each currency pair is based on the 99.9th percentile price decline (0.1th percentile) over a one-day holding period, evaluated on a historical sampling period of ten years.</p> <p>Haircuts are reviewed on a quarterly basis or more frequently when adverse news surfaces. The historical sampling period covers stressed market conditions such as extreme price movements (experienced during the 2008 financial crisis). Ad-hoc reviews of the haircut rates are triggered whenever adverse news on Singapore shares and the issuing countries of acceptable government securities emerges. Haircut rates will be adjusted if the specified rates are insufficient to cover the price movements.</p> <p>The clearing risk unit reviews its haircut methodologies on an annual basis to verify that valuations of collateral assets are sufficient to cover the obligations they are posted against and are reflective of current market conditions. The reviews are validated by the risk management unit.</p>

<p>Key Consideration 3</p> <p>In order to reduce the need for pro-cyclical adjustments, an FMI should establish stable and conservative haircuts that are calibrated to include periods of stressed market conditions, to the extent practicable and prudent.</p>	<p>Haircut rates are considered to be conservative, prudent and stable. The need for pro-cyclical adjustments is offset by the fact that haircut rates are calibrated to cover extreme price movements observed during periods of stressed market conditions.</p>
<p>Key Consideration 4</p> <p>An FMI should avoid concentrated holdings of certain assets where this would significantly impair the ability to liquidate such assets quickly without significant adverse price effects.</p>	<p>To protect CDP from adverse price effects at liquidation, CDP sets limits on collateral concentration to (i) prevent undue concentration of any particular asset class; and (ii) prevent excess concentration with any specific security or end-creditor.</p> <p>Margin collateral pledged with CDP comprises: (i) cash and/or government securities if the total margin requirements are US\$1 million or less; (ii) for clearing members whose total margin requirements are more than US\$1 million, cash and/or government securities must constitute the first US\$1 million of the total margin requirements.</p> <p>There is an additional requirement that 60 percent of the total margin requirements must be in the form of cash and/or government securities (<i>CDP clearing rule 6A.7.1</i>)</p> <p>For Singapore government securities, CDP has assessed the concentration and liquidity risks arising from Singapore government securities to be small given that these government securities are widely tradable in the domestic interbank market. In addition, CDP can pledge/repo these Singapore government securities as collaterals to tap liquidity from MAS. For U.S. government securities, secondary market liquidity is very substantial relative to the amount posted with CDP, i.e., U.S. government securities held by CDP represent less than 0.001 percent of total outstanding U.S. government securities. Nevertheless, a concentration limit of ten percent applies for each issue for all government securities.</p> <p>For government securities, the list of accepted securities is conservative and the credit quality and market liquidity of these government securities is high, hence there are less concerns of the ability to liquidate such assets quickly without adverse price effects. CDP reviews policies and practices whenever</p>

	<p>there are major government events and financial crises.</p> <p>For Singapore shares, the aggregate of a single security that is accepted by both CDP and SGX-DC shall not be more than two percent of a security's issued shares. For a single security at clearing member level, each clearing member shall not pledge more than 20 percent of the average daily trading volume in the preceding quarter of the security. Clearing members will be given up to five days to replace the affected shares with other eligible collaterals. CDP also actively monitors the aggregate holdings of any securities to ensure that it does not exceed the two percent limit.</p> <p>For cash collateral, the list of accepted currencies (SGD and US\$ deposits) is conservative and these are freely traded currencies with substantial market liquidity. CDP will review the concentration policies and practices if market conditions change significantly.</p>
<p>Key Consideration 5 An FMI that accepts cross-border collateral should mitigate the risks associated with its use and ensure that the collateral can be used in a timely manner.</p>	<p>To ensure that cross-border collateral can be used in a timely manner, CDP accepts collateral that can be deposited under a legal jurisdiction which recognizes CDP's creditor rights and seeks legal opinions from both domestic and foreign law firms.</p> <p>Default management procedures and security interest agreements are in place to ensure timely liquidation of such collateral.</p>
<p>Key Consideration 6 An FMI should use a collateral management system that is well-designed and operationally flexible.</p>	<p><b>Collateral management system design</b></p> <p>CDP uses the COSMOS system to manage its margin collateral. COSMOS keeps records of collateral posted by each clearing member. COSMOS handles four types of assets (cash, government securities, LC, Singapore Shares) of which only cash, government securities and Singapore Shares are relevant to CDP. It has the capability of multi-currency calculations (in SGD, US\$, JPY and euros). It has a generic algorithm for computing excess margin and validating withdrawal requests to allow for timely calculation and execution of margin calls, management of margin call disputes, etc. COSMOS can be configured for configurable haircuts (differentiated by outstanding tenure and currency); various levels of concentration limits (per issue of government securities ISIN, bank exposure limits) and has the ability to value individual issues at zero value should it being found unacceptable as collateral or when market price does not represent true value of the collateral assets.</p> <p>CDP does not reuse the collateral. Collateral in cash deposits are placed at regulated banks in current and fixed deposit bank accounts. For government securities, title of such securities is transferred to CDP and the government securities are immobilized and safe kept in national depositories through</p>

	<p>custodian services of global custodian banks. For Singapore shares, such securities are statutorily charged to CDP and will be earmarked and recorded by the CDP (as a CSD).</p> <p><b>Operational flexibility</b></p> <p>All clearing members have access to COSMOS to submit their deposit, withdrawal and transfer requests for margin and financial requirement collateral. All requests submitted by clearing members before the processing cut-off time are processed by CDP within the same day unless the request carries a forward value date.</p> <p>The monitoring of concentration limits is automated. Revisions to haircuts and/or concentration limits are easily implementable. COSMOS is capable of providing all key information of collateral held at any point in time to facilitate management of any stressed or default situation.</p> <p>COSMOS is not used for monitoring clearing fund contributions. Clearing fund contributions are reviewed on a monthly basis and can only be met with SGD. The operations unit has established SOPs and processes that are sufficient to accommodate the timely deposit and withdrawal of such collateral.</p>
Key Conclusions for Principle 5	<p>CDP accepts collateral assets with low credit, liquidity, and market risks. It has in place prudent valuation practices and conservative haircut methodologies that are regularly tested and take into account stressed market conditions. CDP uses the COSMOS for collateral management purposes. Validation rules are built into COSMOS to allow only permitted collateral to be accepted into the system. COSMOS also allows clearing members to manage margin and financial requirement collateral placed with CDP (including submitting electronic requests to deposit or withdraw collateral).</p> <p>While CDP is able to accept other kinds of collateral such as Singapore government securities and U.S. treasuries, it has only received cash as collateral from members. It is recommended that CDP explore with members the possibility of widening the collateral pool apart from cash and examine the feasibility of receiving a part of the collateral in the form of Singapore Government securities, as it has the necessary systems and resources in the form of COSMOS with prudent valuation and stable haircut methodologies. Further, this would enable CDP to avail of MAS standing facility for repo in times of stress.</p>
Assessment of Principle 5	Observed
Recommendations and Comments	<p>While CDP is able to accept other kinds of collateral such as Singapore government securities and U.S. treasuries, it has only received cash as collateral from members. CDP has systems, resources and a framework in place for accepting non-cash collateral with appropriate haircuts and concentration</p>

	limits. It is recommended that CDP explore with members the possibility of widening the collateral pool apart from cash and examine the feasibility of receiving a part of the collateral in the form of Singapore Government securities as this would enable CDP to avail of MAS standing facility for repo in times of stress.
--	--

### Principle 6. Margin

A CCP should cover its exposure to its participants for all products through an effective margin system that is risk-based and regularly reviewed.

<p><b>Key Consideration 1</b></p> <p>A CCP should have a margin system that establishes margin levels commensurate with the risks and particular attributes of each product, portfolio, and market it serves.</p>	<p><b>Description of margin methodology</b></p> <p>CDP only clears products offered in the domestic securities market operated by SGX-ST. From the perspective of margin methodology, the products cleared by CDP are distinguished into two groups: securities<sup>16</sup> traded on SGX-ST; and extended settlement<sup>17</sup> contracts traded on SGX-ST. The margin on securities was introduced in January 2013, while the latter has been in place since SGX introduced extended settlement contracts in 2008.</p> <p><b>Securities margining</b></p> <p>CDP adopts a historical volatility-based margin model, using the volatility of the benchmark FTSE Straits Times Index to estimate the initial margin rate. This is determined at the single-tailed confidence level of at least 99 percent of the index's estimated distribution of future exposure, over sample historical period of 6 months and close-out period of one day. Besides using the FTSE Straits Times Index, the margin estimate also consider the volatility of other key sub-indices, a floor to the margin rate to manage pro-cyclicality risks, and additional margin on specific security when there is concern. For portfolio with concentration risks, or participant with credit concerns, CDP may also impose margin add-on. To cover the current exposure to each participant's portfolio, CDP marks-to-market every outstanding trade to the latest available market prices twice a day. Variation margin is collected for each participant with net mark-to-market loss on their portfolio of outstanding securities trades.</p>
---	---

<sup>16</sup> These are company shares, usually for T+3 settlement basis. Other securities include fixed income products like Singapore government securities, and corporate bonds.

<sup>17</sup> The extended settlement contract is a form of Marginable Futures Contracts which has a settlement date (or last trading date) beyond the three days of the plain vanilla securities. Based on a single underlying security (e.g., a DBS extended settlement contract is based on DBS shares) with its underlying securities being traded on SGX-ST securities trading platform

**Margining on extended settlement contracts**

The initial margin methodology for extended settlement contracts adopts the same model used by SGX-DC for margining its derivatives products. The initial margin for extended settlement is calculated at the product level (i.e., individual security) using a historical volatility based margin model, based on a single-tail confidence level of at least 99 percent of the respective product's estimated distribution of future exposure. The initial margin rate is determined based on the volatility over multiple sample periods, with close-out period of one day. There is no offsetting of margin between extended settlement contracts, nor with any other securities or derivatives products, nor with its underlying securities. To cover the current exposure, CDP marks-to-market every extended settlement position to the latest available market prices twice a day. Variation margin is collected for each participant's positions with net mark-to-market loss.

The following information is disclosed to the participants: the general methodology to determine the initial margin rate; the calculation method for portfolio initial and variation margin requirement, and the consideration for margin add-on.

Given this, the assessment focuses more on the margin framework for securities.

**Credit exposures**

CDP's clearing activity is limited only to products listed and traded on the securities market operated by SGX-ST. It is significantly concentrated in plain vanilla securities (i.e., Company shares, Real Estate Investment Trusts, Exchange Traded Funds) with linear payoff characteristics, with a small exposure to warrants (plain vanilla call and put), and to Singapore government bonds and corporate bonds. In terms of product and market attributes, CDP's credit exposure is primarily driven by the linear market risk of the securities.

In accordance with CDP rules, upon a participant's default, its contractual relationship (established for the participant's portfolio of outstanding trades) with CDP ceases. Each of the participant's customer's portfolio of outstanding trades is transferred to CDP, a process known as re-novation. Proprietary positions of the participants are promptly liquidated.

CDP adopts a historical volatility based margin model, using the benchmark FTSE Straits Times Index to estimate the initial margin rate. This method is found to be adequate in providing a suitable measurement of the price risk exposure faced by CDP, as a high proportion of CDP's clearing activities are in

	<p>stocks (i.e., plain vanilla company shares), of which approximately two-thirds are constituent stocks of the FTSE Straits Times Index.</p> <p>CDP takes a consolidated view of total available resources to cover the exposures arising from a participant's default. The initial margin seeks to cover the potential future exposure (of the participant's net outstanding trades) until the point of re-novation, whilst clearing fund resource is to cover the potential liquidation risks of the re-novated contracts. The CDP clearing fund is sized on a gross basis to cover potential aggregate losses of the individual customer accounts. Any additional risk that may arise following the re-novation is borne by CDP through its significant contribution to the clearing fund (of which 30 percent is in the first layer and another 30 percent in the bottom layer of the fund)<sup>18</sup>.</p> <p><b>Operational components</b></p> <p>CDP executes an intra-day and an end-of-day clearing cycle daily. During the intra-day cycles, all outstanding (including newly executed up to that point in time) trades will be subjected to initial margin, while any variation losses will be subjected to variation margin. Margin call will be made to participants whose collateral is insufficient to meet these margin requirements. This prevents the accumulation of margin deficit until the end-of-day cycle. Together with close monitoring of market conditions, potential risk concerns are detected early and additional collateral or other mitigating actions taken swiftly to protect the clearing system.</p> <p>CDP's default management framework is supported by a prudently capitalized clearing fund. The details on participant default procedure are provided in the responses to Principle 13.</p> <p>The CDP rules require participants to make and complete payment of margin within the prescribed timelines. A failure by a participant to do so may be deemed as an event of default, and default procedures may be enforced against the participant's positions and collateral. Alternatively, CDP may take enforcement actions against such participants, such as reprimand, fine or suspension.</p> <p>Transfer of margin monies take place between CDP's settlement banks and participants' settlement banks. All the settlement banks have operations in</p>
--	--

<sup>18</sup> Approximately 60 percent of the CDP clearing fund is contributed by SGX, and the balance by all participants.

	<p>Singapore. As the margin monies are likely to be primarily SGD, CDP is unlikely to face significant challenges posed by time zone issues. Nevertheless CDP also accepts US\$ as margin collateral from its participants. As the US\$ is in a time zone later than SGD, the timing for payment on T+1 is similar for both currencies.</p>
<p><b>Key Consideration 2</b> A CCP should have a reliable source of timely price data for its margin system. A CCP should also have procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable.</p>	<p><b>Sources of price data</b></p> <p>CDP only clears securities offered in the domestic market operated by SGX-ST. The margin is calculated based on the last done price. Unless there is a system breakdown, the price data sent to the margin system is always timely and reliable.</p> <p><b>Estimation of prices</b></p> <p>CDP does not rely on third-party pricing services for the securities. Where prices are not readily available or reliable, CDP uses the last traded price, for an outstanding position, as the trade would have been done within the past three days (T+3 settlement cycle).</p>
<p><b>Key consideration 3</b> A CCP should adopt initial margin models and parameters that are risk-based and generate margin requirements sufficient to cover its potential future exposure to participants in the interval between the last margin collection and the close out of positions following a participant default. Initial margin should meet an established single-tailed confidence level of at least 99 percent with respect to the estimated distribution of future exposure. For a CCP that calculates margin at the portfolio level, this requirement applies to</p>	<p><b>Initial margin model</b></p> <p>CDP adopts a historical volatility based margin model, using volatility of the benchmark FTSE Straits Times Index to estimate the initial margin rate. This rate is then used to determine the margin requirement of each participant's portfolio of outstanding securities trades. The potential future exposure of a participant's portfolio (for the purpose of margining) is measured as CDP's net risk exposure to that portfolio between the last mark-to-market and the point the exposure is closed out or re-novated, at a minimum of 99 percent confidence level.</p> <p>CDP may also apply margins add-on to address specific risk concerns which include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• <b>Concentration margins</b>, which may be imposed to reflect the additional price risk in the event a participant's portfolio that is highly concentrated in one or a few securities has to be liquidated;</li> <li>• <b>Specific security margin rate</b>, which may be prescribed for security if there are concerns that the trading may be unfair or disorderly; and</li> <li>• <b>Credit risk add-on</b>, which may be imposed when there are concerns about the solvency or credit-worthiness of a participant (e.g., credit downgrade), or if the tail risk in the event of a participant default is excessive</li> </ul> <p>CDP reviews the margin rate on a routine basis every month. However ad-hoc review will be triggered in the event of volatile or exceptional market conditions.</p>

<p>each portfolio's distribution of future exposure. For a CCP that calculates margin at more-granular levels, such as at the sub-portfolio level or by product, the requirement must be met for the corresponding distributions of future exposure. The model should (a) use a conservative estimate of the time horizons for the effective hedging or close out of the particular types of products cleared by the CCP (including in stressed market conditions), (b) have an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products, and (c) to the extent practicable and prudent, limit the need for destabilizing, procyclical changes.</p>	<p><b>Close-out and sample periods</b></p> <p>The liquidation horizon is described below. CDP assumes a one-day close-out period for all securities. Market liquidity is a key consideration when deciding on the one-day close-out. Empirical evidences demonstrate that closing out of positions can be done within a day.</p> <p>In line with its default management process, a participant may be considered to be in default if it fails to meet any of its payment and settlement obligations. Immediately following a default, CDP will immediately close-out the participant's proprietary positions, and transfer out each of its customers' portfolio of outstanding positions, a process known as re-novation. At the point of re-novation, the participant's contractual relationship (established for the participant's original portfolio of outstanding positions) with CDP ceased. Liquidation of a customer's positions happens only if the customer does not or is unable to settle the trades at the end of T+3.</p> <p>In 2008, CDP demonstrated that it was able to close out Lehman's portfolio of net outstanding trades swiftly after it assessed that the latter might not be able to fulfill its obligation going forward and suspended its operations. Although Lehman's was not the largest portfolio amongst the participants, the event took place during a stress period.</p> <p>CDP uses a rolling six months of historical data as the sample period to estimate the rate for the initial margin. To determine the appropriate sample period, the following are considered:</p> <ul style="list-style-type: none"> <li>• The model should be sufficiently responsive to recent volatility, but not overly reactive. A model that is overly reactive to short term market noises is destabilizing as it leads to frequent changes of margin which may in turn affect the funding stability of participants.</li> <li>• The model should be as stable (i.e., low frequency of spike in margin rate) as practically possible, but yet efficient (i.e., will not result in gross over-estimate of risk). A model that seeks to closely track and chase rising price volatility will generate margin spikes, possibly frequently. This is destabilizing and may contribute to a potential liquidity crunch for participants during stress periods and could affect limiting pro-cyclicality.</li> </ul> <p>Based on (i) and (ii) above, CDP has chosen a six-month period as this time-period is able to respond to recent volatility, without overly reacting to noises. The model also incorporates a floor on the margin rate to decrease the likelihood of significant increases in margin when volatility spikes from a low base.</p> <p>As the initial margin rate (for all securities) is primarily estimated from the FTSE</p>
---	--

	<p>Straits Times Index, historical data is available to estimate the margin requirement for newly listed securities.</p> <p><b>Pro-cyclicality and specific wrong-way risk</b></p> <p>CDP address pro-cyclicality in the margin methodology through the following:</p> <ul style="list-style-type: none"> <li>• Adopting a model that is as stable (i.e., low frequency of spike in margin rate) as practically possible, but yet efficient (i.e., will not result in gross over-estimate of risk).</li> <li>• Using a six-month sample, as opposed to a shorter period.</li> <li>• Setting a floor on the margin rate decreases the likelihood of significant increases in margin when volatility spikes from a low base.</li> </ul> <p>As part of the margin review process, CDP complements the historical-based margin model with forward-looking qualitative evaluation by constantly scanning the environment for potential market events that may warrant higher margin requirements. Given the nature of CDP's clearing activity profile, it is unlikely to lead to any credit exposure that may give rise to specific wrong-way risk.</p>
<p>Key Consideration 4</p> <p>A CCP should mark participant positions to market and collect variation margin at least daily to limit the build-up of current exposures. A CCP should have the authority and operational capacity to make intraday margin calls and payments, both scheduled and unscheduled, to participants.</p>	<p>CDP adopts a variation margin model which reduces overall credit risk in the clearing system via the following measures:</p> <ul style="list-style-type: none"> <li>• Intraday and end-of-day cycles, where positions are marked to the latest available market prices. This prevents accumulation of losses throughout the day.</li> <li>• CDP determines on a net basis, the mark-to-market profit and loss of participant's positions during each clearing cycle. Variation losses have to be collateralized, but variation gains are withheld by CDP. Intraday margin calls will be made to participants whose collateral is not sufficient to cover the variation loss. This prevents accumulation of variation margin.</li> <li>• Following a margin call, the settlement bank of a participant is required to confirm, according to strict deadlines (within an hour), that funds will be settled on the value date. Settlement banks serve as an additional layer of protection in the settlement process.</li> </ul> <p>The current exposure is measured on a participant's net exposure, based on the difference between traded and mark-to-market value of all the trades in the portfolio, as at the cut-off time for each designated clearing cycle.</p> <p>There are two clearing cycles each day, where the intraday snapshot will be at 11:30 a.m., and the end-of-day snapshot will be based on the market closing of that day. For the intraday and end-of-day cycles, margin calls will respectively be issued by 2:30 p.m. on the same day and 6:00 a.m. the following morning.</p>

	<p>CDP has the right to make and complete intraday margin calls through the powers as prescribed in its clearing rules, which participants are contractually required to comply with. In an emergency situation, CDP can make advance margin calls.</p> <p>The margin call functionality is automated. It can be triggered on a schedule basis or an ad hoc basis to determine the intraday/end-of-day margin calls for initial and variation margin. Once triggered, the system compares the collateral holdings of each member against the margin requirements of the participant. If there is a shortfall, a margin call will be issued immediately.</p>
<p>Key Consideration 5</p> <p>In calculating margin requirements, a CCP may allow offsets or reductions in required margin across products that it clears or between products that it and another CCP clear, if the risk of one product is significantly and reliably correlated with the risk of the other product. Where two or more CCPs are authorized to offer cross-margining, they must have appropriate safeguards and harmonized overall risk-management systems.</p>	<p><b>Portfolio margining</b></p> <p>CDP does not allow offsets or reductions in required margin across products that it clears or between products that it or another CCP clears. CDP does not offer cross-margining arrangement with other CCPs (including SGX-DC), nor is the required margin (of a portfolio) of different securities reduced.</p> <p><b>Potential future exposure at the portfolio level:</b> The potential future exposure of a participant's portfolio is measured as CDP's net risk exposure to that portfolio between the last mark-to-market and the point the exposure is closed out or re-novated, at a minimum of 99 percent confidence level. To cover this potential future exposure, CDP estimate the portfolio's initial margin requirement based on the product of the portfolio marginable value and the initial margin rate. The portfolio marginable value is calculated based on the higher of the aggregated buy and aggregated sell value. There is no reduction in required margin across different securities.</p> <p><b>Potential future exposure at the product level:</b> This is not applicable in the context of CDP's securities margin methodology.</p> <p><b>Cross-margining</b></p> <p>This is not applicable to CDP, as it does not offer cross-margining arrangement with other CCPs (including SGX-DC).</p> <p><b>Robustness of methodologies</b></p> <p>CDP has confirmed the robustness of its portfolio margining methodology by back testing each participant's portfolio over a period of more than four years from January 2008 to March 2012. This period covers a comprehensive list of market scenarios:</p> <ul style="list-style-type: none"> <li>• Period of stress market movement (Lehman crisis)</li> </ul>

	<ul style="list-style-type: none"> <li>• Period of exceptional event (March 2011 Japanese nuclear fallout)</li> <li>• Period of prolonged market uncertainty (European credit crisis)</li> <li>• Period of high trading value with moderate volatility</li> <li>• Period of high trading value with high volatility</li> <li>• Period of low volatility</li> </ul> <p>The back test result shows that the methodology is sufficiently robust during different market conditions for different permutations of participant's portfolio.</p>
<p>Key Consideration 6</p> <p>A CCP should analyze and monitor its model performance and overall margin coverage by conducting rigorous daily back testing—and at least monthly, and more-frequent where appropriate, sensitivity analysis. A CCP should regularly conduct an assessment of the theoretical and empirical properties of its margin model for all products it clears. In conducting sensitivity analysis of the model's coverage, a CCP should take into account a wide range of parameters and assumptions that reflect possible market conditions, including the most-volatile periods that have been experienced by the markets it serves and extreme changes in the correlations between prices.</p>	<p><b>Back testing and sensitivity analysis</b></p> <p><b>Back testing</b></p> <p>Through portfolio back testing, CDP takes into account actual portfolio effects across all securities in the participant's portfolio. CDP back tests its margin coverage by comparing the previous day's end-of-day initial margin requirement on each participant's portfolio, against the change in the mark-to-market value of that portfolio after applying the realized market movements on the next day. An exception is recorded whenever the former is less than the latter. The margin coverage is determined by evaluating this daily back test result over a one year period for each participant.</p> <p>CDP has conducted a back testing exercise on each participant's portfolio using more than four years of historical data covering a comprehensive list of market scenarios. The result shows that the margin model is able to achieve the desired coverage of at least 99 percent. Portfolio back testing is conducted on a monthly basis.</p> <p><b>Sensitivity analysis</b></p> <p>The sensitivity analysis focuses on two main sets of factors: (i) volatility of the FTSE Straits Times Index and sub-indices, and (ii) trade-value weights of the FTSE Straits Times Index and sub-indices. The first set analyzes the impact of historical and hypothetical market volatility of the three indices (FTSE Straits Times Index, Mid and Small Cap indices) on the margin rate. The second set analyzes the impact of different permutations of trade-value weights of the three indices on the margin rate.</p> <p>The sensitivity analysis is conducted on a monthly basis.</p> <p>The margin methodology was tested against a variety of conditions, including both low volatility and the highly stressed market conditions of the Lehman crisis, for different permutations of participant's portfolio, and for different trade-value weights of the FTSE Straits Times Index and key indices. The results</p>

showed that the margin methodology is sufficiently robust to continue to provide coverage at the targeted confidence level for different permutations of the key margin parameters, across diverse participants' portfolios, as well as during highly-stressed market conditions.

On an on-going basis, CDP adopts a pro-active monitoring and margin review. The daily portfolio back testing will also ensure that the model remains robust even when there are substantive market developments or changes in trading patterns. The daily stress test, which includes historical and hypothetical market conditions, ensures that the total available resources are adequate to cover the impact of stress market conditions (on participants' portfolios).

### **Margin model performance**

The potential shortcomings of the initial margin model identified are as follows:

- The model could be overly conservative, particularly for portfolios where the aggregated buy and aggregated sell are relatively balanced. Portfolio diversification effect is only partially realized because risk (margin) offset between securities are not provided in the portfolio aggregation process, although it is compensated through the use of the index as a proxy for all securities for estimating volatility.
- It may not adequately cover the risk for portfolio with heavy concentration in a few securities. Back testing over the last four years demonstrates that CDP's participant's portfolios largely do not demonstrate this profile. To mitigate this risk, CDP actively monitors each participant's exposure to ensure that risk exposures are appropriately covered by margin. Margin add-ons are imposed when required.
- A single margin rate may result in a less than equitable measurement of risk across portfolios. A single margin rate penalizes a portfolio that carries securities with low volatility, and conversely, under-estimates the risk of a portfolio comprising more volatile securities. While it has been observed that most participants' portfolio tend to be well distributed with securities of different volatility profile (hence a single margin rate would suffice), using a few margin rates may result in a more effective and efficient margin requirement. This shortcoming is proposed to be addressed in future enhancement to the margin model. Potential additional features may include allowing netting to improve the measurement of the diversification effects of the portfolio, differentiated margining so that the risks of certain groups of securities are reflected more accurately.

The source of the back testing exceedances will be evaluated to determine if a fundamental change to the margin methodology is warranted or if recalibration of the parameters is necessary.

	<p><b>Disclosure of back testing analysis:</b> Back testing results are used as part of CDP's risk management processes relating to clearing members' risk exposures. CDP may impose additional margin requirement on the specific clearing member, or work with Clearing Risk unit to increase the margin requirement. Under such circumstances, back-testing results will be used as a supporting factor for taking such actions.</p> <p><b>Disclosure of sensitivity analysis:</b> The sensitivity analysis has been incorporated into the margin review process, to help CDP understand how a change in relevant key model parameters may affect the margin rate. CDP has no intention currently to disclose the results to its participants.</p>
<p>Key Consideration 7 A CCP should regularly review and validate its margin system.</p>	<p>A review of the margining methodology is conducted annually or when there are substantive market developments or changes in trading patterns. This includes back testing as well as assessment of the continued relevance of theoretical properties. The review takes into account both historical and foreseeable future conditions, including more recent stress periods. It reviews the adequacy of the underlying model assumptions for participants' portfolio composition, risk characteristics of products, as well as changes in market structure. The impact of limitations are assessed and reviewed and recommendations made for follow-up actions.</p> <p>Under the governance arrangement, clearing risk develops the margining methodology while risk management performs independent initial validation and periodic reviews. The CRRO oversees both functions. Any revisions and adjustments of the margin methodology must be approved by the CRRO before submission to the EXCO and RMC. Minor adjustments can be approved by EXCO, with RMC and MAS kept informed. Major changes require RMC and MAS' approval.<sup>19</sup></p> <p>CDP discloses the general margin methodology and provides sufficient information for participants to independently determine their margin obligations. Results of SGX's reviews of the validation of margin methodology will be shared with MAS, where requested.</p>
<p>Key Conclusions for Principle 6</p>	<p>The margin system for securities was introduced in January 2013. CDP has a reliable source of timely price data for its margin model. The initial margin meets an established single-tailed confidence level of 99 percent. Intra-day margin calls are made. CDP analyses and monitor its model performance and</p>

<sup>19</sup> The PFMI assessment was conducted in July 2013, and was based on the 2006 Revised Edition of the SFA. With effect from August 1, 2013, amendments to the SFA such as the new authorisation regime for CCPs and the licensing regime for TRs came into effect. Under the revised SFA, CDP shall seek MAS' prior approval for any change to its margin methodology.

	overall margin coverage by conducting daily back testing and monthly, sensitivity analysis. CDP is encouraged to further fine-tune the margin model parameters based on its ongoing evaluation of the margin model's performance for a more efficient and effective margin requirement in various scenarios.
Assessment of Principle 6	Observed
Recommendations and Comments	Ongoing evaluation of the margin model performance reveals the need for further fine-tuning of the margin model parameters. CDP is encouraged to further fine tune its margining model for a more effective and efficient margin requirement in various scenarios.

### Principle 7. Liquidity Risk

An FMI should effectively measure, monitor, and manage its liquidity risk. An FMI should maintain sufficient liquid resources in all relevant currencies to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate liquidity obligation for the FMI in extreme but plausible market conditions.

Key Consideration 1 An FMI should have a robust framework to manage its liquidity risks from its participants, settlement banks, nostro agents, custodian banks, liquidity providers, and other entities.	<p>The liquidity risk management framework comprises risk identification, stress testing based measurement, monitoring of liquidity risk exposures from participants who engage in clearing and settlement activities in CDP and SGX-DC, and liquid resource management. CDP has identified that its key participants are clearing members, settlement banks, deposit-taking banks, custodian banks, clearing banks, bank liquidity providers and linked financial market intermediaries. The potential primary contributors of liquidity risks are attributed to clearing member default and settlement bank failure. CDP has a counterparty risk management framework, comprising admission criteria, daily on-going risk monitoring for each type of participant (for adverse news or potential credit downgrades), risk limits to manage risk exposure and risk concentration, and a default management process. In addition, the participants are monitored daily.</p> <p>CDP manages its liquidity risk through its liquid resources in various forms, including cash holdings and committed bank credit lines. On a quarterly basis, the risk management unit computes CDP's estimated liquidity funding requirement and communicates the results to the finance unit, based on which adjustments are made to the level of liquid resources (including committed bank credit lines and CDP's cash holdings) to be maintained.</p> <p>CDP has a clearing member and a bank counterparty limit risk frameworks.</p>
--	--

### **Clearing Member Risk Management Framework**

The risk management unit conducts daily liquidity testing of CDP clearing members and actively monitors news that could potentially affect the credit worthiness of the clearing members. CDP also monitors the daily liquidity status of its clearing members and assesses sufficiency of their liquid resources, comprising bank balances and unused credit facilities, to settle payment obligations due to CDP. Further analysis is conducted on such clearing members who may exhibit potential liquidity constraints, and CDP may request for additional collateral from the clearing members, if necessary. In addition, CDP monitors a clearing member for its financial strength such as financial resources and base capital.

In the event of a default of a clearing member, payment will be drawn on the defaulting clearing member's collateral deposited with CDP. If this is insufficient, CDP will draw-down from the CDP clearing fund in the following order:

- contributions by defaulting clearing member;
- contributions by CDP of S\$30 million in cash;
- collateralized contributions by all other non-defaulting clearing members;
- contingent contributions by all other non-defaulting clearing members; and
- contribution by CDP of another S\$30 million in cash.

Cash contribution to margins and clearing fund are kept as deposits with banks. Government securities collaterals are kept with CDP (for Singapore government securities) and custodian banks (U.S. government securities). The CDP clearing rules allow CDP to specify the timing by which clearing members' have to deposit the contingent contribution, when called. In addition, if there is a need for additional liquidity, CDP's cash holdings can be used to advance liquidity to facilitate clearing and settlement, in its role as a CCP, where judged necessary.

Currently, CDP deals in currencies that are freely-convertible, i.e., SGD, US\$, Hong Kong dollar, Australian dollar and the Chinese offshore Yuan. SGD forms the majority of its settlement currency. The estimated size of the non-SGD settlement is low.

	<p><b>Bank Counterparty Limit Framework</b></p> <p>Banks play multiple roles as settlement banks, deposit-taking banks, custodian banks, clearing banks, and liquidity providers. SGX<sup>20</sup> has a Bank Counterparty Limit Framework approved by the RMC and SGX Board. Under the Bank Counterparty Limit Framework, SGX aggregates and monitors potential risk from bank counterparties. A ceiling on exposure is set for individual bank counterparties based on their Moody's Bank Financial Strength Rating (BFSR). Furthermore, prescribed risk limits such as the ratio of exposures against the shareholders' funds of individual banks and concentration limits are established to mitigate excessive exposure to one single bank counterparty. RMC will be notified when the aggregated exposures reach the prescribed threshold.</p> <p>CDP conducts the money settlement of trade proceeds on T+3 in SGD, US\$, Hong Kong dollar, Australian dollar and the Chinese offshore Yuan between CDP and its clearing members, termed IBS. CDP also conducts money settlement in SGD and US\$ for its DVP facility. CDP conducts the money settlement of variation (mark-to-market) and margin calls on T+1.</p> <p>The nature of CDP's liquidity requirements are derived under stressed scenarios. These are identified as primary and secondary scenarios. The primary scenarios comprise default of a clearing member and an IBS settlement bank. In the secondary scenario the default of a custodian or deposit taking bank, liquidity provider bank, DVP clearing bank and clearing member default resulting from IBS settlement bank default are taken into account.</p> <p>Primary Scenarios:</p> <p>Clearing member(s) default: When a clearing member defaults and has insufficient liquid resources to meet its settlement obligations, CDP has to provide funding to cover the time needed to liquidate defaulted clearing member's positions and non-cash collateral.<sup>21</sup></p> <p>IBS Settlement Bank and centralized Bank (which applies only in the case of non-SGD settlement) default: For non-SGD settlement, funds reside briefly intraday in CDP's accounts at the settlement banks, or the centralized bank, before being transferred onwards. If the settlement bank/centralized bank defaults before onward transfer takes place, CDP will have to provide funding.</p>
--	---

<sup>20</sup> Bank Counterparty limits are applicable for both SGX-DC and CDP.

<sup>21</sup> With securities margining, the types of acceptable collateral is to be determined.

	<p>The size of the liquidity risk is low.</p> <p>For SGD settlement, money passes through CDP's accounts at the settlement banks, before being onward transferred to MEPS+ or paid to receiving clearing members. If the settlement bank defaults before onward transfer take place, CDP will have to source for funding. This scenario would be dealt by CDP under the SGX default management framework. In the event of a settlement bank default resulting in the clearing members being unable to pay CDP through that bank, alternative arrangements will be established by the affected clearing members to pay CDP for all outstanding obligations owed to CDP. Failure to fulfill the outstanding settlement obligation will be deemed as a default by clearing member and managed accordingly.</p> <p>Secondary Scenarios:</p> <p>Custodian bank or deposit-taking bank<sup>22</sup> default: CDP will require liquidity to facilitate withdrawals in the situation where a clearing member requests to withdraw their excess cash collateral and the withdrawal amount exceeds the pool of cash held with non-defaulting banks. The steps under SGX default management framework would be activated.</p> <p>Bank liquidity provider default: SGX secures committed bank credit lines from banks to meet estimated liquidity requirements in an event of a participant's default. The liquidity risk arising from a bank liquidity provider default is managed through stringent admission criteria, ongoing credit monitoring and diversification through securing credit lines from multiple banks. CDP's risk from banks in their roles as bank liquidity providers on a day-to-day basis is small since they only provide contingent funding when other participants fail to fulfill their obligations (i.e., a simultaneous default).</p> <p>DVP clearing bank default: The likelihood of a liquidity risk for CDP is relatively low as in most cases it takes a double default to affect CDP, i.e., the DVP settlement bank and clearing bank have to default at the same time, before CDP steps in to manage the situation with its own liquid resources.</p> <p>Clearing member default resulting from IBS settlement bank default: If the settlement bank / Centralized bank defaults before payment finality, the clearing member would have to make funding available through other means. As this may create liquidity stress on the clearing member, CDP will closely</p>
--	---

<sup>22</sup> Deposit-Taking Banks refers to banks with whom SGX keeps its own cash deposits, including cash collaterals collected by SGX-DC and CDP from their members.

monitor the situation. The situation will be dealt with as outlined in the Clearing Member Risk Management Framework.

### **Size of Liquidity Requirements**

The liquidity risk associated with each type of counterparty (clearing member/ settlement bank, etc.) will be sized before aggregation. The finance unit will then size and arrange funding through acceptable liquid resources to meet obligations. The size of the liquidity needs is determined by various internal policies and procedures.

Managing clearing member default: CDP conducts daily stress testing of its clearing members with escalation procedures in place to ensure adequacy of the clearing fund size. CDP also conducts liquidity stress testing of its clearing members and monitors the liquidity adequacy daily.

In addition to the daily monitoring, CDP reviews its liquidity requirement quarterly. The liquidity requirement is sized to cover the daily liquidity stress testing at a high confidence level (of at least 99 percent) over the past 12 months. In the event of any exceptions encountered during the daily liquidity stress testing, CDP will assess and consider the need to take mitigating actions such as increasing the amount of liquid resources. The sizing covers a default of a clearing member and its affiliates that create the largest aggregate liquidity need and two financially weakest members. It estimates the funding CDP requires to make payments to non-defaulting members, as well as to settle with the direct customers of the defaulted member under re-novation, over the three day settlement cycle.

Managing settlement bank/centralized bank default: As indicated above, active monitoring and management of settlement bank exposures minimize the liquidity risk faced by CDP in a settlement bank/centralized bank default. The liquidity needs for a settlement bank/centralized bank default are limited by the risk parameters laid down.

Managing custodian bank or deposit-taking bank default: The size of liquidity requirement in the case of a deposit-taking Bank default will be the lower of CDP's cash holding with the bank and the total excess cash collateral held by CDP (as this determines the maximum withdrawal that can be made by clearing members). Custodian bank holds non-cash assets and a default is unlikely to trigger any liquidity requirements for CDP.

Managing bank liquidity provider default: If a bank liquidity provider defaults, CDP will arrange for alternative funding from other liquidity providers to replace the potential liquidity lost due to default by a liquidity provider.

	<p>Managing DVP clearing bank default: The likelihood of CDP needing liquidity is low as it would take the default of a settlement bank and the clearing bank before CDP is affected. In the event a double default occurs, funding may be required for the net DVP payment by settlement bank. CDP will draw-down on its committed bank lines to meet its settlement obligations.</p> <p>Managing clearing member default resulting from IBS settlement bank default: This is handled under the management of a clearing member default (see above).</p> <p><b>Potential aggregate liquidity risk</b></p> <p>An entity and its affiliates may play multiple roles with respect to CDP. As an example, a bank and its affiliates may have the following roles with respect to CDP:</p> <ul style="list-style-type: none"> <li>• CDP clearing member</li> <li>• Subsidiary of Bank of CDP clearing member</li> <li>• CDP IBS and DVP settlement bank</li> <li>• IBS centralized bank</li> <li>• Custodian bank or deposit-taking banks</li> <li>• Bank liquidity provider</li> </ul> <p>The risk of a participant who plays multiple roles are monitored individually in its respective role and reported at an aggregated level on a daily basis.</p>
<p>Key Consideration 2</p> <p>An FMI should have effective operational and analytical tools to identify, measure, and monitor its settlement and funding flows on an ongoing and timely basis, including its use of intraday liquidity.</p>	<p><b>Identification, measuring, and monitoring settlement and funding flows</b></p> <p>The tools and processes in place to identify, manage and monitor settlement and funding flows are as follows:</p> <ul style="list-style-type: none"> <li>• verification of settlement reports, banking instructions and bank confirmations;</li> <li>• operational arrangements between CDP and Settlement Banks to do bank confirmation;</li> <li>• MAS' MEPS+ website and internet banking portals for confirmation of credit.</li> </ul> <p>On a daily basis, the operations unit conducts a thorough verification and authorization of the accuracy of settlement reports, which shows the amounts due to and from each clearing member and settlement bank. The operations unit also verifies banking instructions and checks for bank confirmations. The risk management unit also monitors clearing members' daily obligations to settle trade proceeds on T+3 against clearing members' available liquid resources. The risk management unit highlights any exceptions, as well as any</p>

	<p>clearing member payments exceeding pre-determined threshold to the operations unit for close monitoring.</p> <p>For margin calls, settlement banks are required to confirm within an hour of margin call instructions that the margin calls will be settled on value date. Once such confirmation is made, the settlement bank is obliged to meet the margin call to CDP under the contractual agreement between CDP and the settlement banks. This allows CDP to be alerted by the settlement bank and/or clearing member, within an hour of margin call issuance, of any potential funding difficulty. If a negative confirmation is received, it sets off a series of escalation procedures in line with each unit's default management SOPs.</p> <p>The securities trading and clearing unit monitors incoming funds in CDP's MEPS+ account and settlement accounts daily. Prior to 3:30 p.m., the securities trading and clearing unit will log on to MAS' MEPS+ website and each settlement bank's individual internet banking website to check that payments for all currencies are credited to the different currency settlement accounts with each settlement bank.</p> <p>Concurrently, reconciliation against SWIFT confirmation of credit advice from settlement banks is performed. If there is any concern, the internal escalation and default management procedures for the timely deployment of liquid resources maintained by CDP to manage the liquidity risk are initiated.</p>
<p>Key Consideration 3</p> <p>A payment system or SSS, including one employing a DNS mechanism, should maintain sufficient liquid resources in all relevant currencies to effect same-day settlement, and where appropriate intraday or multiday settlement, of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the</p>	<p>The DVP settlement mechanism that CDP provides for securities settlement presents little or no liquidity risk to CDP. Under the DVP mechanism, depository agents settle direct with CDP. Payment is guaranteed by a DVP settlement bank, whose obligation is guaranteed by the DVP clearing bank, a second tier of guarantee for CDP. CDP will only bear liquidity risk if both the settlement bank and the clearing bank default at the same time.</p> <p>Since the occurrence would be rare, no estimation of liquidity shortfall is required.</p>

<p>default of the participant and its affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions.</p>	
<p>Key Consideration 4</p> <p>A CCP should maintain sufficient liquid resources in all relevant currencies to settle securities-related payments, make required variation margin payments, and meet other payment obligations on time with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should consider maintaining additional liquidity resources</p>	<p><b>Sufficient liquid resources</b></p> <p>The process of estimating the size of the minimum liquidity is conducted via the liquidity assessment as indicated in Key Consideration 1 (size of liquidity requirements). The potential stress scenarios used are described in the same section. The estimation process established in accordance with the liquidity risk management framework. Settlements in currencies other than SGD are insignificant. CDP estimates the amount of liquidity needs in the event of a default by the clearing member and its affiliates with the largest liquidity needs and the two financially weakest clearing members on a quarterly basis. The estimation takes into consideration CDP's re-novation role, i.e., taking over defaulted clearing members' obligations with direct customers.</p> <p>Estimation of liquidity need for US\$ is not critical as the committed bank credit lines can be drawn down in multi-currencies, such as, SGD and US\$, which are the main settlement currencies for CDP. Considering that Singapore is amongst the top five international financial centers for foreign exchange, SGD can be readily converted or swapped into US\$, a G3 currency, with ease.</p> <p>CDP has never had to draw on its clearing fund or credit lines for the purpose of managing a default by participants. CDP's liquidity need is adequately covered by CDP's clearing fund and SGX's committed credit lines.</p> <p><b>Risk profile and systemic importance in multiple jurisdictions</b></p> <p>This question is not applicable for CDP. CDP is not considered a systemically important financial institution beyond Singapore, and does not clear complex products such as credit default swaps (CDS). It also does not operate in multiple jurisdictions.</p>

<p>sufficient to cover a wider range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions.</p>	
<p>Key Consideration 5</p> <p>For the purpose of meeting its minimum liquid resource requirement, an FMI's qualifying liquid resources in each currency include cash at the central bank of issue and at creditworthy commercial banks, committed lines of credit, committed foreign exchange swaps, and committed repos, as well as highly marketable collateral held in custody and investments that are readily available and convertible into cash with prearranged and highly reliable funding arrangements, even in extreme but plausible market conditions. If an FMI has access to routine credit at the central bank of issue,</p>	<p><b>Composition of qualifying liquid resources</b></p> <p>The available liquid resources include: Cash margin collateral; CDP clearing fund contributions by CDP and Clearing Members; Committed bank credit lines. Upon default of a clearing member, payment will be drawn from the defaulting clearing member's margin collateral deposited with CDP and if the collaterals are insufficient to meet the settlement obligation, the CDP clearing fund will be drawn down in the following order:</p> <ul style="list-style-type: none"> <li>• contributions by defaulting members;</li> <li>• contributions by CDP of S\$30 million in cash;</li> <li>• collateralized contributions by all other non-defaulting members;</li> <li>• contingent contributions by all other non-defaulting members (a form of supplemental resource); and</li> <li>• contribution by CDP of another S\$30 million in the final layer. If there is a need for additional liquidity, CDP's cash holdings would be used to advance liquidity to facilitate clearing and settlement, in its role as a CCP, where judged necessary. Currently, CDP deals in currencies that are freely-convertible, i.e., SGD, US\$, Hong Kong dollar, Australian dollar and the Chinese offshore Yuan. SGD forms the majority of its settlement currency. The estimated size of the non-SGD settlement is low.</li> </ul> <p>The liquid resources would be available in time for CDP to facilitate timely settlement as cash can be withdrawn from the bank for same day value, if instructions are provided within the customary notice period of 12 noon–2:00 p.m. The committed bank credit lines are available for drawdown in multi-currencies. The bank credit lines (in SGD or US\$) can be drawn down for value same day if the loan drawdown notice is given to the bank by 4:00 p.m. for SGD or US\$, and by 11:15 a.m. for the Chinese offshore Yuan. For other currencies, CDP may draw down on the lines in SGD or US\$ and convert to the</p>

<p>the FMI may count such access as part of the minimum requirement to the extent it has collateral that is eligible for pledging to (or for conducting other appropriate forms of transactions with) the relevant central bank. All such resources should be available when needed.</p>	<p>required currency for clearing and settlement.</p> <p><b>Availability and coverage of qualifying liquid resources</b></p> <p>The process of estimating the size of the minimum liquidity requirement is done through the liquidity assessment framework as indicated in Key Consideration 1. The size of the available aggregate liquid resources can cover CDP's liquidity requirement to-date.</p> <p>For diversification purpose, the committed bank credit lines are currently provided by four banks which are financially sound and meet SGX's admission and ongoing criteria. CDP also tests, annually, its procedures to drawdown on the committed bank credit lines.</p> <p>MAS provides a standing facility, allowing CDP to repo Singapore government securities and other eligible collateral with MAS for overnight SGD funding.</p>
<p>Key Consideration 6</p> <p>An FMI may supplement its qualifying liquid resources with other forms of liquid resources. If the FMI does so, then these liquid resources should be in the form of assets that are likely to be saleable or acceptable as collateral for lines of credit, swaps, or repos on an ad hoc basis following a default, even if this cannot be reliably prearranged or guaranteed in extreme market conditions. Even if an FMI does not have access to routine central bank credit, it should still take account of what collateral is typically accepted by the relevant central bank, as such assets</p>	<p><b>Composition of supplemental liquid resources</b></p> <p>To cover the liquidity needs for defaults involving Australian and Hong Kong dollar securities trades, CDP would draw down the committed bank credit lines in US\$/SGD and do a FX conversion or swap to Australian or Hong Kong dollar in the market. The foreign exchange swaps are not committed for Australian and Hong Kong dollar as the potential risk exposure is low because the estimated amounts required by CDP are insignificant, relative to the size of the FX market in Asia. The required FX conversion amount is expected to be small. Furthermore, a portion of clearing members' contribution to the CDP clearing fund is made up of contingent contributions. As at February 2013, this amount is equivalent to about 22 percent of the CDP clearing fund.</p> <p><b>Availability of supplemental liquid resources</b></p> <p>CDP does not expect difficulty in converting SGD or US\$ loan proceeds to raise sufficient Australian or Hong Kong dollar amounts to meet default liquidity needs as the FX conversion amounts are low relative to the overall daily FX market.</p> <p>With regards to the contingent contributions, the requirement for non-defaulting clearing members to deposit contingent contributions to CDP when called upon is an obligation that they have to meet during in an event of a default of a clearing member. In addition, the acceptable collateral for such obligation is met in either cash or government securities, which are liquid assets. Nonetheless, the amount of supplemental liquid resources is excluded from Risk Management unit's computation of estimated liquidity funding requirement for determination of the amount of credit lines required.</p>

<p>may be more likely to be liquid in stressed circumstances. An FMI should not assume the availability of emergency central bank credit as a part of its liquidity plan.</p>	<p>CDP does not own supplemental assets. Both qualifying liquid resources and supplemental liquid resources will be used at the same time to meet the liquidity needs, when a participant defaults, for timely settlement of obligations in the various currencies. Based on the periodic stress test results, an adequate amount of supplemental and qualifying liquid resources is determined to cover the total liquidity needs. As indicated above, the required amount of the supplemental liquid resources is small.</p>
<p><b>Key Consideration 7</b></p> <p>An FMI should obtain a high degree of confidence, through rigorous due diligence, that each provider of its minimum required qualifying liquid resources, whether a participant of the FMI or an external party, has sufficient information to understand and to manage its associated liquidity risks, and that it has the capacity to perform as required under its commitment. Where relevant to assessing a liquidity provider's performance reliability with respect to a particular currency, a liquidity provider's potential access to credit from the central bank of issue may be taken into account. An FMI should regularly test its procedures for accessing its liquid resources at a liquidity provider.</p>	<p><b>Use of liquidity providers</b></p> <p>The four banks which provide the committed bank credit lines (i.e., bank liquidity providers) are MAS-licensed and regulated banks who are obligated to understand their commitment in accordance with the commercial loan agreements construed in accordance with the laws of Singapore. All of the banks are established global banks or strong local banks and CDP conducts annual loan drawdown testing to ensure the lines of credit are available when drawn.</p> <p><b>Reliability of liquidity providers</b></p> <p>The credit lines extended to CDP by each bank liquidity provider, are small in comparison with the size of their respective balance sheets. As such CDP does not anticipate that these banks would not provide liquidity in times of need. Additionally, CDP has diversified its funding sources with credit lines from four commercial banks. The clearing members' capacity to discharge their obligations to CDP is also monitored as part of CDP's daily risk monitoring processes.</p> <p>CDP takes into account a liquidity provider's ability to access credit at central bank of issue, which is a major consideration when selecting banks as liquidity providers, in addition to other stringent bank counterparty admission criteria. The major settlement currency for CDP is SGD. The other settlement currencies are US\$, AUD, HKD and CNH.</p>

<p>Key Consideration 8</p> <p>An FMI with access to central bank accounts, payment services, or securities services should use these services, where practical, to enhance its management of liquidity risk.</p>	<p>CDP has a MEPS+ account from which SGD is received to and paid to settlement banks. For the US\$, Hong Kong dollar, Australian dollar and the Chinese offshore Yuan, CDP uses commercial banks (centralized banks) for the settlement.</p> <p>In addition, MAS provides a Standing Facility, allowing CDP to repo Singapore government securities and other eligible collateral with MAS for overnight SGD funding.</p> <p>In market conditions where there is systemic financial risk, CDP is able to, and may consider moving as much as practicable, Singapore dollar funds to its MEPS+ account with MAS as safety of the funds is an important consideration.</p>
<p>Key Consideration 9</p> <p>An FMI should determine the amount and regularly test the sufficiency of its liquid resources through rigorous stress testing. An FMI should have clear procedures to report the results of its stress tests to appropriate decision makers at the FMI and to use these results to evaluate the adequacy of and adjust its liquidity risk-management framework. In conducting stress testing, an FMI should consider a wide range of relevant scenarios. Scenarios should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and</p>	<p><b>Stress-testing program</b></p> <p>CDP conducts daily credit stress testing of its clearing members to ensure adequacy of the clearing fund size. CDP also performs daily liquidity stress testing to assess whether a review of liquidity funding requirement should be conducted ahead of the scheduled quarterly reviews. On a quarterly basis, the Risk Management unit conducts the liquidity assessment exercise. The assessment is reviewed and approved by the Head of Risk Management and CRRO. The results of the liquidity assessment are reported to CFO who will then ensure liquid resources are available to meet the liquidity requirement in a default. The CEO will be kept informed if needed.</p> <p><b>Stress-testing scenarios</b></p> <p>The stress testing is performed daily and takes into account that upon a clearing member's default, settlement is no longer on a net basis but takes place with individual customers. It also provides for the liquidity need to be borne by CDP.</p> <p>As indicated above, an entity and its affiliates may play multiple roles with respect to CDP. The risk exposure of a participant who plays multiple roles is monitored individually in its respective role and on an aggregated basis daily. Daily aggregate monitoring has been introduced from July 15, 2013.</p> <p>Daily calculation of the aggregated liquidity exposure to banks, which plays multiple roles in the clearing process, is done based on a value at risk (VAR) methodology with 99 percentile confidence level. The daily worst bank exposure (WBE) is collected over a rolling period of one year. The exposure for a bank participant is aggregated across its multi-roles and stress tested under three scenarios daily. This is performed for all the bank participants. The daily worst aggregated liquidity exposure is then calculated as the maximum loss among all the banks on a daily basis. The liquidity need is the third largest WBE (i.e., 99 percentile confidence level) over a one year period. This process is</p>

<p>a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions. Scenarios should also take into account the design and operation of the FMI, include all entities that might pose material liquidity risks to the FMI (such as settlement banks, nostro agents, custodian banks, liquidity providers, and linked FMIs), and where appropriate, cover a multiday period. In all cases, an FMI should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount and form of total liquid resources it maintains.</p>	<p>performed at clearing house level (i.e., CDP and SGX-DC), as well as at SGX level.</p> <p>1. Liquidity drivers for CDP and SGX-DC are identified</p> <table border="1"> <thead> <tr> <th>Clearing House</th> <th>Clearing Member (CM)</th> <th>Settlement Bank (SB)</th> <th>Deposit-taking Bank (DB)</th> <th>Bank Liquidity Provider (BLP)</th> </tr> </thead> <tbody> <tr> <td>CDP</td> <td>Default Re-novation</td> <td>Margin calls Settlement obligations</td> <td>Participants withdrawal of excess collateral</td> <td>Credit lines</td> </tr> <tr> <td>SGX-DC</td> <td>Default</td> <td>Margin calls</td> <td>Participants withdrawal of excess collateral</td> <td>Credit lines</td> </tr> </tbody> </table> <p>2. Liquidity requirement conservatively sized to cover the worst exposure based on at least 99 percent over one year</p> <p><b>Review and validation</b></p> <p>Liquidity back-testing is conducted daily. On a quarterly basis, CDP will review the adequacy of the stress-based liquidity requirements methodology. Model validation is conducted in the context of the model's intended use and takes into account both historical experience and foreseeable future conditions. The liquidity stress testing model captures material changes to members' customer spread and lessons from regular default management reviews and fire-drills. Validation is conducted annually.</p>	Clearing House	Clearing Member (CM)	Settlement Bank (SB)	Deposit-taking Bank (DB)	Bank Liquidity Provider (BLP)	CDP	Default Re-novation	Margin calls Settlement obligations	Participants withdrawal of excess collateral	Credit lines	SGX-DC	Default	Margin calls	Participants withdrawal of excess collateral	Credit lines
Clearing House	Clearing Member (CM)	Settlement Bank (SB)	Deposit-taking Bank (DB)	Bank Liquidity Provider (BLP)												
CDP	Default Re-novation	Margin calls Settlement obligations	Participants withdrawal of excess collateral	Credit lines												
SGX-DC	Default	Margin calls	Participants withdrawal of excess collateral	Credit lines												
<p><b>Key Consideration 10</b></p> <p>An FMI should establish explicit rules and procedures that enable the FMI to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations on time following any individual or combined default among its participants. These rules and procedures should address unforeseen and</p>	<p><b>Same-day settlement</b></p> <p>CDP has rules and procedures in place to settle its payment obligations on time during a default. CDP Clearing Rule 6.10 allows CDP to call for margins or additional funds from clearing members to effect payment on time.</p> <p>In addition, upon an event of financial default, CDP may take risk mitigating actions such as restricting the trading and clearing activities of the affected clearing member, using CDP's financial resources to meet continuing settlement obligations, liquidating open positions, permitting the clearing member to perform its settlement activities through appropriate alternative means, such as using data, premises, access to existing systems of CDP, redirecting the movement of monies, providing manual banking instructions, extending the settlement timings, etc.</p>															

<p>potentially uncovered liquidity shortfalls and should aim to avoid unwinding, revoking, or delaying the same-day settlement of payment obligations. These rules and procedures should also indicate the FMI's process to replenish any liquidity resources it may employ during a stress event, so that it can continue to operate in a safe and sound manner.</p>	<p>All CDP clearing members are required to place margins for their outstanding contracts with CDP. Collateral held with CDP serves as the first line of defense, as the value of collateral held as margin is sufficient to cover the expected financial losses under normal market conditions. For SGD settlement, in the event that liquidity providers are alerted after the agreed drawdown notice cut-off timing and are unable to extend the required SGD loan to us, CDP will consult with MAS to seek assistance to facilitate timely settlement.</p> <p><b>Replenishment of liquidity resources</b></p> <p>For a clearing member default, any losses would be met by collaterals of the defaulted clearing member and the CDP clearing fund. The CDP clearing rules 7.10.2 and 7.10.3 allow for replenishment of the CDP clearing fund when it has been used. For a Settlement Bank default, committed bank credit lines will be utilized to manage settlement and withdrawals, until the recovery of funds.</p>
<p>Key Conclusions for Principle 7</p>	<p>CDP has a risk management framework to manage liquidity risk from its participants, settlement banks, clearing banks, custodian banks, liquidity providers, and deposit-keeping banks. Stress testing is carried out by CDP to determine the amount and sufficiency of its liquid resources. CDP has liquid resources available which are deemed adequate to cover the default of the single largest participant (and its affiliates) and the two financially weakest members. The risk exposure of a participant who plays multiple roles is monitored individually in its respective role and on an aggregated basis daily. Aggregate monitoring has been introduced from July 15, 2013.</p>
<p>Assessment of Principle 7</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>The assumption of availability of FX markets should be challenged as part of one of the scenarios of the recovery plan.</p>

### Principle 8. Settlement Finality

An FMI should provide clear and certain final settlement, at a minimum by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intraday or in real time.

<p>Key Consideration 1</p> <p>An FMI's rules and procedures should clearly define the point at which settlement is</p>	<p><b>Point of settlement finality</b></p> <p>CDP handles three types of money and securities settlement:</p> <ul style="list-style-type: none"> <li>• IBS,</li> <li>• DVP,<sup>23</sup> and</li> </ul>
--	---

<sup>23</sup> The settlement arrangement for institutional investors in CDP, without intermediation of a broker, is called DVP settlement, not to be confused with the internationally used concept of delivery versus

(continued)

final.	<ul style="list-style-type: none"> <li>• Securities Margining.</li> </ul> <p><b>IBS:</b> Finality of securities settlement and money settlement occur at different times on settlement date (T+3). Securities settlement becomes final when the securities are either credited to or debited from the clearing member’s clearing account at the end-of-day batch cycle on T+3 (<i>CDP clearing rules 6.5.1 and 6.5.2</i>). Funds settlement happens when CDP conducts the funds settlement with its clearing members through their appointed settlement banks (SBs) via electronic fund transfer on T+3. CDP will receive funds due from clearing members into CDP’s account with the SBs by 3:30 p.m. and will pay outflows due to clearing members from CDP’s account by 4:30 p.m. Payment is final when funds are received in the intended recipient’s account with the SBs on T+3 (<i>CDP clearing rules 6.3.1</i>).</p> <p><b>DVP:</b> Finality of securities settlement and money settlement occur at different times on settlement date (T+3). Securities settlement becomes final when the securities are either credited to or debited from the principal’s securities account or sub-account at the end-of-day batch cycle on T+3 (<i>DVP rules 3.2.5</i>). Funds settlement takes place when CDP sends transfer instructions via electronic fund transfer on T+3 to the DVP SBs. CDP will receive money inflows due from principals and depository agents into CDP’s account with the DVP SBs by 3.30 p.m. and will pay outflows due to principals and depository agents from CDP’s account by 4.30 p.m. Payment is final when funds are received in the intended recipient’s account with the DVP SBs on T+3 (<i>DVP rules 8.3.5 and 8.3.6</i>).</p> <p><b>Securities Margining:</b> Margin payments are made through appointed SBs and final upon confirmation by the SBs of the relevant payment instructions.</p> <p>The points of settlement finality are defined in the CDP clearing rules, DVP rules and Companies Act respectively, which are publicly available online.</p> <p><b>Finality in the case of links</b></p> <p>Not applicable.</p>
Key Consideration 2 An FMI should complete final settlement no later than the end of the	<p><b>Final settlement on the value date</b></p> <p>CDP’s processes and operations are designed to provide final settlement on the value date (T+3).</p>

payment in FMIs that describes the securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.

<p>value date, and preferably intraday or in real time, to reduce settlement risk. An LVPS or SSS should consider adopting RTGS or multiple-batch processing during the settlement day.</p>	<p><b>For IBS and DVP:</b> In respect of each novated contract, final settlement is defined in the CDP clearing rules and DVP rules as the point when money and securities are to be received by the intended recipients on T+3. In respect of buying-in transactions due to a shortfall in securities account during the pre-settlement run on T+3, money settlement of these transactions is the next market day after the buying-in date and securities settlement remains on the originally scheduled T+3 cycle. Money settlement is final when monies are received in CDP's account on the value day (i.e., next market day) whereas securities settlement is final when the securities are debited from the selling investor's securities account or the selling clearing member's securities account on value date (i.e., same day that buying-in is conducted).</p> <p><b>For Securities Margining:</b> In respect of each margin call or request for withdrawal of excess cash margin, a report which provides for a value date of the same day as the margin call or request for withdrawal is generated. Subsequent to receiving the margin call, SBs of clearing members would be required to confirm payment instructions within the next hour. Upon SB's confirmation, the final settlement on the value date is considered complete. Any changes to this process will be communicated to clearing members via circulars.</p> <p>CDP has not experienced deferral of final settlement to the next business day.</p> <p><b>Intraday or real-time final settlement</b></p> <p><b>For IBS and DVP:</b> CDP has a scheduled pre-settlement run at 12 noon to irrevocably earmark securities. CDP informs its clearing members and DVP participants of final settlement balances online, in real time upon the completion of the pre-settlement run. If the participant has insufficient securities at the cut-off time at 12 noon, CDP would conduct buying-in on the same day. If in the event that the clearing member has insufficient funds at money settlement cut-off time at 3:30 p.m. on T+3 (i.e., SBs are not able to provide confirmation that the clearing member is able to meet its financial obligations to CDP), CDP may declare a default on that clearing member and the circumstance will be managed under the default management procedures. An end-of-day run is conducted to effect final securities settlement.</p> <p><b>For securities margining:</b> CDP runs two daily margin cycles to determine margin requirements for unsettled trades. At the end of these cycles, margin calls will be made if there is a shortfall of collaterals. CDP provides intraday settlement through its margin cycle at 12 noon where margin calls are issued to clearing members. Settlement for intraday margin call is final upon confirmation given by the respective SBs on the same day. In the event that a</p>
---	--

	clearing member does not have enough funds at the settlement time (i.e., SBs are not able to provide confirmation), and hence is unable to meet its financial obligations to CDP, CDP may declare a default on that clearing member and the circumstance will be managed under the default management procedures.
Key Consideration 3 An FMI should clearly define the point after which unsettled payments, transfer instructions, or other obligations may not be revoked by a participant.	<p><b>For IBS and securities margining:</b> The CDP clearing rules and LOUs provide that once SBs provide confirmation notice to CDP on the money settlement, the payment instruction will become irrevocable and the SBs will be obliged to carry out that instruction. The CDP clearing rules and LOU provide that a payment instruction (whether to pay CDP or to pay the clearing member) become irrevocable once SBs provide confirmation notice to CDP on the money settlement. As such, the payment instruction can be revoked by CDP before SBs serves the confirmation notice. CDP can revoke by sending out a subsequent instruction to override the original instruction before the SB gives a confirmation. The detailed process is set out in the LOU undertaken by the SB to CDP.</p> <p><b>For DVP:</b> CDP, clearing members, depository agents, and principals cannot revise DVP instructions after the pre-settlement run commences at 12 noon. They also cannot unilaterally revoke accepted and unsettled obligations in terms of <i>DVP rules 6.1.1</i>. CDP, clearing members and DVP participants may revoke accepted and unsettled obligations before the pre-settlement run commences at 12 noon on T+3, if mutually agreed with the counterparty.</p>
Key Conclusions for Principle 8	CDP's rules and regulations provide for final settlement of securities and funds on the value date. The final inter-bank settlement of funds takes place through MEPS+ at 4:30 p.m. The securities are earmarked or blocked in the securities account at 12 noon with delivery happening during the batch processing cycle for securities which starts at 8 p.m. This time lag has the potential to create settlement risks. It is recommended that the settlement lag for securities settlement be reduced to avoid this possibility.
Assessment of Principle 8	Observed
Recommendations and Comments	It is recommended that the time lag between earmarking of securities and delivery be reduced further to minimize settlement risks.

### Principle 9. Money Settlements

An FMI should conduct its money settlements in central bank money where practical and available. If central bank money is not used, an FMI should minimize and strictly control the credit and liquidity risks arising from the use of commercial bank money.

<p>Key Consideration 1</p> <p>An FMI should conduct its money settlements in central bank money, where practical and available, to avoid credit and liquidity risks.</p>	<p>CDP conducts money settlement according to the three types of settlement:</p> <ul style="list-style-type: none"> <li>• IBS,</li> <li>• DVP,<sup>24</sup> and</li> <li>• Securities Margining</li> </ul> <p><b>IBS:</b> On each settlement day, the IBS payments due from and to a clearing member are netted. Instructions are sent by CDP to the clearing member's SB. SBs confirm CDP's instructions within an hour of receiving such instructions. Each SB will then consolidate the net balance of payments and receipts for all of its clearing members and execute payments. The SBs, acting on behalf of clearing members, are required to ensure that clearing members' obligations are paid to CDP's settlement account in the SB by 3.30 p.m. and transferred to CDP's MEPS+ account with the central bank immediately after such payment the latest of which will occur by 3.30 p.m. Thereafter, CDP will transfer funds from CDP's MEPS+ account with the central bank to its account with each SB and then pay each clearing member through its account in the SB. The inter-bank (SB) settlement happens in MEPS+ in central bank money.</p> <p>For foreign currencies (US\$, Hong Kong dollar, Australian dollar and the Chinese offshore Yuan), CDP has no access to foreign central bank payment systems. Therefore, it uses two of the six appointed SBs to perform the function of centralized payment agent. All foreign currency money settlement follows the same process and timings save that CDP's MEPS+ account will be replaced by CDP's centralized accounts with the centralized banks.</p> <p><b>DVP:</b> Similar to IBS, DVP payments due from and to depository agents are netted. Instructions are sent by CDP to the depository agent's DVP SB who guarantees payments to CDP. Each DVP SB will then consolidate the net balance of payments and receipts for all of its depository agents and execute payments. For SGD DVP, payments from depository agents through their DVP</p>
--	--

<sup>24</sup> The settlement arrangement for institutional investors in CDP, without intermediation of a broker, is called DVP settlement, not to be confused with the internationally used concept of delivery versus payment in FMIs that describes the securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.

	<p>SBs are routed to CDP's account in the MAS MEPS+. The DVP SBs, who guarantee and act for the principals, are required to ensure that their depository agents' obligations are paid to CDP's settlement account in the DVP SB by 3.30 p.m. and transferred to CDP's MEPS+ account with the central bank immediately after such payment the latest of which will occur by 3.30 p.m. Thereafter, CDP will transfer funds from CDP's MEPS+ account with the central bank to its account with each DVP SB and then pay each depository agent through its account in the DVP SB.</p> <p>For US\$ DVP, CDP has no access to the Federal Reserve payment system. Therefore, it uses one of six appointed SBs to perform the function of centralized payment agent. USD DVP money settlement follows the same process and timings save that CDP's MEPS+ account will be replaced by CDP's centralized account with the SB performing the function of centralized payment agent.</p> <p><b>Securities Margining:</b> There are two types of margin related payments: margin calls to be paid by clearing members and withdrawals of excess collaterals to be paid to clearing members. Margins are settled in SGD and US\$. CDP maintains trust accounts with SBs for securities margining purpose. At each margin cycle, should a margin call be made, an instruction is sent by CDP to the clearing member's SB to debit the clearing member's account and to credit CDP's trust account held with the same SB. SBs undertake to confirm CDP's instructions within an hour of receiving such instructions. Securities margining involves only incremental movements of funds between CDP and a clearing member.</p>
<p>Key Consideration 2</p> <p>If central bank money is not used, an FMI should conduct its money settlements using a settlement asset with little or no credit or liquidity risk.</p>	<p>As there is a need to settle in commercial bank money, CDP ensures that it only admits commercial banks that meet the stringent credit criteria as SBs. They comprise strong global and local banks which are well-capitalized. These SBs are licensed and closely supervised by the MAS under the Banking Act. Moreover, CDP ensures that concentration risk from the use of commercial bank money is minimized by diversifying its risk over six SBs, which are among the largest global and local banks, and setting concentration risk limits for these SBs.</p> <p>The currencies used by CDP in settlement are fully convertible and liquid. In addition, CDP maintains committed bank lines which are available for drawdown in multi-currencies. CDP's own cash can also be used to meet additional liquidity requirements for clearing and settlement, if required. All these ensure that liquidity risk arising from using commercial bank moneys are adequately mitigated.</p>

<p>Key Consideration 3</p> <p>If an FMI settles in commercial bank money, it should monitor, manage, and limit its credit and liquidity risks arising from the commercial settlement banks. In particular, an FMI should establish and monitor adherence to strict criteria for its settlement banks that take account of, among other things, their regulation and supervision, creditworthiness, capitalization, access to liquidity, and operational reliability. An FMI should also monitor and manage the concentration of credit and liquidity exposures to its commercial settlement banks.</p>	<p>As indicated above all SBs (including the clearing bank) should meet CDP's requirement of having a minimum C rating on its financial strength from Moody's which demonstrates adequate intrinsic safety and soundness of the bank. The risk management unit and securities clearing unit monitor the market closely for any adverse news or credit rating downgrades of SBs, which may lead to degradation of the SBs' creditworthiness, capitalization, access to liquidity or operational reliability. CDP would take prompt actions such as minimizing risk exposures and reducing limits for the affected SB, as necessary.</p> <p>CDP has diversified the credit and liquidity risks of commercial SBs by using six SBs. A ceiling on limit is set for individual bank counterparties based on their credit rating. Also, to mitigate CDP's risks to the banks, the total exposure as a percentage of shareholders' funds of individual banks cannot exceed a prescribed threshold. In addition, concentration limits are established to mitigate CDP's exposure to any single bank counterparty. Second, CDP's exposure to each SB is monitored on an ongoing basis to ensure that the prescribed exposure and concentration limits are not exceeded. Third, CDP also monitors the market closely for any adverse news or developments relating to all its bank counterparties. Fourth, at times when the management deems an SB to be a credit concern or potential default risk, CDP will instruct the SB to immediately sweep funds out of CDP's account to minimize any routing risk. Fifth, CDP has the further ability to take pre-emptive risk-elimination actions by changing the accounts involved in the intra-day routing process. In the first instance, CDP can change its instructions to the SB to route payments to a destination account with another SB.</p>
<p>Key Consideration 4</p> <p>If an FMI conducts money settlements on its own books, it should minimize and strictly control its credit and liquidity risks.</p>	<p>NA</p>

<p>Key Consideration 5</p> <p>An FMI's legal agreements with any settlement banks should state clearly when transfers on the books of individual settlement banks are expected to occur, that transfers are to be final when effected, and that funds received should be transferable as soon as possible, at a minimum by the end of the day and ideally intraday, in order to enable the FMI and its participants to manage credit and liquidity risks.</p>	<p>CDP has the necessary legal agreements with its SBs as explained below.</p> <p><b>For IBS and Securities Margining:</b> For IBS and securities margining, the relevant agreement is the LOU. SBs are held to provide a certain level of service to CDP at all times through their LOU. The LOU provides that once the SB confirms a payment instruction by CDP the same becomes irrevocable and CDP's instructions will be carried out and effected at stipulated times on the value date. In respect of transfer instructions in favor of CDP, if the carrying out of the instruction is prevented or impeded, the SB will ensure that CDP's account will receive and be entitled to keep such sums in respect of which the confirmation or deemed confirmation has been given and will credit such account from its own funds.</p> <p>In the use of centralized banks for foreign currencies payments, CDP has Centralized Bank Agreements with the banks. The agreement provides that upon receipt of CDP's instructions, the centralized banks shall carry out and effect the instructions by the stipulated times on the value date and the same when effected, shall be final and irrevocable. In respect of transfer instructions in favor of CDP, if the carrying out of the instruction is prevented or impeded, centralized banks shall carry out and effect the instructions using the centralized banks' own funds to ensure that such instructions are carried out and effected.</p> <p><b>For DVP:</b> The DVP SBs and clearing bank are bound by the Letters of Guarantee and Indemnity that they have provided and the DVP rules (<i>DVP rules 8.3.3, 8.3.4, and 10.1.2</i>). In addition, the clearing bank is bound by the Clearing Bank Deed.</p>
<p>Key Conclusions for Principle 9</p>	<p>CDP conducts money settlements for IBS and DVP using a combination of commercial and central bank money with the final inter-bank funds settlement taking place in central bank money. CDP has rules and risk management frameworks in place to minimize and control the credit and liquidity risks arising from the use of commercial bank money.</p>
<p>Assessment of Principle 9</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>CDP should consider using MEPS+ for direct settlements in SGD. In addition, although a settlement cycle of T+3 is compliant with Annex C of the PFMI, it is recommended that CDP evaluates the benefits and costs of a settlement cycle shorter than T+3, in line with current international best practices.</p>

### Principle 12. Exchange-of-value Settlement Systems

If an FMI settles transactions that involve the settlement of two linked obligations (for example securities or foreign exchange transactions) it should eliminate principal risk by conditioning the final settlement of one obligation upon the final settlement of the other.

#### Key Consideration 1

An FMI that is an exchange-of-value settlement system should eliminate principal risk by ensuring that the final settlement of one obligation occurs if and only if the final settlement of the linked obligation also occurs, regardless of whether the FMI settles on a gross or net basis when finality occurs.

#### Elimination of principal risk

**IBS:** Governed by the CDP clearing rules, the CDP IBS framework ensures that the final settlement of relevant financial instruments eliminates principal risk by:

1. Earmarking securities due for delivery to ensure that the securities are locked-in for settlement, and
2. Ensuring monies are settled before securities are settled.

The following is the sequence of CDP IBS settlement process on T+3 settlement day:

1. Securities due for delivery on settlement date (T+3) are earmarked in the respective seller's securities account during the pre-settlement run in the early afternoon on T+3;
2. Final money settlement reports are then issued to clearing members;
3. CDP generates SWIFT instructions to the settlement banks of clearing members;
4. CDP will receive money inflows from clearing members into CDP's account with the settlement bank by 3.30 p.m. which is transferred to CDP's account in MEPS+ and pay outflows due to clearing members from CDP's MEPS+ account by 4.30 p.m.;
5. CDP will debit the seller's securities account and credit the buyer's securities account before midnight on T+3.

In the event of a foreign settlement currency holiday, where money settlement could occur after the settlement date, confirmation of good value of fund is secured from settlement banks on settlement date. This confirmation is governed by a letter of undertaking from the settlement bank.

In respect of successful buying-in transactions, where the value date for money settlement is the next market day after the buying-in is conducted and the value date for securities settlement is on the same day that the buying-in is conducted, principal risk is mitigated by withholding the sales proceeds from failed trades until CDP successfully buys-in against the short-sellers. CDP will release the sales proceeds to the short sellers the next market day after the successful buying-in transactions. Since both the sales proceeds due to the short-sellers and the money (arising from buy-in transactions) due from the short-sellers are settled the next market day, principal risk is mitigated.

	<p><b>DVP settlement:</b><sup>25</sup> Governed by the DVP rules, the CDP DVP settlement framework ensures that the final settlement of relevant financial instruments eliminates principal risk by:</p> <p>(a) earmarking securities due for delivery to ensure that the securities are locked-in for settlement, and</p> <p>(b) ensuring funds are settled before the securities are settled.</p> <p>The following is the sequence of CDP DVP settlement process on T+3 settlement day:</p> <ol style="list-style-type: none"> <li>1. CDP's pre-settlement matching system accepts DVP settlement instructions from participants from T+1 before the pre-settlement run on T+3;</li> <li>2. When DVP settlement instructions are matched on pre-settlement and matching system, the securities are earmarked in the selling participants' accounts for delivery;</li> <li>3. Matched DVP instructions become irrevocable upon the commencement of the pre-settlement run on T+3. Matched DVP instructions will result in either a net debit balance where the DVP settlement bank of a participant has to pay CDP or a net credit balance which CDP has to pay settlement bank of a principal;</li> <li>4. Final money settlement reports are then issued to the respective DVP settlement participants;</li> <li>5. CDP generates SWIFT instructions to the settlement banks;</li> <li>6. CDP will receive money inflows from settlement bank into its account with settlement bank by 3:30 p.m. which are then transferred to its account with MAS in MEPS+, from where the outflows are made to receiving settlement banks by 4:30 p.m.;</li> <li>7. CDP will debit the selling participant's securities account and credit the buying participant's securities account before midnight on T+3.</li> </ol> <p>In the event of a foreign settlement currency holiday, where money settlement could occur after the settlement date, confirmation of good value of fund is secured from DVP settlement banks on settlement date. This confirmation is governed by the guarantee from the DVP settlement bank.</p> <p>Under the CDP DVP settlement mechanism, the DVP settlement bank guarantees payment of the buying participant and the DVP clearing bank will in turn guarantee the payment of the DVP settlement bank. In the pre-</p>
--	---

<sup>25</sup> The settlement arrangement for institutional investors in CDP, without intermediation of a broker, is called DVP settlement, not to be confused with the internationally used concept of delivery versus payment in FMIs that describes the securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.

	<p>settlement and matching system, settlement banks set net debit caps on participants which it guarantees payments. The net debit caps are enforced by the validation of all DVP instructions to ensure that the limits are not exceeded. If a matched instruction results in a net debit balance to exceed the net debit cap, the instruction will be rejected by the pre-settlement and matching system. The clearing bank also sets settlement bank net debit cap for each settlement bank.</p> <p><b>Settlement</b></p> <p>In IBS, funds are settled on net basis and securities on a gross basis. Final money settlement reports are available to clearing members after the pre-settlement run before 2:30 p.m. Clearing members are to pay debit final settlement balances to CDP by 3:30 p.m. and CDP is then to pay the credit final settlement balances to its clearing members by 4:30 p.m. Securities settlement on gross basis takes place before 12:00 midnight on T+3.</p> <p>Similarly for DVP settlement, funds are settled on net basis and securities on a gross basis. Net money settlement reports are available to respective DVP settlement participants after the pre-settlement run before 2:30 p.m. CDP is to receive net debit settlement balances from respective DVP settlement banks by 3:30 p.m. and CDP is to pay net credit settlement balances to respective DVP settlement banks by 4:30 p.m. Securities settlement on gross basis takes place before 12.00 midnight on T+3.</p> <p><b>Timing of finality for both obligations</b></p> <p>The timing of finality of both securities and funds obligations in IBS and DVP is as described above.</p>
Key Conclusions for Principle 12	Principal risk is eliminated with the securities to be delivered earmarked and blocked in the pre-settlement run on the value date. On successful completion of earmarking of securities balances for delivery, the final settlement of funds balances happens in the afternoon followed by delivery of securities on the night of value date.
Assessment of Principle 12	Observed
Recommendations and Comments	-

### Principle 13. Participant-default Rules and Procedures

An FMI should have effective and clearly defined rules and procedures to manage a participant default. These rules and procedures should be designed to ensure that the FMI can take timely action to contain losses and liquidity pressures and continue to meet its obligations.

#### Key Consideration 1

An FMI should have default rules and procedures that enable the FMI to continue to meet its obligations in the event of a participant default and that address the replenishment of resources following a default.

#### Participant default rules and procedures

CDP has established default management framework and rules where CDP has the rights to take timely action to contain losses and liquidity pressures and to facilitate the continued functioning of its role as a CCP in the event of a participant default. The default management framework covers the entire default process from pre-default triggers until the return of business-as-usual. CDP has rules that clearly define an event of default and procedures to provide guidance to the relevant units on the key principles and to support actions undertaken in the event of default.

**Event of default:** The CDP Clearing Rule 8.1.1 sets out events in which CDP may declare a default. In addition, CDP is also entitled to suspend or restrict the membership of any clearing member, or the clearing and settlement of exchange trades in general or in particular, or the clearing and settlement of the exchange trades of any clearing member for such duration as it sees fit in appropriate situations (*CDP Clearing Rule 9.1.1*).

In some cases, participants may not be able to meet financial obligations (i.e., unable to effect payment on time) due to operational disruptions, such as a failure in its information technology systems. While the CDP clearing rules do not define the event of an operational default, CDP deals with such operational disruptions in accordance with its Suspension of Clearing and Settlement Policy.

In the event that the affected clearing member still remains unable to meet its financial obligations to CDP, the affected clearing member will be declared in default and dealt with under the default management procedures.

**Method of identifying an event of default:** CDP's declaration of a default is discretionary. On a daily basis, the risk management and regulation group, together with the securities trading and clearing unit, monitors the potential inability of a clearing member to meet its obligations to CDP. This daily monitoring helps CDP identify possible early warning signals of default which include non-receipt or late confirmation of settlement and margin calls, funding difficulties faced by a clearing member and/or removal of its credit lines granted, adverse news on the clearing member and/or its parent company, changes to its credit ratings, widening of CDS spread, etc.

Once such a situation is detected, the situation will be assessed by the core default recovery team (comprising the Risk Management unit, Member Supervision unit and STC) and escalated to the senior management, primarily the CRRO and chief operations and technology officer. Subsequently, if needed, CRRO and chief operations and technology officer, together with the CEO will decide whether to convene crisis management team to assess the situation and if necessary, to declare a default on that participant.

**DVP participation:** The DVP rule clearly sets out events in which CDP may terminate a principal and its depository agent from DVP participation (*DVP rule 9.1*). The DVP rule also sets out the obligations of the principal being terminated, suspended or withholding of their participation in DVP Settlement shall not affect any accrued rights or liabilities and all liabilities and obligations owing to CDP shall become due and owing (*DVP rule 9.3*).

**Actions that CDP can take when a default is declared:** The CDP clearing rules clearly define key aspects of the default management procedures, including actions that CDP can undertake when a default is declared. Pre-default management efforts: CDP proactively monitors the financial soundness of clearing members. It may require additional collateral and/or contributions to the CDP's clearing fund to be deposited with CDP (*CDP clearing rules 6A.9A and 7.2.4*); direct the clearing member not to transfer any funds back to its parent company, affiliates or head office (ring-fencing measure)(*CDP clearing rule 6.10.1(8)*); restrict the withdrawal of clearing member's excess monies and assets which have been deposited with CDP (*CDP clearing rule 6B.5.1*); restrict the clearing member's clearing privileges for risk increasing positions. SGX may still allow risk reducing positions to be taken (*CDP clearing rule 9.1.1*); withhold delivery of securities if payments are not met (*CDP clearing rule 6.6.3*); or work closely with appointed administrator, provisional liquidator(s), administrative receiver or judicial manager of the clearing member, where necessary.

There will also be constant communication with the key personnel of the clearing member to seek clarifications and information and convey requirements, where necessary. Key stakeholders, including CDP's management and MAS, are kept informed of the situation on a regular basis.

CDP will take additional steps to minimize contagion. Where there is risk of contagion or systemic factors, CDP may extend the risk mitigating measures described earlier to a market-wide basis. CDP will also be in close communication with MAS.

**Declaration of default:** Upon declaration of a default by CDP, the defaulting

clearing member's clearing privileges will be suspended. A default notice will be disseminated to the defaulting clearing member. Communication with other market participants and the public will be carefully managed to provide information to the market while avoiding any possible loss of confidence in the clearing system.

The key actions that CDP can undertake include use of financial resources held with CDP to meet CDP's continuing settlement obligations to all other non-defaulting clearing members. CDP has a general right to retain the collateral by virtue of the lien provided (*CDP Clearing Rule 6B.3*). In addition, for marginable futures contracts, the circumstances under which the collateral may be retained and used by CDP differ for collateral relating to either clearing member's proprietary or customer positions which are governed by CDP clearing rules 8.2-8.6, 8.6A and 8.6B. Liquidation of defaulting clearing member's proprietary securities contracts will be undertaken. CDP will net the outstanding proprietary contracts of the defaulting clearing member across settlement dates, and liquidate them as soon as practicable. Re-novation of non-defaulting customers' securities contracts with CDP stepping in and settling the securities contracts directly with the customers of the defaulting clearing member through the process of re-novation (*CDP Clearing Rule 8.2*). Buy-side customers have to pay their obligation to CDP. CDP will deliver securities to customers when payment is received. Sell-side customers must ensure that they have securities available for settlement with CDP by noon on settlement day (*CDP Clearing Rule 8.3 to 8.6*). For customers who have failed to pay or deliver securities to CDP, CDP will conduct force-selling or buying-in. In order to minimize CDP's losses from potential customers' failed trades, CDP will retain the proceeds of customers, and pay them after the settlement of their entire outstanding buy and sell contracts.

***Porting and liquidation of clearing member/customer's positions in relation to marginable futures contracts:*** CDP Clearing Rule 8.6A.2 lists down the actions that CDP may take when a default is declared in relation to marginable futures contracts. In the lead-up to the declaration of such a default, CDP assesses the portfolio of outstanding marginable futures contracts of the defaulting clearing member in preparation for immediate action once the default is declared. In the event of a clearing member default, the clearing member's house positions will be netted and the remaining outstanding positions will be liquidated. With respect to non-defaulting customers, CDP allows them to transfer their positions to other non-defaulting clearing members. Upon the transfer of positions, the receiving clearing member will be fully responsible for the positions, including meeting margin and settlement obligations. If the customer fails to transfer his positions promptly within a specified period, CDP will transfer the customer's position to a designated

	<p>clearing member to net and liquidate the positions.</p> <p>Upon the conclusion of any default proceeding commenced by CDP, as required under Section 81H of the SFA, CDP will submit a report to MAS and the clearing member. The report contains details of default proceedings including (a) the net sum, if any, certified by CDP to be payable by or to the defaulting clearing member; or (b) the fact that no sum is so payable.</p> <p>CDP is also required to publish a notice to bring to the attention of the creditors of the defaulting clearing member regarding the existence of the report.</p> <p><b>Extent to which the actions are automatic or discretionary:</b> CDP's declaration of a default is discretionary. While certain actions are automatic (e.g., use of financial resources and re-novation of customers' positions to CDP), other actions are discretionary in nature and depend on the situation when the default happens.</p> <p>Changes to the normal settlement practices: CDP may allow for changes in its normal settlement process under the following circumstances:</p> <ul style="list-style-type: none"> <li>• in the event of an operational disruption;</li> <li>• default of a clearing member dealing in novated contracts other than marginable futures contracts; or</li> <li>• default of a clearing member dealing in marginable futures contracts.</li> </ul> <p>In the event that a clearing member is unable to perform its money settlement obligation or meeting of its margin calls to the CDP due to operational disruptions, CDP has discretionary powers to mitigate and manage the same.</p> <p><b>Management of transactions at different stages of processing:</b> Upon declaration of a default, CDP will manage all unsettled contracts of a defaulting member that has been novated under the CDP clearing rules within its default management procedures. All contracts that were not successfully novated will be purged.</p> <p><b>Expected treatment of proprietary and customer transactions and accounts:</b> These include: (i) liquidation of defaulting clearing member's proprietary positions; (ii) re-novation of non-defaulting customers' securities contracts; (iii) porting and (iv) liquidation of non-defaulting customer's positions in marginable futures contracts.</p>
--	--

**Probable sequencing of actions:** The actions stated may take place in a particular sequence or concurrently.

**Roles, obligations, and responsibilities of the various parties, including non-defaulting participants:** The crisis management team, which consists of the CEO, chief operations and technology officer and CRRO, is the senior management decision-making body that provides leadership in a default management situation. Only the crisis management team has the authority to declare a default after having made a comprehensive assessment of the situation, based on information provided by the core default recovery team, namely the Risk Management unit, the Member Supervision unit and STC. When an event of default has been declared, the crisis management team will approve / decide on the following: reporting to MAS; all public announcements of the default; the closure of the relevant markets, where required and any other decision sought by the default recovery team. The crisis management team will oversee the whole default management process and ensure the event of default is handled and closed in a proper and timely manner.

The default recovery team's main role is to execute the default management procedures. The responsibility of the default recovery team includes the right to appoint an on-site task force, which will be deployed at the defaulting clearing member's premises, to manage the default situation and uphold the interests of CDP.

Non-defaulting clearing members also have certain obligations to meet in a situation of default. These are pre-default obligation to meet calls for emergency margins or additional capital requirements from CDP under unstable market conditions (Emergency Orders) (*CDP clearing rule 6.10.1*). If the Emergency Orders are not met, the non-defaulting clearing member is obliged to accept CDP's direction to liquidate all or part of its positions. It is obliged to accept an appointment by CDP to render the necessary support to execute the default proceedings, i.e., obligation with non-defaulting clearing member with respect to the re-novation process (*CDP clearing rules 8.9.2*); and to render all assistance and information necessary pursuant to a CDP investigation (in the case of any suspected breaches) and inspection (*CDP clearing rules 11.1 and 11.2*).

*Existence of other mechanisms that may be activated to contain the impact of a default:* CDP and SGX-ST may exercise their powers to take other actions as deemed fit, such as suspension and restriction of trading on the SGX-ST market to contain any knock-on effect of the default (SGX-ST trading rule 8.10.1).

	<p><b>Use of financial resources</b></p> <p>CDP clearing rules allows CDP to use the following financial resources in the event of a default:</p> <p><b><i>Defaulting clearing member's financial resources:</i></b> The margins held with CDP serve as the first line of defense over which CDP has legal claim in the event of default. Further, CDP has the powers, under CDP rules, to request for additional margins from any clearing member (<i>CDP clearing rule 6A.9A</i>). In addition, for their clearing obligations to CDP, clearing members are required to make collateralized contribution of at least S\$500,000 and additional contributions at an amount specified by CDP to the CDP clearing fund (<i>CDP clearing rules 7.2.1, 7.2.1A, 7.2.2 and 7.2.3</i>). The additional contributions will be called upon by CDP, if required. Where a CDP clearing member has failed to promptly discharge any of its obligations to CDP due to failure of a customer, CDP may in addition to the above remedies, apply the margins, assets or collateral deposited by the clearing member in relation to customer accounts provided that the conditions in the SFA in relation to the permissible use of customers' money and assets are satisfied (<i>CDP clearing rule 8.6B.1(2)</i>).</p> <p><b><i>Use of CDP's financial resources:</i></b> CDP is required under Section 59(1)(g) of the SFA to have sufficient financial resources to operate a safe and efficient clearing facility. CDP's policy is to keep all clearing house resources in liquid assets, readily available when needed. CDP may also decide to draw on its own financial resources/ financial resource facilities. Mobilization of financial resource facilities is in the following sequence, depending on market liquidity at time of use:</p> <ul style="list-style-type: none"> <li>• bank deposits,</li> <li>• repurchase agreements, and</li> <li>• committed unsecured credit lines. MAS provides a Standing Facility, allowing CDP to repo Singapore government securities and other eligible collateral with MAS for overnight SGD.</li> <li>• In addition, default recovery team will seek approval from the crisis management team for any activation of the credit lines, where necessary.</li> </ul> <p><b><i>Use of financial resources</i></b></p> <p>The CDP clearing rules define the clearing fund structure and the order of application of clearing fund contributions in an event of default. CDP's clearing fund is sized to withstand a default of the top clearing member and its affiliates and its two financially weakest clearing members. In the event of a default, the clearing fund would be used in the following order of priority (<i>CDP clearing rule 7.9.1</i>):</p>
--	---

	<ul style="list-style-type: none"> <li>(i) contributions from defaulting clearing member(s);</li> <li>(ii) contributions by CDP of S\$30 million in cash;</li> <li>(iii) collateralized contributions by all other non-defaulting clearing members on a pro-rata basis in the proportion of each clearing member's required collateralized contribution to the total required collateralized contributions of all other non-defaulting clearing members at the time of default;</li> <li>(iv) contingent contributions by all other non-defaulting clearing members on a pro-rata basis in the proportion of each clearing member's required contingent contributions to the total required contingent contributions of all other non-defaulting clearing members;</li> <li>(v) insurance (if any);</li> <li>(vi) contribution by CDP of another S\$30 million; and</li> <li>(vii) any other contributions.</li> </ul> <p><b>Replenishment of resources following a default</b></p> <p>CDP is required under Section 59(1)(g) of the SFA to have sufficient financial resources to operate a safe and efficient clearing facility. In an event where the CDP clearing fund has been used, CDP will restore its financial resources expeditiously.</p> <p><b>Obligation of CDP to replenish financial resources:</b> Under the clearing fund capital requirements established by MAS, CDP must at all times maintain in cash an amount of at least 25 percent of the CDP clearing fund. In the event that CDP's clearing fund contribution has been used and falls below 25 percent of the clearing fund size, CDP will replenish its clearing fund contribution up to the minimum aggregate contribution (i.e., an amount equivalent to at least 25 percent of the clearing fund size).</p> <p><b>Obligation of non-defaulting clearing members to replenish financial resources:</b> Where it becomes necessary to apply all or part of the clearing fund contributions placed by non-defaulting clearing members to meet obligations of the CDP, the non-defaulting clearing member shall immediately make good such deficiency in its contribution by such time as stipulated by CDP (<i>CDP clearing rule 7.10</i>).</p>
<p>Key Consideration 2</p> <p>An FMI should be well prepared to implement its default rules and procedures, including any appropriate discretionary</p>	<p><b>Roles and responsibilities for addressing a default</b></p> <p>When a clearing member default occurs, the default management framework and procedures form the basis for handling the default itself. The default management governance structure consists of a crisis management team and a default recovery team. The roles and responsibilities of the crisis management team and default recovery team are described above.</p>

<p>procedures provided for in its rules.</p>	<p><b>Communication procedures</b></p> <p>Besides ongoing communication with CDP’s on-site team which handles the default, there is also constant communication with the key personnel of the defaulting clearing member to seek clarifications and information and convey requirements, where necessary. Key stakeholders, including CDP’s management and MAS, are kept informed of the situation on a regular basis.</p> <p>CDP will announce and provide relevant update on an event of default through circular to non-defaulting clearing members. News release will also be issued to the public, as and when relevant so that customers are well informed of the default situation.</p> <p><b>Fire-drills</b></p> <p>Fire-drills are conducted periodically to test the default recovery team’s preparedness in implementing default procedures promptly and appropriately. Results of the fire-drills are then reported to the ERC. CDP’s default management framework is reviewed at least annually and sooner if conditions so require. While the review is conducted by the Risk Management unit, any material changes to the default management framework are subject to approval of the RMC. Default management procedures are reviewed annually and updated, if necessary.</p>
<p>Key Consideration 3</p> <p>An FMI should publicly disclose key aspects of its default rules and procedures.</p>	<p>The CDP clearing rules (available on the SGX website) define key aspects of its default management procedures. In addition, SGX publishes the CDP members default management manual to provide the guiding principles and steps which will be taken in the event of a default by a CDP clearing member.</p>
<p>Key Consideration 4</p> <p>An FMI should involve its participants and other stakeholders in the testing and review of the FMI’s default procedures, including any close-out procedures. Such testing and review should be conducted at least annually or following material changes to the rules and procedures to</p>	<p>CDP engages its clearing participants in the development of its default management procedures. The CDP Members Default Management Manual published by CDP provides the CDP clearing members the guiding principles and the steps that will be taken in the event of a default by a CDP clearing member.</p> <p>CDP’s default management procedures were tested and verified in the Lehman crisis, which included position liquidation. Fire-drills are conducted periodically to test default recovery team’s preparedness in implementing default procedures promptly and effectively. Further, CDP conducted a default management exercise with a clearing member with significant exposures in late 2011 to further improve the process. The selection of a major clearing member allowed CDP to test its procedures comprehensively. The exercise, spanning over 3 days (21, 24 and 25 Nov), tested the operational readiness, in terms of process, system and human resources, of CDP to manage the event of default,</p>

ensure that they are practical and effective.	<p>including execution of the re-novation process. In addition, CDP walked all clearing members through the procedures. Starting 2013, default management exercises will be conducted at least annually or following material changes to the rules.</p> <p>Post fire-drill reviews, which set out the key observations, are shared with the ERC. Action plans are established to track the completion of follow-up actions. For example, following the late 2011 fire-drill, the action plan included establishing processes for and documentation of handling of cross-border transfer requests and access to trust monies for customers.</p>
Key Conclusions for Principle 13	CDP has an effective default management framework with defined rules and procedures to manage a participant default. The rules and procedures provide for CDP to take timely action to contain losses and liquidity pressures and continue to meet its obligations. It publicly discloses its default procedures and conducts fire drills on a periodical basis.
Assessment of Principle 13	Observed
Recommendations and Comments	-

#### Principle 14. Segregation and Portability

A CCP should have rules and procedures that enable the segregation and portability of positions of a participant's customers and the collateral provided to the CCP with respect to those positions.

<p>Key Consideration 1</p> <p>A CCP should, at a minimum, have segregation and portability arrangements that effectively protect a participant's customers' positions and related collateral from the default or insolvency of that participant. If the CCP additionally offers protection of such customer positions and collateral against the concurrent default of</p>	<p><b>Customer protection from participant default</b></p> <p>In the case of securities transactions, where a member defaults, the member's customers' positions are protected through the process of re-novation, under which CDP settles such positions directly with the defaulted clearing member's customers. Customer positions may be maintained on an individual or omnibus basis. In respect of collateral, CDP only receives margins from its clearing members and not from members' customers.</p> <p>In the case of marginable futures contracts (futures contracts that are listed and traded on SGX-ST and which are subject to margin requirements), CDP holds customer collateral on trust and separate from clearing members' collateral and its own assets, pursuant to section 62 of the SFA and the CDP clearing rules (in particular, rules 6A.6.4 and 6A.10). By virtue of the trust arrangements under the SFA, customers' collateral is protected from the default of or insolvency regime applicable to clearing members. Customer collateral deposited by each clearing member with CDP is commingled in a single omnibus bank account, and accounted for on a clearing member basis.</p>
--	---

<p>the participant and a fellow customer, the CCP should take steps to ensure that such protection is effective.</p>	<p>Trading members of SGX-ST are required to identify the direct customer (referred to as disclosed customers) when executing or reporting the trades on the exchange. This facilitates clear identification of customers' positions in the clearing system and their required collateral. CDP also allows for holding of omnibus account in the case of customers which are not identified to CDP (referred to as undisclosed customers). In the event of a clearing member's default, all customers' positions are protected through CDP's portability arrangements under the CDP clearing rules.</p> <p>Portability arrangements are in place with regard to securities transactions. Under the CDP clearing rules portability is achieved by a re-novation to CDP of all unsettled positions on a default of a clearing member, whereby CDP will settle all such positions directly with the defaulted clearing member's customers. CDP's obligation to re-novate and settle contracts with a defaulted clearing member's customers is set out in Chapter 8 of the CDP clearing rules. With respect to Marginable Futures Contracts, under CDP Clearing Rule 8.6A.2, immediately upon CDP declaring that an event of default has occurred, CDP may appoint one or more clearing members to whom all or any part of such positions shall be transferred. Customers may request for a transfer to a clearing member of their choice. Where positions are so transferred, margins deposited thereon and any settlement due or collected must be delivered to CDP, to be entrusted to the clearing members designated to handle the transactions. CDP will also verify that there is sufficient margin to cover remaining positions before transferring customer positions. Where customer positions are transferred to an alternative clearing member, the alternative clearing member must deposit the required customer collateral with CDP and collect initial margin from the customer, if any, as required under clearing rule 6A.2.1.</p> <p>With regard to segregation of customer assets, in the securities segment CDP obtains margins only from the clearing members and not from their customers. Such margins from clearing members are held as house-origin collateral. Where CDP obtains margins from customers in respect of Marginable Futures Contracts, it does so on a segregated basis and under a trust arrangement.</p> <p><b>Customer protection from participant and fellow-customer default</b></p> <p>Where customer collateral is deposited with CDP for marginable futures contracts, they are considered to be subject to a degree of fellow-customer risk. However, non-defaulting customers' collateral may only be used under limited circumstances as set out in Section 63 of the SFA which outlines the permissible uses of such customer collateral with CDP. Pursuant to section 63 of the SFA, CDP clearing rule 8.6B.1(2) provides that where a clearing member</p>
--	---

	<p>has failed to promptly discharge any of its obligations to CDP, and CDP has reasonable grounds for forming an opinion that the failure is directly attributable to the failure of any customer to meet its obligations, CDP may apply collateral deposited by the clearing member in relation to customer contracts provided that the conditions in the SFA in relation to the permissible use of customers' monies and assets are satisfied.</p> <p><b>Legal basis</b></p> <p>The statutory and regulatory requirements under the SFA and the contractual obligations between CDP and each clearing member provide a high degree of assurance that they will support CDP's segregation arrangements in respect of its clearing members' customers' positions and collateral.</p> <p>CDP's arrangement to transfer the positions and collateral of a clearing member's customers under novated marginable futures contracts is provided for under CDP clearing rule 8.6A.2. In addition, CDP's arrangement to transfer the positions and collateral of a clearing member's customers is supported and given precedence by statute in the event of insolvency. Section 81F of the SFA provides that a court applying insolvency law shall not interfere with the clearing rules or proceedings or other action taken under the clearing rules.</p> <p>Further, Section 62 of the SFA provides for, among other things, notification by the clearing member to CDP where a market contract is a customer contract and the segregation and holding on trust of customers' collateral from clearing members' assets. Hence, customers' collateral is protected from the default of or insolvency regime applicable to clearing members.</p> <p>In Singapore, CDP's segregation and portability arrangements are enforceable.</p>
<p>Key Consideration 2 A CCP should employ an account structure that enables it readily to identify positions of a participant's customers and to segregate related collateral. A CCP should maintain customer positions and collateral in individual customer accounts or in omnibus customer accounts.</p>	<p>Trading members on SGX-ST are required to identify each direct customer when executing or reporting the trades on the exchange. This facilitates clear identification of customers' positions of each position in the clearing system. Customer positions may be maintained on an individual or omnibus basis. In respect of collateral, CDP only receives margins from its clearing members and not from clearing members' customers.</p> <p>In the case of marginable futures contracts, both positions and collateral in respect of customers are clearly identified and segregated from clearing members' positions and collateral and CDP's funds. CDP further holds customer collateral on trust for the benefit of customers, pursuant to section 62 of the SFA.</p> <p>Customer positions may be maintained on an individual or omnibus basis. Customer collateral deposited with CDP is commingled in a single bank</p>

	<p>omnibus account, and accounted for on a clearing member basis.</p> <p>With regard to securities transactions collateral is held on a house-origin basis and covers variation margin and maintenance margin requirements for supporting house and customers' positions.</p> <p>In the case of marginable futures contracts, collateral supporting customers' positions covers maintenance margin requirements, which includes variation margin. Maintenance margin refers to the minimum balance which shall be maintained in the customer's account maintained with CDP.</p> <p>CDP in its role as a CCP relies on its clearing members' records to ascertain each customer's interest. In this respect, CDP separately provides an integrated back office clearing system to all its clearing members (known as CAS), which all clearing members use to maintain their records. A customer will also have a trading account maintained by a trading member of SGX-ST and the trading information in this account is maintained in the CAS as well. The customer's trading account is linked to his CDP securities account for the purpose of crediting and debiting of his securities holdings. With the linkage, CDP receives information on each trade and credits or debits securities to or from the customer's securities account accordingly. Confirmation statements are provided to clearing member's customers and this ensures accuracy of the records. As such, CDP in its role as a CCP will have access to these customers' records as needed.</p> <p>CDP also has the right to request for the submission of records by clearing members under CDP clearing rules 3.5.2 and 3.5.3.</p>
<p>Key Consideration 3 A CCP should structure its portability arrangements in a way that makes it highly likely that the positions and collateral of a defaulting participant's customers will be transferred to one or more other participants.</p>	<p>In respect of securities transactions, CDP's obligation to re-novate and settle contracts with defaulted clearing member's customers is set out in chapter 8 of the CDP clearing rules.</p> <p>In the case of securities transactions, CDP steps in to re-novate customer trades with itself automatically in the event of a member default as provided for under the CDP clearing rules. In view of this consent of the participant is not required.</p> <p>Under CDP clearing rule 8.6A.2, for positions in novated marginable futures contracts, immediately upon CDP declaring that an event of default has occurred, CDP may appoint one or more clearing members to whom all or any part of such positions shall be transferred. Under the CDP clearing rules, CDP has the power to transfer open positions to designated clearing members without having to obtain consent. CDP is therefore able to transfer positions and collateral of non-defaulting customers to a designated clearing member</p>

	<p>once it obtains all necessary information on the customers' positions and collateral. In addition, as a further operational safeguard, CDP will generally obtain the written consent of the receiving clearing member before porting positions and collateral.</p>
<p><b>Key Consideration 4</b> A CCP should disclose its rules, policies, and procedures relating to the segregation and portability of a participant's customers' positions and related collateral. In particular, the CCP should disclose whether customer collateral is protected on an individual or omnibus basis. In addition, a CCP should disclose any constraints, such as legal or operational constraints, that may impair its ability to segregate or port a participant's customers' positions and related collateral.</p>	<p>CDP's segregation and portability arrangements are disclosed in the CDP clearing rules, which are publicly available on SGX's website. CDP does not currently envision any legal constraints to its segregation and porting arrangements. The CDP clearing rules provide clarity on the risks pertaining to the portability of customers' positions and collateral, in particular, the possibility that positions may be liquidated if re-novation or porting is not feasible. For example, CDP clearing rule 6.10.1(3) provides, in relation to novated contracts and as an emergency power, that CDP may require clearing members to liquidate any of the positions carried in any accounts on their books. CDP clearing rule 8.6A.2 provides for the right of CDP to appoint one or more trading members to liquidate positions on the behalf of and at the risk of the defaulted clearing member.</p>
<p><b>Key Conclusions for Principle 14</b></p>	<p>CDP has segregation and portability arrangements that effectively protect a participant's customers' positions and related collateral from the default of a participant. In the case of securities transactions, where a member defaults, the member's customers' positions are protected through the process of re-novation, under which CDP settles such positions directly with the defaulted clearing member's customers. In the case of marginable futures contracts (futures contracts that are listed and traded on SGX-ST and which are subject to margin requirements), CDP holds customer collateral on trust and separate from clearing members' collateral and its own assets. In the event of a clearing member's default, all customers' positions are protected through CDP's portability arrangements under the CDP clearing rules. CDP has an integrated back office clearing system, the CAS which enables it to readily identify positions of a participant's customers. Customer collateral is protected in an omnibus account structure and the details thereof are publicly disclosed in the CDP clearing rules.</p>

Assessment of Principle 14	Observed
Recommendations and Comments	-

### Principle 15. General Business Risk

An FMI should identify, monitor, and manage its general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if those losses materialize. Further, liquid net assets should at all times be sufficient to ensure a recovery or orderly wind-down of critical operations and services.

<p><b>Key Consideration 1</b></p> <p>An FMI should have robust management and control systems to identify, monitor, and manage general business risks, including losses from poor execution of business strategy, negative cash flows, or unexpected and excessively large operating expenses.</p>	<p>SGX has instituted risk governance and reporting structures to manage the range of risks, including general business risks, which SGX (including CDP) encounters. Under the ERM Framework, technology, operational, reputation, competition, staffing and fraud risks are classified as general business risks.</p> <p>In determining the impact of key risks on CDP's financial positions, SGX prepares annually a three-year business plan that includes a three-year financial forecast. SGX also develops a three-year capital plan (Capital Plan) for SGX (including CDP) based on the three-year business plan and financial forecasts. In this Capital Plan, SGX forecasts the capital over the next three years, taking into consideration the strategic directions and business structures changes, which will affect SGX's business in the short to medium term and its ability to meet the regulatory capital requirements imposed by MAS via conditions on CDP (Capital Conditions) under both business-as-usual and business stress scenarios.</p> <p>General business risks are also managed through the annual planning process. SGX prepares the annual budget as part of its business planning process. SGX's management must seek the board's approval on the annual budget prior to deployment of the resources.</p> <p>Any major new projects that have the potential to impact SGX's risk profile are subject to the approval of RMC. Prior to approval by the RMC, a risk assessment will be conducted.</p> <p>In addition, SGX monitors the impact of general business risks on CDP's financial position. This is done through the review of CDP's financial and management performance reports (namely, income statement, balance sheet and cash flow statement). SGX has a comprehensive process to facilitate the review of these documents by the EXCO, and, as appropriate, by the Audit</p>
--	---

	Committee and the SGX Board.
<p>Key Consideration 2</p> <p>An FMI should hold liquid net assets funded by equity (such as common stock, disclosed reserves, or other retained earnings) so that it can continue operations and services as a going concern if it incurs general business losses. The amount of liquid net assets funded by equity an FMI should hold should be determined by its general business risk profile and the length of time required achieving a recovery or orderly wind-down, as appropriate, of its critical operations and services if such action is taken.</p>	<p>CDP holds liquid net assets funded by equity to continue operations even if it incurs business losses. SGX Board reviews and monitors CDP's capital positions to ensure that its business activities and growth are prudently funded. The amount of capital, in the form of liquid net assets, held by CDP is based on its capital plan, which is prepared taking into account the capital conditions to support its business plans. At the minimum, CDP maintains liquid net assets funded by equity of at least the stipulated total risk requirement under the capital conditions. The total risk requirement comprises the risk charges for operational risks, investment risks and general counterparty risks. SGX has assessed that under both business-as-usual and business stress scenarios that CDP holds surplus capital in excess of the minimum regulatory capital requirement to meet potential losses arising from general business risks.</p> <p>The following are considered when determining the amount of capital, in the form of liquid net assets funded by equity that would be required to cover general business risks that is needed to be held by CDP:</p> <ul style="list-style-type: none"> <li>• Three scenarios are considered in the capital plan, namely (1) Business-as-usual scenario; (2) Business Stress scenario of sustained low volumes; and (3) Systemic scenario which assumes multiple defaults of members</li> <li>• The amount of minimum regulatory capital that is needed to support the three-year business plan in accordance with the capital plan;</li> <li>• The projected free-and-available surplus capital after meeting the capital conditions and is available to meet any business losses.</li> </ul> <p>SGX maintains insurance policies for the Group, including CDP, to cover any extraordinary one-time loss, such as fraud. The various insurance policies maintained by the group, such as professional indemnity and crime, industrial all risks and public liability, are comprehensive and are assessed for adequacy annually.</p>
<p>Key Consideration 3</p> <p>An FMI should maintain a viable recovery or orderly wind-down plan and should hold sufficient liquid net assets funded by equity to implement this plan. At a minimum, an FMI should hold liquid net assets funded by equity</p>	<p><b>Recovery or orderly wind-down plan</b></p> <p>The recovery and resolution plan for CDP is in an early stage of development. It is intended to support the continued provision of critical operations and services in the event of a recovery or an orderly wind-down of operations. The time frame and associated operating costs of a recovery or orderly wind-down will depend on the underlying scenario and the recovery or resolution measures taken. It will be reviewed and refined going forward.</p> <p><b>Resources</b></p> <p>CDP currently holds liquid net assets funded by equity of at least six months of operating expenses. In the event if the RRP process takes longer than six</p>

<p>equal to at least six months of current operating expenses. These assets are in addition to resources held to cover participant defaults or other risks covered under the financial resources principles. However, equity held under international risk-based capital standards can be included where relevant and appropriate to avoid duplicate capital requirements.</p>	<p>months, CDP's holding company i.e., SGX, will provide the necessary resources to facilitate the process.</p> <p>CDP is required to maintain a clearing fund that has adequate resources to meet potential financial loss arising from simultaneous default of the member and its affiliates with the largest exposure and two financially weakest members. CDP's contribution to the clearing fund is in the form of cash and deposited at regulated banks in Singapore. As required under the CDP clearing rules, these clearing fund resources are kept in trust, segregated from CDP's own resources. The capital conditions also state that financial resources that are set aside for the clearing fund shall not be available to meet the financial resources requirements designated to cover business risks and losses.</p>
<p>Key Consideration 4 Assets held to cover general business risk should be of high quality and sufficiently liquid in order to allow the FMI to meet its current and projected operating expenses under a range of scenarios, including in adverse market conditions.</p>	<p>CDP's liquid net assets to cover general business risks, that are fully equity-funded, are predominantly in the form of cash and deposited in either current or fixed deposits accounts at regulated banks in Singapore. These deposits can be withdrawn on same day if CDP's withdrawal instruction is served to the bank by 2 p.m. Monitoring and management of bank counterparty risk are provided in the response to Principle 16.</p> <p>As indicated, CDP's liquid net assets comprise of predominantly cash, which is of the highest quality, can be withdrawn without any loss in value.</p>
<p>Key Consideration 5 An FMI should maintain a viable plan for raising additional equity should its equity fall close to or below the amount needed. This plan should be approved by the board of directors and updated regularly.</p>	<p>SGX's and CDP's capital plan contain a list of capital actions, including plans to raise additional equity, that can be undertaken by CDP and/or SGX when CDP's equity fall close to or fall below the amount needed, depending on the prevailing circumstances. The list of capital actions crafted in 2012 will be reviewed and developed more fully over time, including assessment/considerations metrics in determining the practicality and priority of each possible action.</p> <p>CDP, through SGX, reviews the capital plan and recovery and resolution plan which includes scenarios to replenish equity capital, at least on an annual basis, to ensure relevance.</p>

	The RMC reviews and endorses SGX and CDP's capital plan, including plans to raise additional equity if needed, and the recovery and resolution plan annually. Upon RMC's endorsement, the capital plan is presented to the Board for approval.
Key Conclusions for Principle 15	General business risks are managed in accordance with the risk governance structures and the ERM framework. CDP identifies, monitors, and manages its general business risk and holds sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if these losses materialize for up to 6 months. It has a capital plan with a range of actions which has been approved by its risk management committee and Board.
Assessment of Principle 15	Observed
Recommendations and Comments	-

### Principle 16. Custody and Investment Risks

An FMI should safeguard its own and its participants' assets and minimize the risk of loss on and delay in access to these assets. An FMI's investments should be in instruments with minimal credit, market, and liquidity risks.

Key Consideration 1 An FMI should hold its own and its participants' assets at supervised and regulated entities that have robust accounting practices, safekeeping procedures, and internal controls that fully protect these assets.	<p>Financial assets held by CDP can be broadly categorized as (i) cash assets; and (ii) non-cash assets. CDP holds these assets at supervised and regulated banks and national depositories.</p> <p>Cash assets: CDP holds these assets at regulated and supervised banks in Singapore. Cash assets comprise CDP's own cash holding; clearing fund contribution from CDP (as CCP) and its clearing members; non-clearing fund related collaterals received by CDP (as a CCP) from its clearing members; corporate action monies received by CDP (as a CSD) from issuers and the unclaimed corporate action monies held in relation to its corporate action services; and, cash collaterals received by CDP (as a CSD) from securities borrowers in relation to its securities and borrowing lending program.</p> <p>SGX only uses bank counterparties that are supervised by the relevant regulator. The RMC has authorized the CEO to approve new bank counterparties and their corresponding limits based on the admission criteria and within the bank counterparty ceilings. The RMC has further authorized the CRRO to approve/revised limits (not exceeding the prescribed ceilings) of existing bank counterparties, keeping CEO informed. Early warning mechanisms are in place where the RMC will be notified when the individual bank counterparty exposure</p>
---	---

	<p>reaches the prescribed threshold. This allows SGX to take preventive measures swiftly to manage a potential breach of exposure limits.</p> <p>Non-cash assets: CDP could hold non-cash assets at national depositories or through custody services provided by the supervised and regulated custodian banks. Non-cash assets may comprise selected government securities and selected SGX-ST-listed securities received by CDP (as a CCP) from its clearing members. Presently, CDP does not hold any such assets.</p> <p>As part of pre-account opening due diligence, SGX assesses whether the banks and custodians meet its admission criteria. On an ongoing basis, banks/custodians are all required to provide statements on all SGX's (including CDP's) accounts to facilitate reconciliation against SGX's records of asset holding to ensure that all transactions and balances in each account are properly recorded; and to serve as a confirmation that SGX's assets are properly segregated from the assets of the banks and custodians. In addition, CDP's external auditors perform independent verification and confirmation with banks and custodians on the assets holding as part of the annual audit exercise.</p>
<p>Key Consideration 2 An FMI should have prompt access to its assets and the assets provided by participants, when required.</p>	<p>CDP has established that it has a sound legal basis to support enforcement of its rights in all assets it collects from clearing members as collateral based on CDP clearing rules and the SFA. In addition, CDP has also established that it has a sound legal basis to support enforcement of its rights in relation to assets it receives from issuers and securities borrowers.</p> <p>Presently, all collaterals held by CDP are in cash deposits. These cash assets are placed in either current or fixed deposit bank accounts at banks regulated in Singapore. CDP can withdraw these deposits promptly subject to the banks' customary notice periods. Instructions served to the banks before 2 p.m. will ensure availability for same-day settlement for SGD and US\$ deposits and it will be next-day settlement in the case of Japanese Yen deposits. CDP can also draw on its committed standby bank credit facilities to meet settlement obligations on the same day.</p> <p>Presently, CDP does not hold any non-cash collateral.</p>
<p>Key Consideration 3 An FMI should evaluate and understand its exposures to its custodian banks, taking into account the full scope of its relationships with each.</p>	<p>SGX has an established overarching policy framework to address counterparty credit and concentration risks arising from banks and custodians that CDP uses for trade settlement and safekeeping of financial assets, which was approved by SGX's Board and the RMC.</p> <p><b>Cash assets held by CDP:</b> The Board sets the prescribed risk ceilings and any deviation from the ceilings requires approval by the RMC. To mitigate concentration risk to a single bank, SGX's non-settlement related exposure to each bank is capped. Settlement related exposures are not subject to any</p>

	<p>concentration limit as they are short term in nature.</p> <p>A custodian bank may also be a clearing participant of CDP. The credit risk associated with clearing member is managed under CDP's risk management framework (please refer to Principle 3 for more details), while all other counterparty credit risk is managed under the bank counterparty limit and custodian limit framework.</p> <p>For the securities held for its depositors in CDP's role as CSD, CDP uses multiple custodians for safekeeping of securities to diversify the exposure to any single custodian.</p>
<p>Key Consideration 4</p> <p>An FMI's investment strategy should be consistent with its overall risk-management strategy and fully disclosed to its participants, and investments should be secured by, or be claims on, high-quality obligors. These investments should allow for quick liquidation with little, if any, adverse price effect.</p>	<p>SGX/CDP is required to seek the Board's and the RMC's approval for investing its own resources and the collaterals received from CDP's clearing members. In addition, CDP is required to meet the requirements as set out in the SFA in relation to investment of customers' monies and assets.</p> <p>Presently, all of CDP's own cash reserves and cash assets from its clearing members as collaterals are kept at banks either in current or fixed deposit accounts. Presently, CDP does not hold any non-cash assets received from its clearing members.</p>
<p>Key Conclusions for Principle 16</p>	<p>CDP has a well laid-down custody and investment policy. Clearing members' and customers' assets are held in trust and are bankruptcy remote and are kept separate from CDP's own assets. SGX has an established overarching policy framework which addresses counterparty credit and concentration risks arising from banks and custodians that CDP uses for safekeeping of financial assets. CDP holds its own cash reserves and cash collateral from its clearing members in either current or short term deposits with banks.</p>
<p>Assessment of Principle 16</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>-</p>

### Principle 17. Operational Risk

An FMI should identify the plausible sources of operational risk, both internal and external, and mitigate their impact through the use of appropriate systems, policies, procedures, and controls. Systems should be designed to ensure a high degree of security and operational reliability and should have adequate, scalable capacity. Business continuity management should aim for timely recovery of operations and fulfillment of the FMI's obligations, including in the event of a wide-scale or major disruption.

#### Key Consideration 1

An FMI should establish a robust operational risk-management framework with appropriate systems, policies, procedures, and controls to identify, monitor, and manage operational risks.

#### Identification of operational risk

Operational risks are identified using an annual top-down approach through SGX's ERM framework and an annual bottom-up risk self-assessment approach by each unit within SGX. Both approaches are described in greater detail in Principle 3. In addition, the ORM policy uses a threat risk matrix to identify SGX's ability to continue critical operations from high-impact events.

#### Sources of risks

SGX has identified the following operational risks:

- Technology: system failure risk, i.e., the risk that SGX's trading, clearing and depository systems fail, impacting the market place;
- IT security risk, i.e., risk that data in SGX's trading, clearing, depository and internet-facing website is attacked, causing defacement or denial of service;
- IT outsourcing risk, i.e., risk that arises from SGX's IT outsourcing activities.
- Operations: operations execution and processing risk, i.e., risk that arises from implementation of new initiatives and processing activities in the operations unit;
- Staff concentration risk, i.e., risk that SGX fails to resume its operations in a timely manner, in a business continuity situation, due to insufficient resources;
- Outsourcing risk, i.e., risk that arises from SGX's outsourcing activities.
- Fraud: corruption risks, i.e., risk of corporate criminality and the abuse of power by SGX officers;
- Asset misappropriation risks, i.e., risks that SGX's assets and/or confidential information is misused for personal gains.
- People: attraction and retention risks, i.e., risk that SGX is unable to attract and retain talented employees;
- Employee competency risks, i.e., risk that SGX is not able to employ well-qualified personnel to operate the systems safely and efficiently.

The following residual risks for business continuity have also been identified by

EXCO and accepted by the RMC:

- Major island-wide events: These include, but are not limited to, terrorist, civil unrest, or natural disasters such as pandemic, earthquakes and tsunamis. A targeted terrorist act or a major island-wide incident can disrupt the business recovery center (BRC) at the same time when SGX's primary office locations are denied access, making it far more difficult to recover critical business functions promptly; and
- Total failure of vital infrastructure: A total failure of vital infrastructure such as the telecommunications, power supply or transportation networks impacting SGX as well as most parts of Singapore. SGX has made provisions for backup power and use of dual telecommunications service provider.

### **Single points of failure**

SGX Technology unit reviews the infrastructure for single points of failure, high resiliency, robustness and failover capabilities on an annual basis. There are no identified single points of failure in the IT infrastructure that support the CDP and SGX-DC systems.

### **Management of operational risk**

SGX has a multi-layered approach for management of operational risks. These include:

**ERM:** SGX's enterprise key risks are identified annually by EXCO, and approved by the board, through the RMC. KRIs set by EXCO help provide early alerts to keep SGX operations within the tolerance levels.

**RSA:** The enterprise-wide risk self-assessment program includes an assessment of the adequacy of the controls in place, which help to monitor and manage the identified risks.

The SGX risk governance structure further helps to monitor and manage operational risks, see Principle 2.

**SGX organizational resiliency management:** The policy enables SGX to identify high-impact events, using a so-called threat-risk matrix. As part of the ORM, SGX has in place a business continuity plan (BCP) for each critical unit. Both CDP and SGX-DC have been identified as critical units.

**Financial district security program:** SGX is also actively involved in the program that is jointly managed by MAS and the Singapore police force. The program aims to promote and enhance the physical security, crime prevention and contingency response within the financial district in order to counter the threat of terrorism and crime. It also prepares the industry appropriately should a major operational disruption occur from disruptions to telecommunications

service providers and Singapore Power. Recommendations and solutions from the meetings are reported for review by SGX management for feasibility of implementation within SGX. To mitigate the risks of major island-wide events and vital infrastructure failure, SGX has implemented redundant and resilient services for telecommunications and power.

**Business impact assessment:** A business impact assessment is conducted yearly by each unit to assess the expected minimum level of resources (e.g., personnel, equipment, technology) required over a period of time, after a major disruption, to maintain the continuity of an organization's business and support functions at a minimum level of service/production.

**Outsourcing policy:** The outsourcing policy defines the guidelines for the outsourcing process and the requirements for the management of outsourcing agreements undertaken by SGX. All material and/or significant outsourcing engagements are approved by the outsourcing committee before endorsed by RMC. Upon RMC's endorsement, the same is presented to the Board for approval and notified to MAS, prior to entering into the outsourcing engagement.

**Governance structure:** The SGX technology unit has established a governance structure to provide oversight of the IT activities, and ensure that responsibilities, decision rights and accountability are clearly defined. The three key areas covered are IT management policies and controls, the IT risk management framework and the IT security policy.

**SOPs:** Each function head is responsible for ensuring that all key activities in his/her areas of responsibility are documented in SOPs and attest on annual basis regarding the adequacy and completeness of SOPs.

**Operations management:** To support the operations of CDP and SGX-DC, SGX Operations has established systems, policies, procedures and controls to ensure sound operations and to provide clear standards and guidance to staff in operations on the execution of their responsibilities. There is also an operations training program for new hires, staff and managers.

**Human resources:** The SGX recruitment policy, compensation and benefits program and talent management framework aims to ensure that SGX has adequate staff who are competent and possess attributes such as integrity and professionalism to operate the system safely and efficiently and to abide with SGX policies and procedures.

**Compliance function:** Internal audit is independent of management, and reports directly to the audit committee in relation to SGX's internal controls.

SGX's compliance function conducts compliance reviews and monitors self-assessments by functional units in accordance with the compliance key control standards program. The compliance function is also responsible for coordinating the annual statutory self-assessment exercise.

**BCP:** The key activities of the ORM include the preparation of operational, tactical and strategic plans to ensure SGX business continuity. The ORM committee meets three times a year to provide guidance, review current threats to business continuity, approve mitigations and ensure continuous improvement to SGX's (including CDP's and SGX-DC's) preparedness for a major disruption. Regular testing, continuous maintenance and updates to the SGX IT default recovery plan (DRP) and business continuity plans are part of the SGX ORM roadmap. The ORM committee provides an annual attestation to the RMC on SGX's level of business continuity readiness and any residual risks are made known.

#### **Policies, processes and controls**

**SGX technology unit and operations team:** SGX technology is guided by the IT management framework to ensure the safety and efficiency of CDP's and SGX-DC's systems. It also includes protecting and preserving the quality and integrity of CDP's and SGX-DC's information assets against intentional and unintentional damage and loss. SGX technology also ensures that SGX has adequate capability and capacity to continue operating its critical IT systems in the event of security incidents or man-made or natural disasters.

The operations teams maintain daily control function checklists for key operational procedures which outline core activities and timelines. A key operational risk control feature is the requirement of dual control for processes. Dual control requires one staff to process the transaction, while another more senior or experienced staff member will perform verification before the execution of the transaction. This dual control process helps to minimize operational and processing errors.

**Fraud/bribery prevention measures:** SGX has put in place policies to provide controls to address fraud prevention. Staff is required to complete the annual compliance training and certification. One of the modules is on the code of dealing.

**Whistle-blowing program:** SGX has put in place the whistle-blowing program that aims to encourage staff and key vendors to report suspected malpractices and misconduct so that management is able to deal with them promptly. The whistle-blowing policy is available on SGX's intranet and made known to every

	<p>new employee.</p> <p><b>Change management:</b> To effectively manage all changes to the system and production environment, a formal IT change management policy is in place to ensure that valid documentation, timely communication and clear ownership is established for each authorized change. SGX has also implemented a robust test framework to ensure that systems meet requirements, are reliable, secure and have adequate scalable capacity.</p> <p><b>Project management:</b> All significant projects in SGX are managed and governed centrally, through the program management office, in accordance with a defined set of procedures. Once the project's scope, budget and timeline are determined, any subsequent changes would be subject to a formal process where changes would have to undergo impact assessment and formal approval would have to be obtained prior to implementation.</p>
<p>Key Consideration 2</p> <p>An FMI's board of directors should clearly define the roles and responsibilities for addressing operational risk and should endorse the FMI's operational risk-management framework. Systems, operational policies, procedures, and controls should be reviewed, audited, and tested periodically and after significant changes.</p>	<p><b>Roles, responsibilities and framework</b></p> <p>The TOR of the RMC specifically authorize the RMC to approve the risk management strategies of SGX (including CDP and SGX-DC), such as clearing and counterparty risks, technology risks, operational risks and any other enterprise risks that may have a significant impact on SGX's reputation, financial position and business operations and make appropriate recommendations to the Board. The RMC convenes at least three times a year. Some of the risk-related frameworks/reports which were submitted to RMC in relation to SGX's management of operational risks were: (i) the enhanced ERM framework in July 2012); and (ii) the outsourcing policy in January 2013. In addition, the ORM Committee reviews the SGX Organizational Resiliency Policies and Guidelines on an annual basis or as and when required. The last review was conducted in March 2013.</p> <p><b>Review, audit and testing</b></p> <p>The review, audit and testing of SGX's systems, policies, procedures, and controls, including its operational risk-management arrangements with participants are conducted by the internal audit, operations and technology units.</p> <p><b>Internal Audit:</b> Internal Audit is independent of management, and reports directly to the Audit Committee in relation to SGX's internal controls. The scope of audit includes the operational risk management controls in the operations and technology functions. Internal audit also conducts pre-implementation, implementation and post-implementation review for systems depending on risk. Such reviews are determined based on the assessment of risk.</p> <p><b>Operations:</b> The Operations unit has an independent operations control team to</p>

conduct quality assurance to ensure adherence to operational policies, procedures and control measures. For example, the operations control team performs reconciliation of SGX-DT's and CDP's records against statements from banks and custodian banks and verification of physical securities scrips held by CDP (as CSD).

**Technology:** Technology unit has put in place operational policies, procedures and controls to review, audit and test its systems including its operational risk-management arrangements. Other measures include: (a) incident and problem management meeting on a weekly basis in which the Service Management, Applications, Infrastructure, Network and other technical teams discuss the incidents, problems and change for the previous week; (b) testing of systems with members to ensure that members of CDP and SGX-DC are technically and operationally ready to use new systems or services; and (c) Testing of SGX ORM with participants.

The industry-wide testing measures comprise the publication of technical specifications and making available a simulated test environment replicating production, for members to test the proposed production business operations to the extent possible, and familiarize themselves with the new operating environment. As part of the process, SGX requires participants to submit their test results and sign off that the test is successful and that they are ready for launch. In addition, certification of a member's application programming Interface to SGX-DC is required before it is allowed to be used in production.

As indicated above, business continuity measures to test organization resilience are conducted as an annual industry-wide exercise to test the resiliency of SGX's (including CDP's and SGX-DC's) business services and operations in the event of a disaster at the primary data centre covering SGX, market participants and service providers. SGX infrastructures, such as backup, application, storage and network equipment and other critical infrastructures (at the secondary data centre) are also tested for readiness. Other regular BCM exercises undertaken involving participants are an industry-wide crisis management exercise and a number of table-top crisis management activities. Post-exercise reviews and feedback are presented to the ORM Committee. SGX also sets aside two windows each year to enable its market participants (including those from CDP and SGX-DC) to connect from their backup systems to SGX's production systems and to test their disaster recovery procedures. Last year, such exercises were held on March 24, 2012 and November 10, 2012. Both exercises were successful. For 2013, the dates April 20 and November 10 have been set aside.

**External audit:** The operational risk management framework is usually not subjected to external audit. However in FY2012, the auditors reviewed

	management's controls over outsourcing and technology management framework. There were no issues noted by the external auditors.
<p>Key Consideration 3</p> <p>An FMI should have clearly defined operational reliability objectives and should have policies in place that are designed to achieve those objectives.</p>	<p><b>Key objectives</b></p> <p>The key objective of SGX-DC and CDP is to operate a safe and efficient clearing facility, and additionally for CDP, a central depository for the safe custody of book entry securities. Please refer to Principle 2 on more details of the objectives.</p> <p><b>Qualitative operational reliability objectives</b></p> <p>The technology units focus on pursuing excellence in technology operations and enhance market infrastructure. Its objectives are documented in the Technology Management Framework.</p> <p><b>Quantitative operational reliability objectives</b></p> <p>KPIs, set by the EXCO at the beginning of the year for the technology unit, are documented in the technology monthly report. The report covers key activities in the technology unit with the operations dashboard and project dashboard details providing an effective indication of the performance of the unit in meeting its service level commitment to SGX. This report is submitted to SGX Chairman and EXCO every month. Similar KPIs are in place for the operations unit comprising the number of incidents impacting critical systems; unsatisfactory audit reports and details of staff training.</p> <p><b>Ensuring a high degree of operational reliability</b></p> <p>The KPIs are tracked and reviewed against actual achieved targets by technology management and are reported to SGX Chairman and EXCO on a monthly basis. In the operations unit, the KPIs are used for meeting the expected requirements of operational reliability, and focusing staff attention on increasing operational strength and resilience, and continually raising standards. The tracking and managing of operations issues includes root cause and trend analysis. Human resources and fraud control and prevention are managed as described earlier in Key Consideration 1.</p> <p><b>Policies in place for achieving operational reliability objectives:</b> To achieve the operational reliability objectives, SGX undertakes capacity and system reliability exercises, monitors system performance, resilience and recovery measures and follows the problem and change management procedures. As part of SGX Technology's data backup procedures, data for all IT systems is backed-up through disks, tapes and replication between primary and secondary backup storage in the data centers over an internal local area network. All tape-out is encrypted. All data stored in back-up tapes are transported to an offsite onshore location that is certified to be equipped with premium security measures. Controls are in place to protect these back-up data from unauthorized access,</p>

	<p>misuse or corruption, during transit.</p> <p>Daily backups are performed centrally with monthly encrypted data taped-out. Critical business data is stored for a period of seven years offsite. Processes are in place to test the readability and recovery of data from of tapes that are stored for long periods of time.</p> <p>SGX also has in place a policy to ensure that all key activities and controls in operations are covered by documented SOPs.</p> <p><b>Measures to address operational capacity</b></p> <p>All critical systems are required to have at least 100 percent processing capacity above their historical peak. This is to cater for any unanticipated spikes in processing volumes due to the volatile nature of SGX's (including CDP's and SGX-DC's) business.</p>
<p>Key Consideration 4</p> <p>An FMI should ensure that it has scalable capacity adequate to handle increasing stress volumes and to achieve its service-level objectives.</p>	<p><b>Capacity related issues</b></p> <p>The architecture and infrastructure team within the technology unit manages and governs the area of capacity planning and implementation of reliable and efficient infrastructure services. Capacity tests for all critical systems are conducted annually to confirm the systems are able to meet the said capacity numbers. All critical systems are required to have at least 100 percent processing capacity above their historical peak. System capacity reports including historical peaks for critical systems are published and reviewed monthly. Quarterly capacity planning meeting is conducted to review all system capacity metrics. Standby systems in the secondary data centre are provisioned with comparable processing capacity as the systems in the primary data centre. In addition, the operations unit reviews capacity management periodically and prior to launches of new products, services or corporate action events.</p> <p><b>Issues relating to operational capacity</b></p> <p>The capacity metrics are monitored closely via monitoring tools. Alerts are sent and incident tickets generated when the pre-set thresholds are breached. The processing capacity statistics are incorporated in the technology monthly report submitted to SGX Chairman and EXCO.</p>
<p>Key Consideration 5</p> <p>An FMI should have comprehensive physical and information security policies that address all potential vulnerabilities and</p>	<p><b>Physical Security</b></p> <p>Facilities management and architecture and infrastructure teams are responsible for the security of physical premises at SGX's primary location and the data centers respectively. These teams report any potential security risks to the ORM committee. The ORM committee reviews the risks involved, and escalates to the EXCO, where needed, for further deliberations.</p> <p>The measures in place to monitor, assess and manage the physical vulnerabilities</p>

<p>threats.</p>	<p>of the data and business operating centers include carrying out independent threat, vulnerability, risk assessments.</p> <p>Unauthorized access is prevented through an established internal data centre access procedure coupled with the data centre provider's building access security policy. Fire prevention and detection measures include smoke detectors, fire alarm systems, water sprinkler systems with continuous CCTV monitoring by the Management Corporate Strata command centre. At the SGX Primary business operating centre physical measures for preventing vehicle attack are in place. Critical systems being addressed by external engineers need to be accompanied and supervised by internal subject matter experts. All works carried out in the data centre must be executed during Monday to Fridays: 0200 hours to 0400 hours; Saturday 1500 hours to Sunday 1800 hours. Approvals must be sought from the data centre manager or the head of architecture and infrastructure team for any exceptions.</p> <p>Relevant international standards are adopted for ensuring physical security. For example, SGX data centers are sourced from established providers that have built their data centers to Tier III specifications as per the Uptime Institute data centre tier definitions. Also, SGX's primary operating centre is located within a class A office building, according to the Building Owners and Managers Association classification and managed by Management Corporate Strata which provides first level security control for the whole building.</p> <p><b>Information Security</b></p> <p>The IT risk management framework establishes the high level framework for the management of risks confronting the technology unit in the discharge of its roles and functions. Key security controls, including security policies, standards and guidelines, have been put in place. These include:</p> <ul style="list-style-type: none"> <li>• Secure configurations for hardware and software on laptops, workstations, and servers;</li> <li>• All servers must comply with the documented security checklists;</li> <li>• Identified exceptions to IT policies and standards are reviewed on a monthly basis.</li> <li>• Once a month, critical servers are scanned to determine which ones are not configured according to the secure configuration guidelines affecting security of the system. Account monitoring and control measures perform periodic reviews of system accounts and disable or delete any accounts that cannot be associated with a business process and owner.</li> <li>• A combination of host-based intrusion detection, intrusion prevention, and least privilege access control for devices, applications and systems, as well as integrity</li> </ul>
-----------------	--

	<p>checking tools and change management procedures are in place to ensure that only authorized changes are possible and that critical system files (including sensitive system and application executable, libraries, and configurations) have not been altered.</p> <ul style="list-style-type: none"> <li>• Internal audit performs an independent review to ensure that technology standards are robust and enforced.</li> </ul> <p><b>Data Loss Prevention</b> measures include full hard drive encryption software on all laptops; web and email content monitoring and filtering to analyze outbound traffic looking for a variety of anomalies, including large file transfers, long-time persistent connections, connections at regular repeated intervals, unusual protocols and ports in use, and possibly the presence of certain keywords in the data traversing the network perimeter. Deployment of host-based data loss prevention is also used to conduct periodic scans of laptops and workstations to determine whether sensitive data is present. The tool is able to search for patterns that indicate the presence of sensitive information, and can help identify if a business or technical process is leaving behind or otherwise leaking sensitive information in data at rest. Further, data is not allowed to be stored on removable and easily transported storage media</p> <p>SGX has a security incident monitoring and response procedure that includes a definition of staff roles for handling incidents, as well as senior management who will support the incident handling process by acting in key decision-making roles.</p> <p>Controls to address potential risks due to changes and major projects include network penetration test; application penetration test; and security source code review of certain types of module e.g. those involving financial transactions. SGX commissions an independent security specialist to undertake the tests and provide a test completion report.</p> <p>The scope of SGX IT Security Policy is derived from ISO standards 17799 and SS493. SGX conducts penetration tests in accordance with MAS' requirements, as stated in the Internet Banking and Technology Risk Management Guidelines v3.0.</p>
<p>Key Consideration 6</p> <p>An FMI should have a business continuity plan that addresses events posing a significant risk of disrupting operations, including events that</p>	<p><b>Objectives of BCP</b></p> <p>The SGX ORM policies and guidelines seek to minimize the impact of a physical, manpower or technological disruption on SGX's operations. This includes regular tests such as technology mobilization, organizational-wide call tree exercises, desktop exercises and industry-wide exercises. These plans are reviewed annually and documented.</p> <p>The IT default recovery plan seeks to minimize the impact of a disruption on</p>

<p>could cause a wide-scale or major disruption. The plan should incorporate the use of a secondary site and should be designed to ensure that critical IT systems can resume operations within two hours following disruptive events. The plan should be designed to enable the FMI to complete settlement by the end of the day of the disruption, even in case of extreme circumstances. The FMI should regularly test these arrangements.</p>	<p>SGX's critical applications by identifying critical applications, disaster levels, hardware and software resources and recovery plans. It is supported by the Incident Management Procedure, which seeks to restore normal service operation as quickly as possible and minimize the adverse impact on SGX business operations whenever incidents occur.</p> <p>The ORM roadmap is reviewed annually. Further, an infectious diseases preparedness plan seeks to address the management of staff and business operations in a pandemic situation such as bird flu. The human resource unit manages the plan and coordinates the preparedness across SGX.</p> <p><b>Design of business continuity plan</b></p> <p>SGX's readiness is aligned to the MAS business continuity management guidelines and principles for the financial services Industry. All critical systems are mandated to have a recovery time of not more than two hours. Critical business functions in SGX are identified, prioritized, documented and approved by the ORM committee. Recovery strategies and recovery time objectives are set for all critical business units. SGX's business rules require an ORM on the part of members. Member supervision conducts reviews and assessments of members' compliance with rules on business continuity management as part of their inspection program. SGX's business continuity plans take into account disruptions that are both geographically widespread and of a prolonged nature. SGX's business recovery centre and secondary data centre are located away from the same zone as its offices. Recovery strategies also consider longer disruptions that may last 30 days or more, assuming that a minimal number of critical staff is still available to support operations. Plans for wide area disruptions are regularly tested. High availability solutions have been implemented across all key infrastructures. Synchronous replication of the production data from the primary data centre to the secondary data centre is undertaken.</p> <p>SGX has implemented permanent split operations of critical functions. A business recovery centre has been established as a split site office with permanent staffing from relevant critical business and support units in order to continue should a disaster strike. Should there be a sudden high impact event with widespread loss of life at the SGX center, staff will remain at the second operations site for a maximum of 14 days. This timeframe would enable SGX to manage its trading, clearing and settlement obligations until the orderly shutdown of the SGX business can be completed, or further resources can be found to complement the teams to continue SGX's business. Business continuity risks are reviewed annually by the ORM committee using a Threat Risk Assessment Matrix.</p> <p>The recovery time objective was tested during the annual industry-wide exercise</p>
---	--

on September 29, 2012 and the recovery time objective of 1 hour 43 minutes was achieved for all critical systems.

#### ***Data loss prevention***

Data is replicated synchronously between the primary data centre and secondary data centre. This ensures there is an updated duplicate copy of the data located offsite at all times. In the event of a disaster at the PDC, services at SDC will be made available, accessing the updated duplicate set of data there. SGX systems are commissioned, designed, built and tested to ensure there is no data loss as a result of a system failure.

#### ***Effective communication***

The crisis management plan provides the procedures for responding to emergency situations. The following are documented in the plan:

- a) management of information dissemination based on the severity of the incident, including issuance of press release; b) crisis activation process; and
- c) responsibilities of the crisis communications team.

#### ***Secondary site***

SGX's business recovery center is located outside the central business district. It has the ability to connect to either the primary or secondary data centers. The business recovery center is a permanently occupied split site office with permanent staffing from relevant critical business and support units. Staff, including one EXCO member together with one function head each from three specific critical units namely Operations, Technology and the risk management and regulation group is present at the business recovery center in order to continue operations should a disaster impact the SGX center.

#### ***Review and testing***

Contingency arrangements are reviewed at least on an annual basis. Various tests are conducted throughout the year as part of the yearly roadmap of BCP activities. Documentation is also reviewed as part of the arrangement. An annual industry wide exercise with market participants including those from CDP and SGX-DC is conducted to test SGX's internal recovery procedures where SGX, SGX vendors and market participants are involved. The test scope covers securities and derivatives, trading and clearing, as well as internal critical corporate systems. The BCP exercise simulates a failure of SGX's primary data centre, resulting in SGX teams failing over services to the secondary data centre and enabling them for market operations. The scope of the test also includes the other network service providers, through which some market participants connect to SGX. SGX is planning to provide two test windows a year to enable market participants from CDP and SGX-DC to test their disaster recovery

	capability to SGX's production systems.
<p>Key Consideration 7</p> <p>An FMI should identify, monitor, and manage the risks that key participants, other FMIs, and service and utility providers might pose to its operations. In addition, an FMI should identify, monitor, and manage the risks its operations might pose to other FMIs.</p>	<p><b>Risks to the FMI's own operations</b></p> <p><b><i>Managing risk from key participants</i></b></p> <p>The risk management and regulation group conducts onsite inspections and compliance visits on clearing members, to assess the adequacy of members' internal controls, risk management systems and procedures. Clearing members are also required to submit a thematic self-assessment questionnaire on an annual basis covering their risk management and controls, BCP arrangements etc.</p> <p><b><i>Managing risks from other FMIs</i></b></p> <p>In the case of SGX-DC, the links with other FMIs is the MOS link with CME. (Refer to Principle 20—FMI Links). The operations unit monitors the trades transferred through the link by carrying out reconciliations of trade allocations twice a day to ensure the records are consistent. There are contingency procedures in place to ensure that this reconciliation process is not disrupted. This enables accurate monitoring and measurement of risk posed by the FMIs arising from the link.</p> <p><b><i>Managing risks from service and utility providers</i></b></p> <p>Under the outsourcing policy, units using outsourced service providers have to monitor service performance and service level agreements. In addition, the policy requires all engagements to have provisions for the rights of access of regulatory bodies and appointed personnel to conduct inspections of the service provider's premises, systems, infrastructure, processes, data protection and other services provided to SGX. An annual review is required to assess the financial and operational condition to assess the vendor's ability to continue to meet outsourcing obligations.</p> <p>SGX has outsourced its IT infrastructure services to a software company in Singapore for a period of five years. SGX Technology has established a governance structure to provide oversight over the IT infrastructure service provider's activities, and ensure that responsibilities, decision rights and accountability are clearly defined. The architecture and infrastructure function is responsible for the management and governance of the IT infrastructure service provider. The service management function manages and governs the IT infrastructure service provider for all deliverables. The information security function manages and governs the IT security operations, and is supported by the IT infrastructure service provider.</p> <p>Technology conducts an annual review of the IT infrastructure outsourcing arrangement.</p>

	<p><b>Risks posed to other FMIs</b></p> <p>In the case of SGX-DC, the links with other FMIs is the MOS link with CME. The operations unit (derivatives clearing) monitors the trades transferred through the link by carrying out reconciliations of trade allocations twice a day to ensure the records are consistent. There are contingency procedures in place to ensure that this reconciliation process is not disrupted. This enables accurate monitoring and measurement of risk posed by SGX arising from the link. In addition, SGX ensures all technology systems employed by critical functions have a well and regularly tested IT DRP and have a well-established ORM for business continuity.</p> <p>SGX sets aside two test windows a year for market participants from the securities and derivatives market to test their disaster recovery capability connectivity to SGX's production systems. Market participants will have to sign up for the test window, so as to allow SGX to determine the scale of support resources. The list of production systems for participants to connect to is made known to the market participants to facilitate their planning for the failover test. During the test window, market participants are supported fully by SGX in the event of any connectivity issue. Contingency operational procedures are in place to ensure that the interdependent nature our operations with CME will not lead to a major disruption in the operation of the MOS. These procedures have been tested and found to be effective in ensuring that both CME and SGX-DC can continue to manage the positions transferred between the two clearing houses.</p>
Key Conclusions for Principle 17	<p>SGX (including CDP and SGX-DC) have in place appropriate systems, policies, procedures, and controls to mitigate operational risk which are reviewed, tested and audited periodically. Operational risks are identified using an annual top-down approach through SGX's ERM framework and an annual bottom-up risk self-assessment approach by each unit within SGX. The RMC approves the operational risk management strategies. Systems are designed to ensure a high degree of security and operational reliability and have adequate, scalable capacity. SGX has comprehensive physical and information security policies that address potential vulnerabilities and threats. Business continuity management is ensured through a permanent split-site which is staffed. SGX's ORM plan is aligned to the MAS business continuity management guidelines and principles for the financial services industry. All critical systems have a recovery time objective of not more than 2 hours. An annual industry wide exercise with market participants is conducted to test the recovery procedures. The business continuity management plans are documented and tested.</p>
Assessment of Principle 17	Observed
Recommendations and Comments	-

### Principle 18. Access and Participation Requirements

An FMI should have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.

#### Key Consideration 1

An FMI should allow for fair and open access to its services, including by direct and, where relevant, indirect participants and other FMIs, based on reasonable risk-related participation requirements.

#### Participation criteria and requirements

CDP admits two classes of clearing members: general clearing members and bank clearing members. They are permitted to clear their own trades and trades of their clients and other trading members. CDP has admission and continuing participation requirements for clearing members that are objective, publicly disclosed, risk-based and allow for fair and open access to its services. Clearing members are expected to comply with the admission criteria and ongoing requirements which are:

- Legal requirements (*CDP clearing rule 3.1*): bank clearing members must be authorized to conduct banking business in Singapore under the Banking Act. General clearing members must hold the Capital Markets Services License under the SFA unless otherwise exempted under the SFA or the Securities and Futures (Licensing and Conduct of Business) Regulations (SF(LCB)R);
- Operational requirements (*CDP clearing rule 3.1*): All clearing members must maintain segregated and adequate back-office functions. Clearing members must have in place adequate systems and adequate staff for proper functioning of their clearing obligations, and ensure that managerial or executive staff has a high standard of integrity and deep level of knowledge with regard to the nature, risks, and obligations of the market or contract(s) being cleared. In terms of *CDP clearing rule 4*, each clearing member has to appoint at least one person as approved executive director who shall be approved by MAS as a director in accordance with the SFA. The approved executive director of a bank clearing member refers to any person who is (a) in the direct employment of, or acting for or by arrangement with, the bank clearing member; and (b) is principally responsible for the management and conduct of the business of the BCM. In addition, the SF(LCB)R requires CMS Licensees to appoint fit and proper persons as chief executive officers and directors.
- Financial requirements (*CDP clearing rules 7.1 and 7.2*): bank clearing members and general clearing members are subject to minimum financial requirements that are imposed by CDP, besides the requirement to contribute to the CDP clearing fund an amount calibrated to the size of their activities. Both general clearing members and locally incorporated bank clearing members must maintain a base capital (or net head office funds for GCMs incorporated outside Singapore) of at least S\$5 million or S\$8 million (if also a SGX-DC clearing member) and financial resources above its total risk requirement. For general clearing members, there is an additional requirement to ensure that aggregate indebtedness shall not exceed 1,200 percent of its aggregate resources (*CDP clearing rules 3.1, 5.1 and 5.1D*). In addition, a bank clearing member incorporated outside Singapore must deposit with CDP, in cash and/or government securities, of not less than S\$5 million or S\$8 million (if also a SGX-DC clearing member); and maintain its cash and/or government securities

	<p>deposited with CDP or SGX-DC above its total risk requirement. (<i>CDP clearing rules 3.1 and 5.1D</i>).</p> <ul style="list-style-type: none"> <li>• Other requirements (<i>CDP clearing rule 3.1</i>): All bank clearing members are also subject to a credit rating requirement which states that all bank clearing members or their parent banks must have a rating that indicates, at least, adequate intrinsic safety and soundness, excluding external credit support and a limited ability to withstand adverse business or economic conditions, from any rating agency registered with an appropriate authority.</li> </ul> <p><b>Access to trade repositories</b></p> <p>NA</p>
<p>Key Consideration 2</p> <p>An FMI's participation requirements should be justified in terms of the safety and efficiency of the FMI and the markets it serves, be tailored to and commensurate with the FMI's specific risks, and be publicly disclosed. Subject to maintaining acceptable risk control standards, an FMI should endeavour to set requirements that have the least-restrictive impact on access that circumstances permit.</p>	<p><b>Justification and rationale of participation criteria</b></p> <p>To ensure the safe and efficient functioning of the CDP clearing facility, only institutions which have demonstrated sufficient financial strength and adequate internal processes will qualify as a clearing member of CDP. CDP's admission criteria and ongoing requirements are risk-based and commensurate with the risks undertaken by clearing members. CDP promotes fair and open access by admitting all market participants who satisfy admission requirements as CDP clearing members. CDP's clearing membership admission criteria and ongoing requirements allow for fair and open access based on the following:</p> <ul style="list-style-type: none"> <li>• Availability of two membership classes (i.e., general clearing members and bank clearing members) and diversity of membership criteria which can accommodate a wide range of potential members. The two classes of memberships have admission criteria calibrated to cater for different types of market participants, taking into account their size, needs and interest.</li> <li>• No restriction on geographical jurisdictions. There is diversity of market participants admitted, e.g., clearing members incorporated in foreign jurisdictions with presence in Singapore<sup>26</sup> (France, Germany, Netherlands and U.S.). No restriction in CDP clearing rules on customer profile of clearing members.</li> <li>• No restriction in CDP clearing rules on minimum transaction volume of clearing members.</li> <li>• CDP imposes a non-prohibitive admission and annual fee; and allows clearing members to be admitted, subject to fulfillment of all obligations.</li> </ul> <p>The SFA also requires CDP to ensure that access to participation in its clearing facility is based on criteria that are not unnecessarily restrictive and access is not limited other than on grounds of risks.</p>

<sup>26</sup> Subject to the constraints of laws in foreign jurisdictions.

	<p><b>Least restrictive access</b></p> <p>CDP's participation requirements in CDP clearing rules are risk-based and fair without restrictive criteria. Reviews of participation requirements are conducted on an ad hoc basis, based on the market environment and regulatory requirements if any. For any change in the admission requirements, the CDP clearing rules would need to be amended which includes a consultative process on rule amendments, and notification to MAS. This promotes regulatory transparency and accountability for CDP with respect to its rule-making process and thereby promotes confidence amongst clearing members.</p> <p><b>Disclosure of criteria</b></p> <p>CDP clearing rules on membership criteria, requirements and fees are publicly available on the SGX website and are accessible to all participants and prospective participants.</p>
<p>Key Consideration 3</p> <p>An FMI should monitor compliance with its participation requirements on an ongoing basis and have clearly defined and publicly disclosed procedures for facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, the participation requirements.</p>	<p><b>Monitoring compliance</b></p> <p>The risk management and regulation group is responsible for monitoring and overseeing the conduct of CDP's clearing members.</p> <p>Clearing members are required to submit monthly financial returns within 14 calendar days after the end of each month. The risk management and regulation group conducts off-site reviews of monthly financial returns to check for any non-compliance with financial requirements. The review also looks at significant or unusual fluctuations in the Statement of Assets and Liabilities, Statement of Profit and Loss, Statement of financial resources, and total risk requirements. For clearing members which pose financial concerns, CDP can direct such submissions, pursuant to the CDP clearing rules, to be done on a more regular basis for closer monitoring. On an annual basis, clearing members are required to submit their audited financial reports certified by clearing member's external auditor. The external audit also includes the auditors' findings on members' controls and processes. In addition, clearing members are subject to internal audits, where auditors ascertain the accuracy of information provided to CDP.</p> <p>The risk management and regulation group also requires clearing members to submit a self-assessment questionnaire on an annual basis. In the self-assessment questionnaire, clearing members are required to provide information on risk management and controls, business continuity planning and others. RMR also undertakes onsite compliance visits and inspections on clearing members on an ongoing basis according to risk profiles of its clearing members. Clearing members are also subject to other reporting requirements as laid down in the CDP clearing rules.</p>

On an ongoing basis, CDP monitors international developments and clearing members' financials and operations and update the risk profile of the clearing members with adverse information. CDP may require additional amounts to be paid as a top-up to the clearing fund contribution of the clearing member or/and a clearing member's contingent contribution to be deposited with CDP (*CDP clearing rule 7.2*). In recent periods of market volatility, CDP had requested for daily submission of financial returns and credit facilities report from clearing members. CDP clearing rule 6.10 provides wide powers to CDP for enhanced surveillance and other actions.

Additionally, in terms of CDP clearing rule 11.1, CDP can conduct an investigation.

### **Suspension and orderly exit**

CDP has procedures in place to manage the suspension and orderly exit of a clearing member that has failed to meet participation requirements. In terms of CDP Clearing Rule 9.1, CDP may suspend or restrict the membership of any clearing member under the conditions specified therein.

When a clearing member is suspended, the clearing member shall not have any privileges of a clearing member during the period of its suspension and no further trades can be executed for clearing through the suspended clearing member. If the clearing member is also a trading member, CDP may request SGX-ST to suspend the clearing member from further trading on SGX-ST. Clearing member remains liable for all trades entered for clearing prior to the point of suspension. Other clearing members will also be kept informed of the suspension via a circular immediately after a formal notice of suspension is served on the clearing member in question. In addition, when a clearing member is suspended or is restricted in its clearing activities by CDP, other than for default, CDP may designate one or more clearing members to deal with any positions carried in any account on the books of the suspended or restricted clearing member in accordance with CDP's direction. In the event that the suspension does not lead to a Default and the clearing member is unable/does not wish to carry on the business, the clearing member may write in to CDP to resign its clearing membership giving at least 30 days' notice, subject to settling all its outstanding obligations.

In an event of bankruptcy or insolvency of a clearing member, the procedures that CDP will follow are covered under Principle 13 on participant default rules and procedures which permit CDP to take timely action to contain losses and liquidity pressures and to facilitate the continued functioning of its role of a CCP in the event that a clearing member fails to meet its obligations.

	CDP clearing rules on managing the suspension and orderly exit of a clearing member are available on the SGX website and are freely accessible to the public. When a decision is made to suspend a clearing member, a formal notice will be issued to the clearing member. Thereafter, a clearing members' circular will be issued to alert all clearing members of the suspension. Communication with market participants and the public will be managed to provide information to the market while avoiding any possible loss of confidence in the clearing system.
Key Conclusions for Principle 18	CDP has objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access. CDP monitors compliance with its participation requirements on an ongoing basis and has clearly defined and publicly disclosed procedures for facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, its participation requirements.
Assessment of Principle 18	Observed
Recommendations and Comments	-

### Principle 19. Tiered Participation Arrangements

An FMI should identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements.

Key Consideration 1	<b>Tiered participation arrangements</b>
An FMI should ensure that its rules, procedures, and agreements allow it to gather basic information about indirect participation in order to identify, monitor, and manage any material risks to the FMI arising from such tiered participation arrangements.	Direct participants of CDP are its clearing members, which have access to CDP's clearing services. As of June 30, 2013, there are 25 clearing members, which comprise securities firms and banks. The indirect participant base is diverse and typically includes securities/derivatives firms, banks, asset management funds, hedge funds and other funds, market makers, non-financial corporate entities, and individuals. CDP clearing rules allow information on indirect participants to be gathered. These rules are effective in enabling CDP to identify and evaluate CDP's exposure to indirect participants. Mandatory trading account identification enables CDP to assess exposures to indirect participants. Trading accounts must be identified and designated by the full name of the customer under SGX-ST Rule 12.3.7. SGX systems map the trading account identities to the most granular trade-by-trade position. These trade-by-trade positions are passed to the risk management system, allowing the measurement and monitoring of exposures to indirect participants. Stress test exposures are measured and updated at least daily. In addition, an analysis of the clearing members' ability to fund upcoming settlement obligations is also performed daily. Through this process, CDP is not only able to identify indirect participants, but also measure the level of exposure to each indirect participant and determine

	<p>materiality. The clearing member's capital is also compared against exposures to assess adequacy.</p> <p>Clearing members<sup>27</sup> are required to notify CDP when they have large exposures to a particular indirect participant, under CDP clearing rule 5.6 Single Customer Notification. Similarly, trading members are required to notify SGX-ST when they have large exposures to a particular indirect participant, under SGX-ST rule 11.7.</p> <p>Members must monitor all indirect participants against a predefined threshold and inform CDP/SGX-ST once any indirect participant reaches a significant exposure. This monitoring is required at both the individual indirect participant level as well as related group of indirect participants. The exposure must include all products, both traded on SGX-ST and on foreign exchanges. The threshold is defined as an exposure to the indirect participant exceeding 20 percent of the member's capital.</p> <p>Additionally, on a monthly basis, members must provide a breakdown of the ten indirect participants with the largest exposures. CDP has the power to require such submissions on a more frequent basis if closer monitoring is required. In accordance with CDP clearing rules 3.1 and 3.5, CDP has the power to seek additional information from clearing members as it may require from time to time. Similarly, SGX-ST rule 2.6 allows SGX-ST to seek additional information from trading members.</p> <p>SGX conducts off-site reviews of members' monthly financial returns to check for any non-compliance with financial requirements and material fluctuations beyond internal threshold. Information regarding indirect participant and house trading activity and other financial information are obtained and assessed. Such information provides an overview of the proportion of indirect participation vis-à-vis the direct participation.</p> <p>In addition to inspections conducted by MAS, SGX conducts onsite compliance visits and inspections and requires members to submit annual self-assessment questionnaires. Through these onsite and offsite reviews, SGX is able to obtain information such as amount of indirect participant funds placed with the members. Members' securities margining and credit management, set on indirect participants (including member's affiliates), can also be obtained.</p> <p><b>Risks to the FMI</b></p> <p>The risk management and regulation group within SGX monitors the exposures of</p>
--	--

<sup>27</sup> Applicable only to general clearing members. SGX-ST obtains large exposures information from trading members who clear through bank clearing members. Currently, there are only 4 bank clearing members. Please refer to Principle 18 for more details on different classes of clearing members.

	<p>each clearing member to indirect participants (and in turn CDP's risk to the clearing member) on a daily basis. If additional information is required, it is obtained from the clearing member.</p> <p>The following measures are used for an evaluation:</p> <ul style="list-style-type: none"> <li>• Where stress test losses of the member exceed the early warning threshold. Further investigation involves identifying the indirect participants attributable for the stress test loss. Additional collateral is collected if required.</li> <li>• Where payment obligations of the member are large the member is questioned on how the payment obligations will be made, with respect to arrangements made with its indirect participant. Even if the indirect participant is expected to provide the payment, members are expected to have sufficient backup liquidity to pay in place of its indirect participant.</li> <li>• Where the member's exposure to an indirect participant exceeds early warning threshold. The exposure is measured using a conservative 20 percent shock to the market.</li> </ul> <p>This monitoring process is set out in standard operating procedures. Members accorded higher risk rating will be subject to closer offsite monitoring and more regular onsite compliance visits and inspections.</p>
<p>Key Consideration 2 An FMI should identify material dependencies between direct and indirect participants that might affect the FMI.</p>	<p>CDP gathers details of large exposures to a single indirect participant as an indication of potentially significant counterparty risk that a clearing member could face. Similarly, the monthly listing of each clearing member's top ten indirect participants with the largest exposures is monitored to gauge the level of dependence that a clearing member has on its key customers. Interdependencies between a trading member and a clearing member (for example, where a trading member outsources its trading system to a clearing member) or between a trading or clearing member and a third party vendor (for example, where a member outsources its trading system to a third party vendor) are also evaluated. Similarly, ensuring that a member has an adequate business continuity arrangement is also assessed.</p>
<p>Key Consideration 3 An FMI should identify indirect participants responsible for a significant proportion of transactions processed by the FMI and indirect participants whose transaction volumes or values are large</p>	<p>Trading accounts must be identified and designated by the full name of the customer under SGX-ST rule 12.3.7. SGX systems process trading activity into exposures for monitoring. SGX is able to determine the proportion of activity attributable to indirect participants because the identities of these indirect participants are disclosed to CDP. Members' capacity is assessed in terms of both credit and liquidity—members' credit exposures to their customers are assessed against their capital for adequacy; and members' payment obligations are assessed against their liquid resources for adequacy.</p> <p>CDP is not only able to identify the number of customers that a member has, but also their identities from detailed trading information. It is able to distinguish between indirect participants which are intermediaries who bring more contagion risk, and those who are non-intermediaries.</p>

<p>relative to the capacity of the direct participants through which they access the FMI in order to manage the risks arising from these transactions.</p>	<p>In addition, based on the required risk-based capital computation, the number of trading members that each clearing member qualifies will correspondingly increase the amount of capital that needs to be set aside to meet financial requirements. This will ensure that a clearing member has the necessary financial strength to support clearing of trades of other trading members. This is prescribed in CDP clearing rule 5.1H. As indicated above, when an indirect participant's exposure exceeds pre-determined threshold, CDP will evaluate if additional mitigating measures is required. Where CDP has a concern with an indirect participant, actions are usually taken through the clearing member: these would include requesting the clearing member to demonstrate the adequacy of its liquid resources. If required, additional margin requirement is collected from clearing members. There are additional safeguards which are in place to address risks from indirect participation.</p> <p>Clearing members are required to have a risk function that conducts credit checks and sets risk-based limits on their customers. The member must conduct daily monitoring against these limits and demonstrate that a process is in place to manage limit excesses. Clearing members have to ensure that they have adequate internal control measures and risk management systems to monitor the trading members' trades and manage their risk exposures to such trades (CDP clearing rule 3.9.1), while trading members will need to have adequate internal controls (SGX-ST rule 4.6.7).</p> <p>A Risk-Based Capital framework is imposed on all clearing and trading members (CDP clearing rules 5.1 and 5.1D, and SGX-ST rules 11.3 and 11.4).</p> <p>In Singapore, trading representatives may either be employed by a trading member or independently self-employed, although working under the name of the trading member. The former is known as a dealer while the latter is known as a remisier. In the remisier arrangement, an additional level of protection is provided to the trading member (and indirectly to its clearing member and CDP), as the remisier has to bear the losses of his/her customers if they default. SGX-ST requires each remisier to give a deposit of at least \$30,000 to the trading member, in the form of cash, marketable securities or a guarantee from a bank or financial institution operating in Singapore. The trading member may require a remisier to increase the amount of deposit or restrict the remisier's volume.</p> <p>On a collective basis, the remisier arrangement offers protection for retail trading members as retail indirect participants contribute 60 percent of SGX-ST volume. The remaining 40 percent of the trading volume comes from institutional indirect participants which generally settle through Delivery-Versus-Payment.</p> <p>In the event of a clearing member default, CDP will stand good for the customers of the defaulting member (i.e., re-novation). Re-novation provides indirect participants with the means to complete settlement of their transactions with CDP, which may</p>
--	---

	<p>otherwise fail. CDP Clearing Rule 8.2.2 provides clarity on the finality and status of indirect participants' transactions when a clearing member defaults. To provide assurance that re-novation is feasible, CDP has in place default management procedures, rules, and conducts exercises regularly with participants.</p> <p>As of June 30, 2013, 21 out of 25 clearing members are also trading members. The structure of the RBC Framework also favors direct clearing with CDP. For example, trading members would enjoy a zero percent risk weight for exposures to CDP instead of 20 percent for exposure through their clearing member, similar to Basel.</p> <p>CDP's clearing fees, rules and other participation requirements are transparent. Indirect participants have access to the information required to make their assessment as to the viability of taking up clearing membership.</p>
<p>Key Consideration 4 An FMI should regularly review risks arising from tiered participation arrangements and should take mitigating action when appropriate.</p>	<p>CDP has in place a well-established framework for addressing risks from tiered participation on the foundation of detailed information which allows us to undertake the analysis. The rules, controls, measures and procedures address each class of participants. CDP reviews the relevance of risk management practices on a yearly basis. If there is need for updates to the procedures or frameworks, necessary approval will be obtained in line with the escalation process within the SGX risk governance structure. If CDP identifies any areas that can be further strengthened, CDP may propose amendments to its rules to achieve the same.</p> <p>Indirect participation risks are monitored and reported to senior management and RMC. Key data is reported to the Board on a monthly basis.</p>
<p>Key Conclusions for Principle 19</p>	<p>CDP has an extensive risk management framework for monitoring and mitigating tiered participation arrangements. Its rules and procedures allow it to gather basic information about indirect participation in order to identify, monitor, and manage any material risks to it from such tiered participation arrangements. These measures enable CDP to identify those indirect participants responsible for a significant proportion of transactions processed by it and whose transaction volumes or values are large relative to the capacity of the clearing member and take effective measures.</p>
<p>Assessment of Principle 19</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>-</p>

### Principle 21. Efficiency and Effectiveness

An FMI should be efficient and effective in meeting the requirements of its participants and the markets it serves.

**Key Consideration 1**  
An FMI should be designed to meet the needs of its participants and the markets it serves, in particular, with regard to choice of a clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.

CDP's products and services cater to various participants' requirements such as brokers, clearing members, retail investors, institutional investors and depository agents. CDP emphasizes the protection of investors' interests and the prevention of fraud as much as convenience and efficiency.

The pre-settlement and matching system was introduced in 2008 facilitating DVP settlement catering to participants needs for reduced settlement risk for Singapore securities. The system was mainly designed to improve market efficiency, allowing participants to easily integrate with their backend processing systems. The pre-settlement and matching system is provided with ISO standard messaging thus allowing participants to submit settlement instructions electronically and download the electronic matching statuses. CDP provides for re-novation of customer trades in the event of a member's default. The re-novation approach seeks to safeguard the interest of participants' customers, and provide full certainty on the settlement of each customer's trades even if the participant defaults. CDP follows a process of public consultation for any changes to the CDP clearing rules, DVP rules and CDP depository rules.

CDP also regularly reviews its efficiency in terms of pricing structure and in particular system-related costs. Service delivery fees are set based on a few factors, namely, cost of providing the services, fees chargeable by other service providers, internal business model and policies. CDP's pricing structure is mainly transaction-based. For system-related costs, SGX has regular system reviews using a life-cycle approach which takes into account system implementation and maintenance costs. Security control measures are intensely deliberated within SGX to ensure that there is a right combination of IT security requirements, operational efficiencies and cost considerations.

SGX (including CDP) also engage customers to get regular feedback on the quality of the services provided. For larger projects, SGX engages participants and customers to discuss project issues and implementation milestones to ensure meeting stakeholders' requirements.

SGX participates in the Singapore National Market Practice Group Singapore, which represents the custodian banks for intermediate and originating customers investing in Singapore securities market. The group meets every quarter to discuss industry issues on securities processing which include operational efficiencies, market initiatives, fee structure, etc. Besides the Singapore National Market Practice Group,

	<p>SGX also organizes quarterly meetings with the SAS to discuss matters relating to securities processing which include operational efficiencies, market initiatives, fee structure, etc.</p>
<p><b>Key Consideration 2</b> An FMI should have clearly defined goals and objectives that are measurable and achievable, such as in the areas of minimum service levels, risk-management expectations, and business priorities.</p>	<p>Safety, sound risk management and efficiency are defined as a priority by CDP. These translate into timely processing of transactions, maintaining sufficient financial resources to minimize market disruptions in the event of a default by members and minimizing systems downtime. CDP seeks to manage risk through the ERM framework (for further details, please refer to Principle 3).</p> <p>As part of its risk management framework, CDP maintains a clearing fund that can be applied in the event a clearing member is unable to discharge its money obligations to CDP or if CDP suffers any loss as a result of liquidating a defaulted clearing member's position.</p> <p>The clearing fund structure is scalable and clearing members' contributions are linked to the level of risk (securities traded value) they bring to the clearing system. As commitment to sound risk management of the clearing facility, CDP contributes S\$60 million to the clearing fund in total, while members' committed contributions amount to S\$40 million in aggregate.</p> <p>To improve efficiency, CDP notifies its participants of key timelines through the CDP clearing rules, which are publicly available on SGX website, and members' circulars. CDP's technology objectives seek to achieve efficient ways of managing IT services and ensuring timely delivery of quality IT projects within the agreed project scope and budget.</p> <p>In reviewing its efficiency, SGX has an established performance measurement mechanism where functions (including CDP's) are reviewed by the EXCO through the use of KPIs, which are set annually. Technology and operational critical breaches are reviewed by EXCO to prevent recurrence and are reported to MAS.</p>
<p><b>Key Consideration 3</b> An FMI should have established mechanisms for the regular review of its efficiency and effectiveness.</p>	<p>The KPI management system is in place to evaluate CDP's efficiency and effectiveness. SGX Operations is responsible for running the SGX's (including CDP's) daily operations and production activities in a manner that meets statutory and regulatory obligations. Operations' objectives are documented in the Operations Monthly Report that is submitted to SGX Chairman and EXCO. In addition to the performance management review process, EXCO reviews the monthly key operating statistics of the clearing and settlement functions. Follow-up actions are taken whenever targets are not met.</p>
<p><b>Key Conclusions for Principle 21</b></p>	<p>CDP's products and services cater to various participants' requirements and the market. CDP is efficient and effective in meeting the requirements of its participants and the markets it serves through timely processing of transactions, maintaining sufficient financial resources to minimize market disruptions in the event of a default</p>

	by members and minimizing systems downtime.
Assessment of Principle 21	Observed
Recommendations and Comments	-

### Principle 22. Communication Procedures and Standards

An FMI should use, or at a minimum accommodate, relevant internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording.

Key Consideration 1 An FMI should use, or at a minimum accommodate, internationally accepted communication procedures and standards.	<p><b>Communication procedures</b></p> <p>CDP uses widely accepted communication procedures to communicate with participants, the customers of participants and other linked FMIs. Where necessary, CDP uses proprietary applications or message converters to translate between proprietary messages and SWIFT messages for securities money settlement, corporate actions announcement information and CDP shareholdings position with the foreign and local custodian banks.</p> <p>In relation to all SGX-ST listed and traded products that are cleared on CDP, CDP adopts widely accepted communication procedures for the following processes:</p> <ul style="list-style-type: none"> <li>• Capturing clearing positions: Trade records from the trading engine are disseminated via the Orders and Trades Dissemination System (OTDS) feed into a database in the post trade system for clearing and settlement.</li> <li>• Retail and institutional settlement: All CDP clearing members are required to use the SGX-provided CAS to facilitate trade settlement with CDP. Institutional settlement instructions on DVP or Free of Payment basis are captured from clearing members, depository agents (custodians) or agent banks. These instructions are communicated to CDP via either Secured File Transfer Protocol (SFTP) or CDP's online portal which is accessible by the participants via web interface on the CDP extranet.</li> <li>• Settlement Failure Management Process: CDP generates a buying-in file to address failed settlement and communicates to clearing members via SFTP with a summary buying in position being posted on SGX website.</li> <li>• Banking settlement process/systems: CDP uses the SWIFT network for money settlement with clearing members and the depository agents.</li> <li>• Other reporting / communication process/systems: CDP operates a face-to-face service counter that enables investors to perform a range of transactions, including deposit, withdrawal and transfers of securities. For the convenience of CDP securities</li> </ul>
---	--

	<p>account holders, CDP operates an Internet service that provides useful public information on CDP's services.</p> <p><b>Communication standards</b></p> <p>CDP uses widely accepted communication standards, such as SWIFT communication standards for banking related instructions for cash settlement. Reference data standards such as International Securities Identification Number (ISIN) to identify stock and government securities and Bank Identifier Codes to identify counterparties are used. CDP collaborates with the Association of National Numbering Agencies for the issuance of ISIN codes for SGX-ST listed securities.</p> <p>CDP also provides and receives data files and reports via Secured File Transfer Protocol. The proprietary formats of such files are published to participants to allow them to integrate with their back-office systems. Where necessary, CDP uses proprietary applications or message converters to translate between proprietary messages and SWIFT messages.</p> <p>CDP plans to adopt the following internationally accepted messaging formats for the post-trade API to be developed: SWIFT ISO20022 for securities settlement instructions; FIXML for trades allocation; and XML for other messages that are not supported in SWIFT ISO20022 and FIXML.</p>
Key Conclusions for Principle 22	<p>CDP uses internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording activities. Where necessary, CDP uses proprietary applications or message converters to translate between proprietary messages and SWIFT messages for securities money settlement, corporate actions announcement information and CDP shareholdings position with the foreign and local custodian banks.</p>
Assessment of Principle 22	Observed
Recommendations and Comments	-

### Principle 23. Disclosure of Rules, Key Procedures and Market Data

An FMI should have clear and comprehensive rules and procedures and should provide sufficient information to enable participants to have an accurate understanding of the risks and fees and other material costs they incur by participant in the FMI. All relevant rules and key procedures should be publicly disclosed.

#### Key Consideration 1

An FMI should adopt clear and comprehensive rules and procedures that are fully disclosed to participants. Relevant rules and key procedures should also be publicly disclosed.

#### Rules and procedures

The CDP clearing rules, DVP rules and attendant instruments are available to the participants and are supported through instruments such as directives, practice notes and circulars. The documents set out above, except for some directives and circulars, are publicly available on the SGX website. Circulars are available to all participants. Where directives are issued to specific participants for prompt and decisive action, such directives are only visible to the party to whom the directive has been issued. CDP's rules (and attendant instruments) are complemented by contractual agreements.

All participants have access to handbooks and guides on various matters in relation to the CAS System and the pre-settlement and matching system. These are provided to participants at the point of onboarding. Subsequent changes are sent directly to participants.

At the point of admission, participants are additionally provided with contractual agreements between the participant and CDP; and handbooks and guides on various matters, for example in relation to the CAS System and the pre-settlement and matching system.

The SGX website contains general information on the operations of the clearing system, the settlement cycles for cash trades and Extended Settlement Contracts, types of margin collateral and financial safeguards, *inter alia*, margining methodology and mark-to-market practices, default fund provisions and default management. It also contains general information about products and services, as well as information on product specifications.

CDP uses three measures to determine that its rules and key procedures are clear and comprehensive: (i) acceptance of and compliance with the rules and key procedures by participants at the point of admission and on an ongoing basis; (ii) amendments to the rules are reviewed by regulatory, legal and business units for clarity of language and ease of understanding, and notified to the MAS. CDP is required to notify the MAS of all proposed amendments to rules, and the MAS has the powers to disallow, alter or supplement any part of the proposed amendment; and (iii) the establishment and amendment of CDP's rules are subject to public consultation requirements under the SFA.

	<p>After feedback has been received through the formal consultation process, CDP will analyze and publish the market feedback (on an anonymous basis) on the SGX website together with CDP's responses to each of the issues raised. Where amendments/changes have limited impact on market participants, CDP will notify participants of changes through circulars.</p> <p>In addition, directives, circulars and practice notes provide additional guidance to participants on the interpretation or application of CDP's rules, which contribute to clarity and comprehensiveness.</p> <p><b>Disclosure</b></p> <p>The CDP clearing rules contain broad information on the procedures that CDP will follow in the following non-routine events: (i) failure of clearing member to meet securities delivery obligations on settlement day; (ii) default of a clearing member; (iii) market emergencies. The DVP rules contain broad information on the procedures that CDP will follow in the event of a default of a principal, settlement bank or clearing bank.</p> <p>With respect to default management, CDP engaged its clearing members in March 2011 during the development of its default management procedures. Subsequently, SGX published the CDP Members Default Management Manual to provide clearing members the guiding principles and steps which will be taken in the event of a default by a CDP clearing member.</p>
<p>Key Consideration 2</p> <p>An FMI should disclose clear descriptions of the system's design and operations, as well as the FMI's and participants' rights and obligations, so that participants can assess the risks they would incur by participating in the FMI.</p>	<p>The documents that include information about the system's design and operations are: a) rules and attendant instruments; b) contractual agreements; c) participant guides; and d) general information on the SGX website.</p> <p>Participants are provided all documents such as agreements, guides and user manuals that provide details of CDP's design and operations at point of on boarding and on request, as well as all information available to the public via SGX's website.</p> <p>CDP publishes the rules on the SGX website, which contains general information on the operations of the clearing system, the settlement cycles for cash trades and Extended Settlement Contracts, types of margin collateral for extended settlement contracts and financial safeguards, inter alia, margining methodology and mark-to-market practices for extended settlement contracts, default fund provisions and default management.</p> <p>CDP's rules contain provisions on the discretion that CDP can exercise over the operation of the CCP, in particular in respect of non-routine events. Discretion is typically exercised in non-routine events. The CDP clearing rules and DVP</p>

	<p>rules are publicly available on the SGX website, without any access restrictions, and are transparent to all CDP clearing members and market participants.</p> <p>CDP provides information to the participants about their rights, obligations, and risks incurred through their participation in CDP.</p>
<p>Key Consideration 3</p> <p>An FMI should provide all necessary and appropriate documentation and training to facilitate participants' understanding of the FMI's rules and procedures and the risks they face from participating in the FMI.</p>	<p>CDP facilitates its participants' understanding of the rules, procedures, and the risks associated with participating through the participant and system on boarding process, public consultation when proposing rule amendments and member engagement and industry-wide testing.</p> <p>As part of the membership entry process, CDP interacts with prospective clearing members to facilitate their familiarity with system infrastructure and requirements. The on boarding process includes provision of detailed guidance on the necessary requirements to connect to the trading and clearing system. In the membership on boarding process, CDP also evaluates specific requests of potential clearing members on a case-by-case basis and provides on-site assistance where it is warranted.</p> <p>For new procedures involving significant technology changes, CDP ensures that the solution is documented, aligned to the SGX technology infrastructure and thoroughly tested before implementation. Testing includes both internal testing by CDP and member testing, if changes are required on member systems which interface to CDP. Member changes required are communicated through updates to the SGX technical specifications for the respective systems.</p> <p>Rule 3.5.4 of the CDP clearing rules requires a clearing member to assess its business and operational risks and maintain adequate business continuity arrangements. CDP has issued a practice note to guide clearing members in this regard. In addition, the MAS has also issued BCM Guidelines which clearing members use as a reference. BCM exercises are conducted periodically to validate the preparedness of CDP and its participants.</p> <p>Finally, with regard to risk and regulatory issues, guidance is provided to clearing members on issues such as the computation of risk-based capital requirements, and briefing/training sessions are held for clearing members in relation to pertinent regulatory changes.</p> <p>Compliance with the rules and key procedures demonstrates that a participant understands the rules and key procedures and they are clear and comprehensive.</p> <p>In addition, on an ongoing basis, the SGX Member Supervision unit monitors and oversees the use of its facilities by its clearing members.</p>

	<p>Where participants demonstrate serious lapses or non-compliance from a willful lack of understanding, CDP can discipline participants to enforce breaches of the Rules, including the issuance of warnings, reprimands or referral to the Disciplinary Committee.</p> <p>In the past five years, there has only been one case of breach of the CDP clearing rules by a clearing member which was referred to the disciplinary committee, which evidences clearing members' compliance and understanding of rules, procedures and risks.</p>
<p>Key Consideration 4</p> <p>An FMI should publicly disclose its fees at the level of individual services it offers as well as its policies on any available discounts. The FMI should provide clear descriptions of priced services for comparability purposes.</p>	<p>CDP discloses its clearing/access fee schedule to the public via its webpage on the SGX website.</p> <p>Included on the website is a description of CDP's policy on discounts and incentive schemes: Incentive schemes, which may include waivers of clearing fees (partially or fully), are awarded to market makers and active traders of specific products so as to provide additional liquidity for the benefit of the market.</p> <p>Participants are informed of the effective date of proposed changes to the clearing fees and associated discounts by way of circulars. Typically, a two week-notice is provided before the changes take effect.</p> <p>The public is notified of changes to services and fees via SGX's website, which is updated with the latest services and fees on a timely basis. Typically, a two week-notice is provided before the changes take effect.</p> <p>CDP discloses information on its system design, technology and communication procedures in the course of member on boarding. This allows a prospective clearing member to assess their costs arising from such internal arrangements in order to participate on CDP.</p> <p>CDP discloses information on the operating costs in the following ways: audited financial statements of SGX, its holding company, which contain detailed cost breakdowns; and to MAS in the application for changes to clearing fees or depository fees.</p> <p>In addition, CDP prepares annual financial statements which contain information on the cost of operating its clearing house business. These financial statements are lodged with the Accounting and Corporate Regulatory Authority (ACRA) and are accessible by the public.</p> <p>Separately, CDP's holding company, SGX as a public listed company is obliged to release quarterly financial statement and its Annual Report contains</p>

	<p>information on the consolidated technology, manpower and other operational costs across SGX.</p> <p>Under regulation 16(7) of the SF(CF)R, CDP must seek MAS' approval for a proposed imposition or change in clearing fee. Information to be provided includes the cost of providing the service for which such proposed imposition or change in clearing fee is proposed.</p>
<p>Key Consideration 5</p> <p>An FMI should complete regularly and disclose publicly responses to the CPSS-IOSCO Disclosure framework for FMIs. An FMI also should, at a minimum, disclose basic data on transaction volumes and values.</p>	<p>This is the first time that CDP has completed the CPSS-IOSCO <i>Disclosure framework for financial market infrastructures</i>. CDP has plans to update the document following material changes to it and its environment and, at a minimum, at least every two years.</p> <p>The following data is available on SGX's website:</p> <ol style="list-style-type: none"> <li>a) the daily price and volume data for each security for the past 22 market days;</li> <li>b) on a daily basis, a summary of the traded volume and value by sector; and</li> <li>c) daily buying-in information by quantity and value for each security.</li> </ol> <p>In addition, SGX publishes a monthly statistics report. This report provides, <i>inter alia</i>, monthly aggregate numbers of:</p> <ol style="list-style-type: none"> <li>d) securities market turnover by market (Mainboard, Catalist, SGX GlobalQuote, Exchange Traded Funds and Company Warrants), Industry Classification Benchmark, individual STI constituent stocks and country of origin;</li> <li>e) number of trades;</li> <li>f) net volume and value of married trades; and</li> <li>g) securities borrowing and lending volume and identifies the top five securities on loan by volume and value.</li> </ol> <p>CDP also discloses the amount that CDP sets aside for its clearing fund in SGX's annual report.</p> <p>CDP discloses a wide array of information to the public via its webpage on the SGX website. This includes information on the products that CDP clears and settles, membership criteria and list of members, overall set of financial safeguards that CDP adopts, list of acceptable collateral for clearing members to meet margin requirements, and information about CDP's systems and operations.</p> <p>CDP discloses the information in English, on the SGX website.</p>

## SINGAPORE

Key Conclusions for Principle 23	CDP has clear and comprehensive rules and procedures and provides sufficient information to participants enabling them to have an accurate understanding of the risks. The fees and other material costs they incur by being a participant of CDP are also disclosed. All relevant rules and key procedures are publicly disclosed in English. CDP has completed the CPSS-IOSCO <i>Disclosure framework for financial market infrastructures</i> . CDP has plans to update the document following any material changes to it and its environment and, at a minimum, at least every two years.
Assessment of Principle 23	Observed
Recommendations and Comments	-

### III. DETAILED ASSESSMENT FOR SGX-DC

<b>Detailed Assessment of Observance of Principles</b>	
<b>Principle 1. Legal Basis</b>	
An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions.	
<p><b>Key Consideration 1</b> The legal basis should provide a high degree of certainty for each material aspect of an FMI's activities in all relevant jurisdictions.</p>	<p><b>Material aspects and relevant jurisdictions</b></p> <p>Material aspects for SGX-DC:</p> <ul style="list-style-type: none"> <li>• novation arrangements;</li> <li>• settlement finality, netting and set-off arrangements;</li> <li>• collateral arrangements;</li> <li>• interoperability; and</li> <li>• the rights, interests and obligations of SGX-DC, clearing members and their customers, with particular regard to default procedures.</li> </ul> <p>Relevant jurisdictions for SGX-DC:</p> <p>The Singapore jurisdiction is relevant with regard to clearing members. As SGX-DC's activities are primarily conducted in Singapore its business rules are governed by Singapore law.</p> <p>SGX-DC currently has general clearing members and bank clearing members. All 22 general clearing members are incorporated in Singapore and are subject to relevant laws in Singapore. Of the 15 bank clearing members, three are Singapore-incorporated banks. The remaining 12 are foreign-incorporated banks regulated by the MAS, under the Banking Act, through their Singapore branch. In the case of the foreign-incorporated bank clearing members, the relevant jurisdictions of incorporation to-date are:</p> <ul style="list-style-type: none"> <li>• the U.S.;</li> <li>• the U.K.;</li> <li>• France;</li> <li>• Germany;</li> <li>• Sweden;</li> </ul>

	<ul style="list-style-type: none"> <li>• the Netherlands;</li> <li>• Switzerland;</li> <li>• Malaysia and</li> <li>• Hong Kong.</li> </ul> <p>With regard to collateral arrangements, the following jurisdictions are relevant:</p> <ul style="list-style-type: none"> <li>• the U.S. as the issuer of U.S. treasury securities, and the location of the custodian for U.S. treasury and French and German government securities;</li> <li>• Japan as the issuer of, and the location of the custodian for, Japanese government bonds;</li> <li>• France as the issuer of French government securities;</li> <li>• Germany as the issuer of German government securities;</li> <li>• Singapore as the issuer of Singapore government securities and the location and place of incorporation of SGX-DC.</li> </ul> <p><b>The legal basis for each material aspect</b></p> <p>SGX-DC's legal framework consists of three components:</p> <p>(a) statutory and regulatory requirements as contained in the SFA, in particular part III on clearing facilities, the Companies Act, the Banking Act, the Bankruptcy Act, and the SF(CF)R;</p> <p>(b) contractual obligations, i.e., contractual agreements between SGX-DC and each clearing member, and between each clearing member and another clearing member.<sup>28</sup> The contractual agreements between SGX-DC and its clearing members include:</p> <ul style="list-style-type: none"> <li>• the SGX-DC clearing rules and the associated directives and circulars;</li> <li>• contract between SGX-DC and the clearing member;</li> <li>• contract specifications of derivative contracts; and</li> <li>• a security deed, which, among other things, creates a security interest over the cash collateral and securities collateral of the clearing member and for settlement by clearing members, a LOU issued by the settlement bank of a clearing member, which is an undertaking to act on instructions received from SGX-DC to transfer amounts between such clearing member's</li> </ul>
--	--

<sup>28</sup> Section 72 of the SFA provides that the business rules of SGX-DC are deemed to be a contract between each clearing member and every other clearing member

	<p>account and certain designated accounts; and</p> <p>(c) common law (i.e., laws of contract, credit and security, trusts and equity).</p> <p>The legal framework combines to create a high degree of legal certainty in SGX-DC's clearing activities in all relevant jurisdictions. The SFA and SF(CF)R regulate the establishment and amendment of the SGX-DC clearing rules and in Singapore, statute confers further protection as to the enforceability of the SGX-DC clearing rules—section 72(1)(b) of the SFA provides that the SGX-DC clearing rules operate as a binding contract between SGX-DC and each participant; and section 73 of the SFA provides that the Singapore High Court may make an order directing the participant to comply, observe or give effect to the SGX-DC clearing rules. Singapore statutory law also provides that the clearing rules shall have precedence in insolvency proceedings. Section 81F of the SFA provides that market contracts, the disposition of property pursuant to a market contract, the provision of market collateral and market charges (including certain transactions relating thereto) shall not be invalid by reason of inconsistency with the insolvency law. It also provides that a court applying the insolvency law shall not interfere with the clearing rules or proceedings or other actions taken under those clearing rules. The insolvency of a clearing member will therefore not disrupt the enforcement of the rules and the clearing and settlement of transactions under these rules, including any applicable collateral, netting and set-off arrangements.</p> <p><b>Provisions relating to novation arrangements</b></p> <p>The SGX-DC clearing rules (rule 7.04) provide for novation between SGX-DC and its clearing members through rules setting out when SGX-DC will assume the position of the selling clearing member to the buying clearing member, and when SGX-DC will assume the position of the buying clearing member to the selling clearing member, thereby becoming the central counterparty.</p> <p><b>Provisions relating to settlement finality, netting and set-off arrangements</b></p> <p>Singapore statutory law provides that the clearing rules shall have precedence in insolvency proceedings. Section 81F of the SFA provides that market contracts, the disposition of property pursuant to a market contract, the provision of market collateral and market charges (including certain transactions relating thereto) shall not be invalid by reason of inconsistency with the insolvency law. It also provides that a court applying the insolvency law shall not interfere with the clearing rules or proceedings or other actions taken under those clearing rules. The insolvency of a clearing member will therefore not disrupt the enforcement of the rules and the clearing and</p>
--	--

settlement of transactions under these rules, including any applicable collateral, netting and set-off arrangements. The SGX-DC clearing rules provide for settlement finality between SGX-DC and clearing members through rules setting out the final settlement point of payment obligations and placement of collateral between clearing members and SGX-DC, including rules pertaining to settlement, settlement variation, debit and credit balances, and margins. This is given legal effect by section 81F of the SFA which prevails over bankruptcy rules in the event of inconsistency.

Section 88(1) of the Bankruptcy Act provides that all mutual debts arising out of obligations incurred by a Singapore-incorporated company prior to the making of a winding-up order must be set-off.

Section 81H of the SFA provides that in the event of a clearing member's default, upon SGX-DC's conclusion of any default proceedings, SGX-DC shall certify the net sum payable by or to the defaulted clearing member. Section 81I further provides that any such net sum shall be taken into account during bankruptcy or winding up procedures or payable to the relevant office holder.

The clearing rules provide for netting and set-off arrangements. Rule 7.18 provides that SGX-DC may at any time consolidate accounts of a clearing member and set-off and/or transfer and/or apply any funds in such accounts to satisfy any liabilities of the clearing member towards SGX-DC.

Rule 7.10 provides that SGX-DC will produce a recap ledger for each clearing member, which will specify the net settlements and the net debit or credit balances for the day.

SGX-DC is not a designated system under the PS(O)A as it is not regulated as a payment system.

#### **Provisions relating to collateral arrangements**

Section 81M of the SFA provides that the application by SGX-DC of market collateral cannot be affected by other interests.

In relation to collateral arrangements, the SGX-DC clearing rules act as the primary contract between SGX-DC and each of its participants, and are further complemented by the security deed. The security deed, among other things, creates a security interest over the cash collateral and securities collateral of the clearing member. SGX-DC has obtained legal opinions to ensure that its security interests have been properly attached and perfected in the relevant jurisdictions.

Clearing members' and their customers' collateral placed with SGX-DC are held on trust (contractually and in accordance with section 62 of the SFA, respectively) by SGX-DC for the clearing member and/or their customers. This allows customers' collateral to generally fall outside of the pool of assets available for distribution during the insolvency of a clearing member or SGX-DC.

#### **Provisions relating to interoperability**

The existing link established by SGX-DC with another FMI is the MOS link with the CME. Chapter 8 of the SGX-DC clearing rules sets out the MOS link provisions with respect to participating members. SGX-DC and the CME have concluded an agreement, setting out their respective rights and obligations. The agreement is governed by the laws of the State of New York, U.S.

#### **Provisions relating to the rights, interests and obligations of SGX-DC, its clearing members and their customers**

The clearing rules provide for SGX-DC's and its participants' rights and interests in the event a clearing member defaults on its obligations to SGX-DC as follows:

- SGX-DC has the powers to use the assets which are deposited by clearing members to meet their financial requirements in case of that clearing member's default (SGX-DC clearing rules 2.07C.3 and 2.08.4).
- Rule 7A.02.1 provides that when a clearing member has defaulted on its obligations to SGX-DC, SGX-DC may, inter alia, transfer the clearing member's positions in customer contracts to a designated clearing member.
- Rule 7A.02.1.1 enables the transfer of margins and settlement monies when a defaulted clearing member's positions in customer contracts are transferred to a designated clearing member. If margins and settlement monies are not transferred, Rule 7A.02.1.1 provide that the designated clearing member shall be required to collect margins and settlement monies from the customer.
- Rule 7A.05 provides that where a clearing member has failed to promptly discharge any of its obligations to SGX-DC, SGX-DC has the right, subject to conditions in the SFA being satisfied, to apply security, margins, collateral, cash or government securities (where applicable) of the defaulted clearing member.
- Rule 7A.06 and 7A.01A.2 provide SGX-DC with the right to establish and maintain a clearing fund comprising of contributions from SGX-DC and its clearing members and to use the clearing fund to compensate all losses suffered by SGX-DC arising from the default of a clearing member.
- Rule 7A.07 provides for SGX-DC's and its participants' rights and interests in

	<p>the event SGX-DC defaults on its obligations to clearing members.</p> <p>The parts of SGX-DC's recovery and resolution plan that relate to default proceedings (e.g. use of margins and replenishment of clearing fund) as articulated under the clearing rules will also take precedence over insolvency laws. A legal opinion has been obtained which verifies the enforceability of such arrangements under Singapore law.</p> <p><b>Enforcement in different jurisdictions</b></p> <p>If a foreign bank clearing member becomes insolvent or if a foreign bank clearing member commences insolvency proceedings against SGX-DC in a foreign jurisdiction, the insolvency laws of the foreign jurisdiction will apply.</p> <p>In that case, there is a potential risk that the foreign insolvency laws may affect SGX-DC's rights over the collateral or netting and set-off arrangements. This risk is considered small and sufficiently mitigated by the following factors:</p> <ul style="list-style-type: none"> <li>• SGX-DC has assessed, based on legal opinions received, that its security interest over the collateral that it holds has been properly attached and perfected in the relevant jurisdictions, and any order made by a foreign court in connection with any insolvency proceedings is unlikely to affect its rights over such collateral, regardless of whether such collateral is held in Singapore or in a foreign jurisdiction.</li> <li>• Each of the foreign-incorporated bank clearing members has a Singapore branch which is regulated by MAS under the Banking Act and subject to the requirements under the Banking Act.</li> <li>• In any event, any order obtained in the foreign jurisdiction against SGX-DC in connection with any insolvency proceedings will likely need to be enforced in Singapore, through the Singapore courts. Section 81O of the SFA provides that a Singapore court shall not recognize or give effect to a foreign order if such order would be prohibited by section 81F of the SFA. SGX-DC has further obtained a legal opinion which concludes that a foreign judgment that would not have been permitted under section 81F of the SFA is not likely to be enforced.</li> </ul> <p>Another relevant risk is that if the order obtained in the foreign jurisdiction relates to collateral held in a foreign jurisdiction, such order will be enforced in the foreign jurisdiction where the collateral is held (i.e., the U.S. or Japan). In those circumstances, the collateral that SGX-DC holds in that foreign jurisdiction may be at risk. SGX-DC has assessed that this risk is small for the following reasons:</p> <ul style="list-style-type: none"> <li>• SGX-DC deems it unlikely that any foreign court would make an order affecting SGX-DC's collateral rights.</li> </ul>
--	--

- As an additional safeguard, when admitting a foreign-incorporated clearing member, SGX-DC requires such clearing member to provide information on the insolvency regimes applicable to them through a questionnaire. Based on the responses to such questionnaires and/or relevant legal opinions, SGX-DC conducts internal analyses on the legal risks relating to enforceability of its collateral, netting and set-off arrangements and has determined to-date that such risks are sufficiently mitigated and managed.

Further, SGX-DC is in the process of applying for a registration with the U.S. CFTC as a derivatives clearing organization (DCO) and will further be applying for recognition with the ESMA as a third country CCP. In connection with these applications, SGX-DC has obtained independent legal opinions on the application of the insolvency regimes in the U.S. and the EU in relation to SGX-DC's clearing arrangements in the event of a clearing member's or SGX-DC's insolvency. On the basis of the applications, the applicable legal opinions and SGX-DC's internal assessment, SGX-DC's U.S. and EU incorporated clearing members would not introduce additional risks to SGX-DC's collateral arrangements.

Recognition by the CFTC and ESMA may provide additional layers of protection as follows:

- SGX-DC may have U.S.-incorporated clearing members that are futures commission merchants registered with the CFTC. In the event of the insolvency of a futures commission merchant, it will be subject to the U.S. Bankruptcy Code which provides protection for the exercise of termination, netting and collateral remedies with respect to commodity contracts and swap agreements. To qualify for such protection, among other things, SGX-DC needs to qualify as a commodities broker. With registration as a DCO, SGX-DC qualifies as a commodities broker and its right to enforce netting, set-off and collateral arrangements for futures and swaps will be protected in the event of a FCM's insolvency.
- The U.S. Federal Deposit Insurance Corporation Improvement Act of 1991 will apply if SGX-DC is registered as a DCO. The Act specifically recognizes the enforceability of termination and netting provisions and related security arrangements as between a clearing organization and its members following the failure of a member (subject to some limited exceptions). SGX-DC as a DCO will be able to enforce its netting, set-off and collateral arrangements in the event of a member's insolvency.
- SGX-DC's dealings with EU-incorporated clearing members are subject to the modifications to insolvency laws provided by the EU Financial Collateral Directive. The effect of the modifications provided by the Financial Collateral Directive are such that in an insolvency of an EU-incorporated clearing member, insolvency legislation is dis-applied insofar as they would restrict the rights of SGX-DC to enforce its security under its collateral arrangements. SGX-DC's collateral arrangements will be able to take effect notwithstanding an insolvency event and SGX-DC's rights of use over collateral would continue to

	apply.
<p>Key Consideration 2</p> <p>An FMI should have rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations.</p>	<p>The clearing rules are published on the SGX's corporate website (<a href="http://www.sgx.com">http://www.sgx.com</a>) and are accessible to the public. All other relevant documentation is made available to a participant that joins as a clearing member.</p> <p>The clearing rules are supplemented by directives, practice notes and circulars that help to clarify the intention behind the clearing rules, or to provide further directions to clearing members with regard to the clearing rules and relevant procedures.</p> <p>The clearing rules (and any amendment thereto) are formulated to address any concerns the clearing members or the public may have, which in turn reduces uncertainty and misinterpretation of the clearing rules.</p> <p>Pursuant to regulation 22(2) of the SF(CF)R, SGX-DC consults its clearing members in respect of all rule amendments unless such amendment has a limited impact on the clearing members. To assess such impact, SGX-DC considers the effect the amendments may have on the rights, obligations, operations and systems of each clearing member. Even where such impact has been determined as being limited, SGX-DC will generally still conduct a closed or informal consultation.</p> <p>SGX-DC conducts a public consultation on any amendment that may affect the interests of the general investing public. If a public consultation is conducted, the public consultation document will be posted on SGX's website between 10 days to 1 month, with an accompanying press release being issued.</p> <p>Although not mandatory, SGX-DC engages in informal discussions with clearing members at the stage when an amendment is being proposed to solicit feedback. SGX-DC will provide responses to such feedback and either publish the same on its website or circulate the same to the affected clearing members.</p> <p>SGX-DC ensures that its rules, procedures, and contracts are consistent with relevant laws and regulations. Pursuant to section 71 of the SFA, SGX-DC makes provisions in its clearing rules for any matter that MAS may prescribed. Pursuant to regulation 22 of the SF(CF)R, proposed amendments to the clearing rules are notified to MAS before they are made where MAS has the power to disallow, alter or supplement the proposed amendment. Amendments disallowed by MAS will not be implemented and proposed amendments altered or supplemented by MAS will be implemented as altered or supplemented.</p>

	<p>Where SGX-DC introduces rules, procedures or contracts relating to collateral arrangements, set-off or netting arrangements, or other arrangements to be enforced upon a default or insolvency of a clearing member or SGX-DC itself, SGX-DC conducts the necessary legal analysis and, where required, obtains legal opinions to ensure that the same are consistent and enforceable under Singapore law.</p>
<p>Key Consideration 3 An FMI should be able to articulate the legal basis for its activities to relevant authorities, participants, and, where relevant, participants' customers, in a clear and understandable way.</p>	<p>The legal basis for SGX-DC's activities is further articulated in its public consultation documents as well as in presentations and meetings with participants and/or their customers. SGX-DC also releases statements to the press from time to time to aid in public understanding of the legal basis.</p> <p>SGX-DC articulates the legal basis for its activities to MAS in various rationale documents and information papers. In applying for registration with the CFTC as a DCO and for recognition with ESMA, SGX-DC has articulated and will articulate its legal basis in its draft applications.</p> <p>Where appropriate, SGX-DC shares the existence of relevant legal opinions and the outcomes with appropriate recipients in an effort to promote confidence among participants and transparency in the system.</p>
<p>Key Consideration 4 An FMI should have rules, procedures, and contracts that are enforceable in all relevant jurisdictions. There should be a high degree of certainty that actions taken by the FMI under such rules and procedures will not be voided, reversed, or subject to stays.</p>	<p><b>Enforceability of rules, procedures and contracts</b></p> <p>The enforceability of the clearing rules is protected in the manner set out in Key Consideration 1. Section 72(1)(b) of the SFA provides that the rules operate as a binding contract between SGX-DC and each participant. Section 73 of the SFA provides that the Singapore High Court may make an order directing the participant to comply, observe or give effect to the rules.</p> <p><b>Degree of certainty for rules and procedures</b></p> <p>SGX-DC achieves a high degree of certainty that its rules, procedures and contracts will not be voided, reversed, or subject to stays.</p> <p>So far, there has not been a court in a relevant jurisdiction that has failed to enforce SGX-DC's activities or arrangements.</p>
<p>Key Consideration 5 An FMI conducting business in multiple jurisdictions should identify and mitigate the risks arising from any potential conflict of laws across jurisdictions.</p>	<p>SGX-DC has identified two areas in which its activities give rise to potential conflict of laws issues and require consideration of foreign legal frameworks:</p> <ul style="list-style-type: none"> <li>• the perfection of security interest in collateral; and</li> <li>• the enforceability of SGX-DC's clearing arrangements in the event that insolvency proceedings are commenced in a foreign jurisdiction.</li> </ul> <p>Potential conflict of laws issues arising from these areas have been analyzed and addressed and independent legal analyses, as described in Key Consideration 1.</p>

	In addition, SGX-DC's internal control guidelines stipulate that no cross border activities should be undertaken by SGX-DC unless authorized in accordance with the guidelines.
Key Conclusions for Principle 1	<p>SGX-DC has a sound legal basis for its clearing activities and the enforceability of related rights and obligations are established with a high degree of certainty. The SFA, SF(CF)R and the SGX-DC rules govern sufficiently the novation and collateral arrangements, interoperability and default procedures. The SFA provides for a firm statutory foundation for finality, netting, set-off and closing out of positions. There's a high certainty that the rules, procedures and contracts are enforceable in the Singapore and foreign jurisdictions. SGX has identified and mitigated potential conflict of laws issues concerning the admittance of non-local clearing members as well as the use of collateral issued by US, European and Japanese governments.</p> <p>The global regulatory reforms related to OTC derivatives clearing and reporting may however expose SGX-DC to legal risk due to conflicts of laws, in particular the U.S. and EU laws.</p>
Assessment of Principle 1	Observed
Recommendations and Comments	The MAS is encouraged to continue its efforts to mitigate cross-border regulatory risks, in close cooperation with foreign authorities.

**For Principle 2 on governance please refer to the detailed assessment of Principle 2 for the CDP CCP.**

### Principle 3. Framework for the Comprehensive Management of Risks

An FMI should have a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

Key Consideration 1	<b>Risks that arise in or are borne by the FMI</b>
An FMI should have risk-management policies, procedures, and systems that enable it to identify, measure, monitor, and manage the range of risks that arise in or are borne by the FMI. Risk-management frameworks should be subject to periodic	<p>SGX-DC is exposed to the following risks:</p> <ul style="list-style-type: none"> <li>• Credit and liquidity risks of clearing members, their trading members and customers, and linked FMIs, currently only CME, arising from clearing and settlement obligations.</li> <li>• Credit and liquidity risks of settlement banks arising from (i) settlement between SGX-DC and clearing members (ii) guarantee of clearing members' payments.</li> <li>• Credit and liquidity risks of commercial banks holding margin monies and default fund contributions that SGX-DC receives from its clearing members.</li> </ul>

review.	<ul style="list-style-type: none"> <li>• Custody risks of custodian banks holding non-Singapore government securities as collateral on behalf of clearing members with SGX-DC</li> <li>• Custody risk for Singapore government securities or SGX-listed securities held at CDP.</li> <li>• Non-clearing credit and liquidity risks of commercial banks holding SGX-DC's cash.</li> </ul> <p>Other risks SGX-DC has identified are:</p> <ul style="list-style-type: none"> <li>• Operational risks, including business continuity risks, outsourcing of technology management, and services provided by external suppliers.</li> <li>• Technology risks, including system stability and security issues.</li> <li>• Legal risks, e.g., inadequate rights to collateral or to enforce members' compliance in normal and stressed conditions.</li> <li>• Reputation risks, e.g., from questions on SGX-DC's efficiency, safety, and judgment.</li> <li>• Regulatory risks, pertaining to the failure to meet regulatory standards, or requirements.</li> <li>• Staffing risks, focusing on employee retention and skill gap issues.</li> <li>• Fraud risks, encompassing the unlikely instances of corruption and asset misappropriation.</li> <li>• Competition risks, pertaining largely to the lack of product and membership growth vis-à-vis other competitors.</li> </ul> <p>SGX-DC has identified the following risks that it poses to its clearing members and its clearing members' customers:</p> <ul style="list-style-type: none"> <li>• Risk that clearing members' contribution to the default fund is utilized in a default of another clearing member.</li> <li>• Risk that SGX-DC may not return collateral in a timely manner arising from failure at a commercial or custodian bank holding the collateral; and risk that SGX-DC will require the member to put up fresh collateral because the original is inaccessible, which may lead to a member default.</li> <li>• Liquidity risk from delayed settlement arising from disruption to SGX-DC's clearing and settlement operations.</li> <li>• Risk of SGX-DC default, resulting in unsettled transactions, loss or inaccessibility of collateral held by SGX-DC, inability to manage positions and market instability.</li> </ul>
---------	--

	<p><b>Risk management policies, procedures and systems</b></p> <p>SGX has a comprehensive risk management framework to manage the risks that it has identified. Key components of the risks management framework are:</p> <ul style="list-style-type: none"> <li>• A governance structure</li> <li>• SGX ERM framework</li> <li>• SGX-DC CCP risk management framework</li> <li>• SGX operational risk management framework</li> <li>• Other risk policies, procedures and manuals</li> <li>• Systems</li> </ul> <p><b>Governance structure</b></p> <p>SGX has established a risk governance structure to provide oversight and management of risks and to ensure that responsibilities and accountabilities are clearly defined (see Appendix 2). Detailed information is provided in Principle 2.</p> <p>Key players in SGX governance structure are:</p> <ul style="list-style-type: none"> <li>• SGX board, which is responsible for the establishment of the RMC and the approval of the key risks and risk tolerance.</li> <li>• The RMC, which is responsible for the review and approval of the type and level of business risks (risk appetite) that SGX undertakes on an integrated basis to achieve its business strategy. It also approves frameworks and policies for managing risks that are consistent with SGX's risk appetite.</li> <li>• The RCC, which is accountable to the SGX board for the arrangements and decisions to address any perceived or actual conflict of interest between SGX's regulatory responsibilities and commercial interests.</li> <li>• The EXCO, which exercises executive decision powers over risk matters. EXCO also plays a central role in the review of key risk management policies submitted to the RMC for approval. Accountability for risk propagates down to function heads, which are responsible for enterprise-wide risks that come under their purview and for their functional risks.</li> <li>• The ERC is a management committee established by the EXCO to address risk issues. Its primary function is to take a holistic view that risks are being managed by appropriate functions, monitored and reported.</li> <li>• The risk management and regulation group consists of the units that operate under the EXCO, i.e., the risk management unit, clearing risk unit, member supervision and regulatory policy and development unit.</li> </ul>
--	--

- The internal audit and compliance unit are two independent units also involved in the risk management governance structure. Compliance identifies the key regulatory requirements and rates them in accordance with the RSA methodology for risk impact, risk probability, control design and control effectiveness.

### ***SGX ERM framework***

The ERM Framework is an overall framework of SGX for the identification, measuring, monitoring and management of risks. This addresses legal, credit, liquidity, operational and other risks, such as general business risk. The framework sets the tone from the top regarding risk culture, governance and risk appetite.

The key risks, which have enterprise-wide implications at SGX are identified annually and are reported to the SGX board and RMC. The cascading of risk identification and accountability from the SGX board level down the risk governance hierarchy to the functional unit level provides for the management of key risks, via existing controls or additional action plans. The key risks for FY2013 include default risks, technology risks, and regulatory risks, operational risks, reputation risks, competition risks, fraud risks and staffing risks.

At the start of each financial year the risk management unit works with the EXCO to identify SGX's key risks. The annual exercise involves various focus groups and brainstorming sessions with both EXCO and function heads, such that all relevant internal developments and external market and environmental changes are taken into account. Where appropriate, external consultants are appointed to assist with this exercise. These key risks are then cascaded into component risks for which risk owners at EXCO level are identified. Component risks are further broken into risks to be owned by various function heads for greater granularity.

The specific risk areas are managed by the respective risk owners in accordance with the overarching risk policies delineated in the ERM framework. These risk owners establish the necessary frameworks, policies, and procedures to manage the risks, allowing for decentralized risk management by the parties with the relevant expertise.

As part of this annual risk assessment exercise the risk management unit works with the various risk owners to identify risk tolerance thresholds and KRIs. KRIs measure adherence to risk tolerance levels in each area that is being monitored. Risk owners monitor the relevant functions' performance against these KRIs.

In addition to the above top-down approach, in a separate bottom-up RSA process, the risk management unit assists and facilitates the various functions

	<p>within SGX to identify risks within their functions. All SGX functions appoint a 'risk champion.' The risk management unit works closely with the risk champion and functional head to identify risks within each function.</p> <p>At the end of the RSA process, the risks, controls and action plans are recorded in the enterprise risk assessor system (the same platform as used for key risks) for centralized tracking. The risk champions within each function are accountable to monitor that the action plans are applied and that the risks are prudently mitigated and managed.</p> <p><b><i>SGX-DC risk management framework</i></b></p> <p>As a CCP, the key risk faced by SGX-DC is direct counterparty credit risk, resulting from exposures to its clearing members, and indirect counterparty credit risk to its trading members and their customers. In line with its need to ensure high resilience and very low probability of any failure/losses to the system, the SGX-DC risk management framework, and the accompanying policies and procedures, deal with the management of these risks.</p> <p>The framework includes various risk management tools and processes to address counterparty credit and liquidity risks, i.e., risk governance, robust legal basis, stringent member requirements, policies for limits, margin, collateral requirements, default fund and default procedures.</p> <p>The risk management unit, clearing risk unit, and the member supervision unit engage in risk policy formulation, obtaining the necessary EXCO, RMC, board and MAS approvals before the policies are implemented. They monitor participants' compliance with the risk management requirements to identify the potential inability of a participant to meet its obligations and take appropriate action.</p> <p>The division of roles between the risk management unit and the clearing risk unit entails dual control structure with the clearing risk unit developing risk models for margining, stress testing and collateral valuation and the risk management unit providing initial validation and annual review.</p> <p><b><i>Framework of management of SGX operational contingencies</i></b></p> <p>This framework consists of a set of contingency policies and plans in place, consolidated under an overarching framework for management of SGX operational contingencies.</p> <ul style="list-style-type: none"> <li>• SGX ORM policies and guidelines: over-arching framework that defines SGX's overall strategy to ensure continuity in business operations by minimizing the impact of disruptions. Key elements are (i) developing crisis management procedures and business continuity plans, business impact analysis and IT DRPs to facilitate timely resumption of business operations after any</li> </ul>
--	---

	<p>disruption; and (ii) conducting regular tests to validate the adequacy of the plans.</p> <ul style="list-style-type: none"> <li>• IT DRP and incident management procedures: seeks to minimize the impact of a disruption on SGX's critical applications by identifying critical applications, and recovery plans; and conducting regular tests to validate the adequacy of the plans.</li> <li>• Default management framework: codifies a structured approach to the management of a default by one or more clearing members.</li> <li>• Suspension of clearing and settlement policy: provides guidance on suspension of clearing activity when it is no longer prudent for clearing and settlement to continue.</li> <li>• Market closure policy: sets out key considerations for the closing of SGX-DT.</li> </ul> <p><b>Other risk frameworks, policies, and procedures</b></p> <p>In addition to the ERM and the CCP risk management framework SGX-DC has developed dedicated frameworks, policies and procedures for specific types of risk:</p> <ul style="list-style-type: none"> <li>• Risk limit policy: addresses counterparty credit risk and market risk beyond the scope of the SGX-DC risk management framework, which addresses risks from clearing members and their customers. The policy specifies limits for bank counterparties and custodians. It also specifies market risk limits.</li> <li>• Liquidity risk management framework: provides the overarching policy for managing SGX's liquidity risk arising from the clearing and settlement functions of SGX's clearing house subsidiaries, namely SGX-DC and CDP.</li> <li>• Technology management framework: the SGX technology unit established a set of IT management policies that set out overarching principles to be reflected in all other technology guidelines, controls and procedures. Key areas are IT management policies and controls and the IT security policy.</li> <li>• SGX outsourcing policy: governs all outsourcing engagements undertaken by SGX.</li> <li>• Incident management: covers communications of incidents to external stakeholders (MAS) and internal stakeholders (EXCO, audit committee).</li> </ul> <p><b>Systems</b></p> <p>Three risk management systems are operated by SGX and SGX-DC:</p> <ul style="list-style-type: none"> <li>• Risk management system</li> </ul> <p>The risk management system measures risk exposures to clearing members. It receives information on new positions intraday and end-of-</p>
--	--

	<p>day from three sources: i) SGX-DT ii negotiated large trades and OTC commodity trades that are reported for clearing via SGX's OTC trade registration platform; and iii) trade reporting system for OTC financial products.</p> <p>The risk management system has a direct overview of positions, as soon as the information on outstanding positions is uploaded, allowing the generation of stress testing and other reports</p> <p>The system also receives collateral held and margins required at clearing member level intra-day, and at the end of each day. In terms of the more static data, the system receives periodic updates and more frequently in some cases, of clearing members' financial resources and available credit facilities for comparison against exposures. Risk measures are compared against early warning and risk thresholds and exceptions are highlighted.</p> <p>SGX is developing a new multi-asset risk management system that will receive positions of both SGX-DC and CDP, including individual positions for OTCF, so that risk exposure of common clearing members can be aggregated automatically across all asset classes and both clearing houses.<sup>29</sup></p> <ul style="list-style-type: none"> <li>• Aggregation of exposures to commercial banks</li> </ul> <p>The system contains exposures to commercial banks that include exposures following the settlement process, placement of collateral for margin and default fund, and the deposit of SGX's (including SGX-DC's) own cash holdings.</p> <ul style="list-style-type: none"> <li>• Enterprise risk assessor system</li> </ul> <p>System that records and supports monitoring of the risks, controls and action plans that results from the ERM activities.</p> <p>Majority of the risk reports are generated in the risk management systems automatically. Some reports are Microsoft Excel based and automated using Excel macros.</p> <p><b>Review of risk management policies, procedures and systems</b></p> <p>The risk management and clearing risk units have in place a process to review</p>
--	---

<sup>29</sup> Phase 1 for this new risk management system project is at the stage of user acceptance testing. Implementation is scheduled for Q4 2013.

	<p>and update risk management policies, procedures, models and bank counterparty risk limits annually, and sooner if conditions so require. In reviewing the risk policies and models, the risk management and clearing risk units take into account material changes to members' portfolio composition, historical market experience, forward-looking market indicators and other relevant factors.</p> <p>The most recent ERM review was completed in June 2012, with the assistance of external consultants. The revised framework was approved by the RMC in July 2012, and provided to MAS in August 2012.</p>
<p>Key Consideration 2</p> <p>An FMI should provide incentives to participants and, where relevant, their customers to manage and contain the risks they pose to the FMI.</p>	<p><b>Information provision by SGX-DC to clearing members</b></p> <p>SGX-DC and SGX-DT provide clearing members and trading members with information to facilitate their management of credit and liquidity risks:</p> <p><b>Provision of transaction information and checks</b></p> <p>SGX-DT provides a real-time feed of matched trades to trading members. This comprises trading members' own trades and trades of their customers. SGX-DC clearing members that clear for trading members receive a drop copy of the trading member's feed. SGX-DC clearing members also receive information on OTC commodity derivatives registered for clearing. Each trade notification carries the account's new open position in that contract facilitating aggregation of risk.</p> <p>Pre-trade risk control capability in SGX-DT's trading engine allows SGX-DC clearing members to set pre-trade limits for their customers and trading members at the exchange level.</p> <p>For OTC commodity derivatives, SGX-DC's trade registration system performs the pre-execution checks based on position and margin limits maintained by the clearing member for each account. Trades are also checked against price bands, updated by SGX-DC based on regular volatility studies.</p> <p>For OTCF contracts, clearing members receive the trade notification and other status updates from the third-party's trade registration system, MarkitSERV, once the trades have been novated. For an OTCF trade to be accepted by SGX-DC for clearing, the OTCF clearing system validates that sufficient collateral has been placed with SGX-DC to cover the new exposure before trades can be novated by SGX-DC.</p> <p><b>Provision of clearing reports</b></p> <p>SGX-DC provides clearing members with the following information/reports which they can apply in their risk management:</p>

- A SPAN file is provided three times intra-day and at the end-of-day for exchange traded and OTC commodity contracts containing margin rates and mark-to-market prices.
- For OTC commodity transactions participants receive information via the transaction reporting system that transactions has been novated.
- For margining of OTCF contracts, SGX-DC provides clearing members with a margin calculator application.
- Clearing members have online access to SGX's collateral management system COSMOS.
- Reports detailing the collateral posted.
- Reports following each clearing cycle detail clearing information.
- For OTCF, SGX-DC provides hourly reports that show the clearing members their overall margin requirement including for trades pending novation.
- Changes to margin rates are disseminated to clearing members via circulars two days before the effective change.
- Files and reports are delivered in real time to participants through the secure file transfer protocol.

#### **Incentives**

SGX-DC has the following incentives in place for participants and their customers to monitor and manage the risks they pose to SGX-DC:

#### ***Disciplinary and corrective actions***

SGX-DC's disciplinary sanctions range from warnings, financial penalties to a charge brought before SGX's disciplinary committee which deals with disciplinary matters in relation to members of SGX-DT and SGX-DC. Depending on the severity of the breach, disciplinary actions could include expelling or suspending the member, imposing a fine on the member, publicly or privately reprimanding the member, imposing restrictions or conditions on member and requiring a director to step down from day-to-day conduct of the business affairs of the member. In addition to the disciplinary committee, an appeals committee is available comprising market representatives and legal experts. The rationale for the decisions are published on the SGX website.

While disciplinary actions do not directly apply to customers, SGX-DC may impose requirements on the member in relation to the customer.

#### ***Requirements to timely meet settlement and margin call obligations***

SGX may charge clearing members before the disciplinary committee in case of

	<p>late payments related to settlement and margining obligations. While there has not been a late payment case for SGX-DC, CDP brought two clearing members before the disciplinary committee for repeated late payments in 2005 and 2008. Fines were imposed by the disciplinary committee in both cases.</p> <p><b><i>Risk-sensitive contributions to the default fund</i></b></p> <p>SGX-DC's loss sharing arrangements are proportionate to the risk exposures clearing members bring to the system. Specifically, the clearing members' securities deposit contribution to the default fund, and further assessment, scale with their margin requirement.</p> <p><b>Design of policies and systems</b></p> <p>In designing policies and systems, SGX-DC consults its clearing members and relevant industry participants. Public consultation is conducted if the project entails rule amendments.</p> <p>SGX-DC ensures that its policies and systems are relevant and effective over time through day-to-day monitoring of clearing members, based on early warning and periodic information submitted and member self-assessments, supported by inspections and compliance visits. In addition, experience from handling market crises such as the Lehman and MF Global incidents will be taken into consideration in the design of SGX-DC's policies and systems as appropriate.</p>
<p>Key Consideration 3</p> <p>An FMI should regularly review the material risks it bears from and poses to other entities (such as other FMIs, settlement banks, liquidity providers, and service providers) as a result of interdependencies and develop appropriate risk-management tools to address these risks.</p>	<p><b>Material risks</b></p> <p><b><i>Interdependencies banks, custodians and liquidity providers</i></b></p> <p>To limit the impact of disruptions from dependencies on settlement banks, SGX performs due diligence on the banks prior to admission, and will only admit banks which meet SGX's admission criteria.</p> <p>SGX monitors and manages its exposures to the banks. In addition to daily monitoring against a set of risk exposure limits the risk management unit performs daily monitoring of all bank counterparties, including custodian banks and liquidity providers. Daily monitoring cover various aspects, such as overall market movements, as well as adverse developments, such as SGX internal escalation of issues, adverse media coverage, widening of credit default swap spreads, share price, and credit rating warnings or downgrades which may impact the credit standings of the counterparty.</p> <p>Credit line facilities are obtained from banks with Moody's bank financial strength rating of at least C. SGX conducts exercises with its banks to test-run the actual drawing down of its committed credit lines and has an existing</p>

	<p>default liquidity management SOP in place.</p> <p>For a participant who plays multiple roles in the clearing and settlement process, its risk exposure in each role is monitored individually in accordance with the related risk management framework and limits, and are aggregated to be monitored against a set of alert levels for review.</p> <p><b><i>Dependency on Service Provider HCL for Technology Infrastructure Management</i></b></p> <p>For the IT infrastructure outsource service provider HCL the SGX technology function has robust controls to ensure the service provider meets the defined outsourcing objectives stated in the engagement. The following controls are in place:</p> <ul style="list-style-type: none"> <li>• The CIO reviews the monthly service levels and discusses any areas of concern, improvements and accomplishments with HCL senior management.</li> <li>• The executive steering committee of HCL and SGX discuss the financial health of the respective companies, the engagements, market conditions, improvements and issues that were escalated to the ESC.</li> <li>• The HCL support to SGX is located both onsite and offshore, with the offshore more used as a command centre to manage SGX's operations. SGX manages the HCL operations through a defined engagement management structure which includes appropriate escalations.</li> <li>• A service level agreement is in place regarding HCL's services. HCL's performance is measured using service levels. If HCL does not perform properly, service level credits are applied.</li> </ul> <p>Further details are provided in Principle 17.</p> <p><b>Risk management tools</b></p> <p>SGX has established plans and procedures for coordination with affected entities in case of the default of a clearing member. The plans describe how to coordinate necessary actions with and disseminate all relevant information to other clearing members and financial institutions impacted as a result. SGX will also coordinate with MAS and provide updates to the press and public.</p> <p>SGX participates in the periodic financial industry crisis management exercise conducted by the association of banks in Singapore (ABS) and MAS. Previous tests have demonstrated SGX's ability to coordinate with other entities in a crisis situation.</p>
<p>Key Consideration 4 An FMI should identify</p>	<p><b>Scenarios that may prevent an FMI from providing critical operations and services</b></p>

<p>scenarios that may potentially prevent it from being able to provide its critical operations and services as a going concern and assess the effectiveness of a full range of options for recovery or orderly wind-down. An FMI should prepare appropriate plans for its recovery or orderly wind-down based on the results of that assessment. Where applicable, an FMI should also provide relevant authorities with the information needed for purposes of resolution planning.</p>	<p>SGX has identified the extreme scenarios which may potentially trigger the SGX-DC recovery and resolution plan. These fall into three main categories:</p> <ul style="list-style-type: none"> <li>• Systemic risk scenario of multiple defaults of members.</li> <li>• Business stress scenario of sustained low volumes.</li> <li>• Reverse stress testing scenario of the largest SGX-DC loss that SGX can absorb.</li> </ul> <p>These three categories of scenarios will be regularly reviewed as part of SGX's default and crisis management reviews and exercises simulating the default of an SGX-DC clearing member. The plans will be updated to incorporate new scenarios identified to keep the plans relevant.</p> <p><b>Recovery and orderly wind-down plans</b></p> <p>The recovery and resolution plan for SGX-DC is in an early stage of development. The recovery and resolution plan is intended to support the continued provision of critical operations and services in the event of a recovery or an orderly wind-down of operations. The time frame and associated operating costs of a recovery or orderly wind-down will depend on the underlying scenario and the recovery or resolution measures taken. It will be reviewed and refined going forward.</p> <p>Once SGX-DC enters the resolution stage, the MAS will be the Resolution Authority to oversee the implementation of the resolution plan by SGX-DC. Section 80A of the SFA provides for the power of MAS to appoint a statutory adviser for this purpose. The MAS also has powers under the MAS Act to impose a resolution regime on SGX-DC. The crisis management team of SGX-DC will work closely with MAS to implement any resolution measures as directed by MAS.</p>
<p>Key Conclusions for Principle 3</p>	<p>SGX uses an effective ERM framework to manage companywide risks and CCP related risks. The framework entails a top-down approach, with annual board decisions on risk types and limits, as well as bottom up assessments of divisions and units of the risks specific to their functions. The governance of SGX, its policies and systems support the enterprise risk framework. The key risks for 2013 include default, operational, regulatory, and competition risks.</p> <p>A recovery plan is available, which can be further developed. SGX has started to identify its critical operations as well as scenarios that may potentially prevent SGX-DC to continue operations.</p>
<p>Assessment of Principle 3</p>	<p>Broadly observed</p>

Recommendations and Comments	It is recommended to extend the number and nature of the scenarios considered in the recovery plan, going beyond the default of several clearing members. The scenarios may cover extreme but plausible events, such as the simultaneous default of more than one large banks that fulfill various roles to the CCP, such as settlement banks, liquidity providers but also custody services. In addition, reduced liquidity in supporting markets, such as the FX market may be considered. One of the strategies that SGX-DC may potentially consider for its OTCF clearing activities are loss-sharing arrangements that go beyond the current mutualization of the clearing fund.
------------------------------	---

#### Principle 4. Credit Risk

An FMI should effectively measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes. An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions.

<p>Key Consideration 1</p> <p>An FMI should establish a robust framework to manage its credit exposures to its participants and the credit risks arising from its payment, clearing, and settlement processes. Credit exposure may arise from current exposures, potential future exposures, or both.</p>	<p>SGX-DC's framework to manage credit exposures consists of:</p> <ul style="list-style-type: none"> <li>• Regulations, rules and policies;</li> <li>• Tools to identify measure, monitor and reduce the credit risk exposures;</li> <li>• A governance structure dedicated to handle the daily credit operations; and</li> <li>• Escalation tools and default procedures.</li> </ul> <p><b>Regulations, rules and policies</b></p> <p>SGX-DC's framework to manage credit risk is based on regulations and rules, in particular chapter 7 of the clearing rules and related practice notes as well as capital conditions imposed by MAS. Its framework is laid down in several policies of the credit risk function and the finance function.</p> <p>The requirement to post margins and collateral requirement for holdings of margin and clearing fund are documented in the SGX clearing rules chapter 7 (including the practice note). The capital conditions for SGX-DC as set out by the MAS are set out in the capital management policy and related procedures</p>
---	---

	<p>maintained by the finance function.</p> <p>SGX's stress test framework for ascertaining the size of clearing fund is documented in the clearing risk function's policy and SOP document repository. In addition, member's collateral requirements for clearing fund resources are stated in the SGX-DC clearing rules chapter 7.</p> <p>SGX-DC's margin framework for OTC financial derivatives products and margin framework for non-OTC financial derivatives products are documented in clearing risk function's policy and SOP document repository.</p> <p>All SGX-DC rules are available to the public on the SGX web-site and handbooks are available to SGX-DC clearing members. Any amendments to the rules or handbooks are updated accordingly. For any change to the clearing fund structure and/ or rules, SGX goes through a formal process of public consultation. The rules are then formulated upon the no objection of the MAS</p> <p><b>Tools</b></p> <p>SGX-DC uses the COSMOS, an electronic system, for clearing members to manage collaterals placed with SGX-DC. Validation rules are built into COSMOS to allow only permitted collaterals to be accepted into the system.</p> <p><b>Governance structure</b></p> <p>SGX-DC has developed governance arrangements for mitigating credit risk, involving the SGX board, CEO, EXCO and MAS as well as the head of the risk management function and the chief risk and regulatory officer.</p> <p><b>Escalation tools and default procedures</b></p> <p>SGX-DC has developed escalation tools and default procedures to manage crisis situations related to credit events, see Principle 13.</p>
<p>Key Consideration 2</p> <p>An FMI should identify sources of credit risk, routinely measure and monitor credit exposures, and use appropriate risk-management tools to control these risks.</p>	<p>SGX-DC is exposed to credit risk coming from various sources, which are:</p> <ul style="list-style-type: none"> <li>• clearing members' positions in case of a member's default;</li> <li>• failure of banks in their role of settlement bank, where they are responsible for settling trades between SGX-DC and clearing members and guaranteeing clearing member's payments;</li> <li>• failure of banks in their role of custody bank, holding margin and clearing fund contributions from clearing members;</li> <li>• default of banks holding SGX-DC's own cash;</li> <li>• exposures to CME;</li> </ul>

- default on investments of collateral; and
- failure of issuer of cash or securities that are used as collateral.

### **Framework to manage credit exposures to clearing members**

The framework of SGX-DC to manage credit risks following exposures to clearing members comprises:

- Admission criteria: SGX-DC admits only financially sound companies as clearing members that meet minimum financial, credit and operational requirements.
- Compliance of clearing members with rules on capital adequacy, risk management and reporting requirements at all times.
- Active monitoring of credit exposures towards clearing members, taking additional risk mitigating measures where required.
- Mitigation of credit risks by requiring maintenance margins and variation margins.
- Position limits for non-OTC financial derivative contracts to cap the exposure to both clearing member's house and customer positions.
- Additional financial resources, i.e., the clearing fund, which are stress tested using extreme but plausible scenarios.
- As OTC derivative transactions can be executed at prices away from the market prices, SGX-DC has put in place additional mitigating checks, to protect itself from exposures to OTC derivative transactions executed at prices, which deviate strongly from market prices:
  - (i) Pre-execution checks: for OTC commodity derivatives, pre-execution checks are performed based on position and margin limits maintained by the clearing member for each account.
  - (ii) Pre-funding margins: OTC financial derivatives products are accepted for clearing by SGX-DC only upon validation that the clearing member has sufficient collateral placed with SGX-DC.

### **Framework to manage credit risks to banks**

Banks are instrumental in the conduct of settlement of variation and maintenance margins between SGX-DC and its clearing members. Separately, SGX-DC also places margin monies and clearing fund contributions received from clearing members, as well as its own monies as deposits at banks.

SGX has in place a bank counterparty risk limit policy, approved by the SGX board and RMC, to manage credit risk exposure to banks. The policy prescribes that SGX-DC only uses supervised and regulated banks which meet the

	<p>admission and ongoing criteria. Limits are monitored on a daily basis and independently reviewed by the Risk Management functions and Chief financial Officer on a weekly basis. Both risk units (i.e., clearing risk and risk management) have in place a process to review and update risk management policies and procedures on a regular basis, and to update the models and bank limits annually, and sooner if conditions so require. Mitigation of this type of credit risk is further described in Principles 9 and 16.</p> <p>Mitigation of credit risk related to the link with CME is covered in Principle 20.</p> <p>SGX does not invest collateral. Mitigation of credit risk coming from issuers of collateral is further described in Principle 5.</p>
<p>Key Consideration 3 A payment system or SSS should cover its current and, where they exist, potential future exposures to each participant fully with a high degree of confidence using collateral and other equivalent financial resources (see Principle 5 on collateral). In the case of a DNS payment system or DNS SSS in which there is no settlement guarantee but where its participants face credit exposures arising from its payment, clearing, and settlement processes, such an FMI should maintain, at a minimum, sufficient resources to cover the exposures of the two participants and their affiliates that would create the largest</p>	<p>NA</p>

<p>aggregate credit exposure in the system.</p>	
<p>Key Consideration 4 A CCP should cover its current and potential future exposures to each participant fully with a high degree of confidence using margin and other prefunded financial resources (see Principle 5 on collateral and Principle 6 on margin). In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should</p>	<p><b>Coverage of current and potential future exposures to each participant</b></p> <p>Credit risk exposure from SGX-DC's clearing members is measured as the sum of current exposure and potential future exposure. SGX-DC uses mark-to-market as a measure for current exposure and maintenance margins (initial margin) as determined by various methodologies for potential future exposure.</p> <p>Positions are marked to the latest available prices during the intra-day and end-of-day cycles. Potential future exposure is covered by setting maintenance margins at a high confidence level. Mitigation of this type of credit risk is further described in Principle 6.</p> <p>Members can meet their initial margin requirement by depositing either cash (US\$, JPY, SGD, euro), Singapore government securities, U.S. treasuries, Japanese government bonds, German and French government bonds and/or selected component securities of the FTSE Straits Times Index and the MSCI Singapore Index.</p> <p><b>Risk profile and systemic importance in multiple jurisdictions</b></p> <p>SGX-DC primarily clears equity index derivatives, interest rate derivatives (swaps) and non-deliverable FX forwards. Credit risk exposure from these instruments generally does not show a strong form of correlation (general wrong-way risk) with the counterparty. In addition, these instruments are not characterized with a jump-to-default risk of the clearing member.</p> <p>Although SGX-DC is regulated as a key financial institution in Singapore, SGX-DC is not regarded as systemically important in other jurisdictions due to the following reasons:</p> <ul style="list-style-type: none"> <li>• SGX-DC clearing members must be located in Singapore. Remote clearing member is currently not allowed in the SGX-DC membership framework;</li> <li>• SGX-DC only operates in Singapore.</li> <li>• SGX-DC does not have concentrations to OTC derivative products that are subject to mandatory clearing in multiple jurisdictions. Though SGX-DC clears USD IRS, its volume is small;</li> <li>• The MOS only applies to five exchange traded futures contracts and the volume is small.</li> </ul>

<p>include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. In all cases, a CCP should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount of total financial resources it maintains.</p>	<p><b>Additional financial resources</b></p> <p>The financial resources available to SGX-DC are:</p> <ul style="list-style-type: none"> <li>• Margins of members' positions at a high confidence level (of at least 99 percentile). SGX-DC's total margin requirements currently amount to US\$4.5 billion (as of June 28, 2013).</li> <li>• SGX-DC's contribution to the SGX-DC clearing fund, which currently amounts to S\$150 million.</li> <li>• Member's contribution to the SGX-DC clearing fund, which currently amounts to S\$410 million (as of June 28, 2013).</li> </ul> <p>In addition to margin, the SGX-DC clearing fund is sized to cover the default of the clearing member and its affiliates with the largest exposure and two financially weakest members. Members' contributions to the clearing fund vary with their respective average risk margins for the preceding quarter. Clearing members with higher credit risk exposures are required to contribute more to the clearing fund. The clearing fund has a minimum size but is scalable as risk increases in the clearing system.</p> <p>The clearing fund consists of contributions from SGX-DC and its clearing members. SGX-DC contributes a significant portion to the clearing fund and is required to contribute at least 25 percent of the clearing fund in cash. Currently, SGX-DC's contribution is SGD150 million, of which a minimum 15 percent of the clearing fund or S\$136 million, whichever is higher, must form the first layer of the fund. The minimum SGX-DC clearing fund size must be agreed with the MAS.</p> <p>Clearing members' contributions consist of</p> <ul style="list-style-type: none"> <li>• a fully funded security deposit, and</li> <li>• funded portion of further assessment.</li> </ul> <p>For clearing contracts which are listed for trading on SGX-DT and/or OTC commodity contracts, members' security deposits are calculated as the higher of (i) S\$1 million; or (ii) 3.0 percent of the daily average of the risk margin during the preceding three month period.</p> <p>For clearing OTC financial derivatives security deposits are calculated as the higher of (i) US\$5 million; or (ii) three percent of the daily average of the risk margin during the preceding three months.</p> <p>Further contributions from clearing members can be called for during further assessments. The SGX-DC clearing rules require that a portion of these further</p>
--	---

assessments need to be funded. The further assessment is set as a multiple of up to a limit of three times of the security deposits. Currently, the limit of the 'further assessment', that must be funded for exchange traded derivatives and OTC commodities, is set at 1.5 times, while the limit for OTC financial derivatives is set at one time. For OTC financial derivatives, all the further assessments are funded while for exchange traded derivatives and OTC commodities, the funded portion is set at 50 percent.

The SGX-DC clearing fund resources are fully prefunded with collateral in the form of cash (US\$, JPY, SGD, euro) and selected government securities (U.S. treasuries, Japanese government bonds, German and French government bonds). Non-cash collateral is subject to haircuts at the prescribed rates.

SGX-DC stress tests the sufficiency of its resources on at least a daily basis. SGX-DC evaluates the sufficiency of the margins frequently throughout the day and margin calls will be made when there is a shortfall of margin collaterals. The risk management function performs stress testing on a daily basis to determine adequacy of the SGX-DC clearing fund. More frequent reviews of adequacy of the clearing fund can be performed during an adverse period. SGX-DC maintains a conservative buffer of sizing SGX-DC clearing fund based on the maximum simulated stress loss over the past one year.

#### **Supporting rationale and governance arrangements**

SGX-DC has developed governance arrangements for mitigating credit risk. Any exceptions to the clearing fund will be reported to the head of the risk management function, the chief risk and regulatory officer, and the CFO. The simulated shortfall in clearing fund resources will immediately be funded by SGX-DC's additional resources which have been kept as buffers to cater for sudden changes in risk profiles. The EXCO and MAS will be informed of the exceptions within the day.

The risk management function will review the risk profile of the specific member(s) that triggers the exception and determine the need for additional margins to mitigate the potential losses. The risk management function will engage with the specific member(s), assess the situation and take action to keep MAS informed.

Regular reporting of adequacy of clearing fund is submitted to the RMC, EXCO and MAS. The SGX board is also presented with the risk dashboard to enquire or initiate review for need of action.

<p>Key Consideration 5</p> <p>A CCP should determine the amount and regularly test the sufficiency of its total financial resources available in the event of a default or multiple defaults in extreme but plausible market conditions through rigorous stress testing. A CCP should have clear procedures to report the results of its stress tests to appropriate decision makers at the CCP and to use these results to evaluate the adequacy of and adjust its total financial resources. Stress tests should be performed daily using standard and predetermined parameters and assumptions. On at least a monthly basis, a CCP should perform a comprehensive and thorough analysis of stress testing scenarios, models, and underlying parameters and assumptions used to ensure they are appropriate for determining the CCP's required level of default protection in light of current and</p>	<p><b>Stress testing</b></p> <p>The adequacy of the clearing fund is assessed through SGX-DC's daily stress testing.</p> <p>Stress tests are evaluated for all positions at a member level net of collateral. Positions are segregated into house and customer origins and each origin is stress tested separately. Potential gains and assets from house origin may be used to offset against potential losses of customer origin. However, potential gains and assets from customer origin will not be offset against house losses. Clearing member's positions and losses are aggregated. These losses are compared against the clearing fund size to ensure that maximum losses in the preceding one year are covered by stress test losses.</p> <p>For stress testing, SGX-DC has adopted a framework that splits stress testing scenarios into two main groups—core and extended. Each of these groups is further sub-divided into forward-looking and historical scenarios. At a minimum, SGX-DC clearing fund is expected to cover the maximum loss for the past one year from the core scenarios.</p> <p>When stress test losses exceed the clearing fund size, the exception will be reviewed to determine the cause. Appropriate risk mitigating actions, including requiring additional collaterals from the clearing members, either through margins or additional clearing fund contributions will be taken to address exceptions in its review. Where action is taken, the clearing member that has triggered this exception would have been informed.</p> <p>For OTCF products stress testing is currently performed by the OTCF clearing system, Calypso, and where stress test results are fed into the risk management system twice intraday, and at the end of each day for consolidation purposes. All exceptions and mitigating actions taken are reported to the CRRO, the CFO and other members of the EXCO, including the CEO. All exceptions are also reported to the MAS.</p> <p>Regular monthly reporting on the adequacy of the clearing fund is submitted to the RMC, EXCO and MAS. In periods of high volatility e.g., the Lehman and MF Global crisis, more frequent reporting on stress tests, clearing fund and margin requirements will be provided to the EXCO and MAS.</p> <p><b>Review and validation</b></p> <p>SGX-DC reviews of the stress testing scenarios at least quarterly and a full assessment and validation annually. Further, the stress test scenarios used in the stress testing framework are meant to be extreme enough that they are not</p>
--	--

<p>evolving market conditions. A CCP should perform this analysis of stress testing more frequently when the products cleared or markets served display high volatility, become less liquid, or when the size or concentration of positions held by a CCP's participants increases significantly. A full validation of a CCP's risk-management model should be performed at least annually.</p>	<p>expected to change frequently. However, SGX-DC will in addition conduct ad-hoc stress test reviews due to increase in market volatility and/ or member conditions or whenever the situation requires.</p> <p>SGX-DC has in place a dual control structure with the clearing risk function developing risk models for margining, stress testing and collateral valuation, and the risk management function providing an initial validation of the model and periodic review. In addition MAS performs in-depth reviews of the assumptions of the margin and other risk management models.</p> <p>Validation takes place when a new methodology or model is first put in place. On a quarterly basis, the clearing risk function will review the adequacy of stress tests scenarios. The review will take into consideration the market and member conditions to ascertain if core and extended scenarios are adequate. On an annual basis, the clearing risk function will under-take a comprehensive review of its entire stress test framework, which is validated by the risk management function.</p>
<p>Key Consideration 6</p> <p>In conducting stress testing, a CCP should consider the effect of a wide range of relevant stress scenarios in terms of both defaulters' positions and possible price changes in liquidation periods. Scenarios should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a</p>	<p>All the products cleared by SGX-DC are included in the stress testing framework. SGX-DC adopts a framework that splits stress testing scenarios into two main groups—core and extended. Each of these groups includes both forward-looking and historical scenarios. A scenario is included if it satisfies the tests for condition of being relevant, comprehensive and extreme but plausible.</p> <p><b>Core stress tests</b></p> <p>The core stress tests are designed to cover relevant, extreme but plausible scenarios. This includes relevant peak historical volatilities and forward-looking hypothetical scenarios that cover for risks that have not been exhibited in history but could emerge in future. Core stress tests are designed to be conservative and are used to size the clearing fund on a daily basis.</p> <p><b>Extended stress tests</b></p> <p>The extended scenarios are used for monitoring and risk discovery. The extended scenarios are those which might not be relevant for fund sizing but useful for identifying potential risks and act as early warning signals for appropriate risk mitigating actions</p>

<p>spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions.</p>	
<p><b>Key Consideration 7</b></p> <p>An FMI should establish explicit rules and procedures that address fully any credit losses it may face as a result of any individual or combined default among its participants with respect to any of their obligations to the FMI. These rules and procedures should address how potentially uncovered credit losses would be allocated, including the repayment of any funds an FMI may borrow from liquidity providers. These rules and procedures should also indicate the FMI's process to replenish any financial resources that the FMI may employ during a stress event, so that the FMI can continue to operate in a safe and sound manner.</p>	<p><b>Allocation of credit losses</b></p> <p>Rule 7A.01A.2 describes the SGX-DC clearing fund waterfall structure:</p> <ul style="list-style-type: none"> <li>• Defaulting SGX-DC clearing member's collateral: margin deposits, security deposit, letters of credit and/or all other assets and securities placed with SGX-DC (SGX-DC Rule 7A.01A.2).</li> <li>• Contributions of SGX-DC: S\$136 million or 15 percent of the clearing fund, whichever is higher</li> <li>• Security deposits of non-defaulting SGX-DC clearing members who participate in the same contract class as the defaulted SGX-DC clearing member</li> <li>• Further assessments on non-defaulting SGX-DC clearing members who participate in the same contract class as the defaulted SGX-DC clearing member</li> <li>• Contribution (if any) of SGX-DC set aside for the contract class in which the event of default occurred: US\$10 million applicable only for the contract class OTCF</li> <li>• Security deposits of non-defaulting SGX-DC clearing members who participate in all other contract classes</li> <li>• Further assessments on non-defaulting SGX-DC clearing members who participate in all other contract classes</li> <li>• Any other contributions to the SGX-DC clearing fund</li> </ul> <p><b>Replenishment of financial resources</b></p> <p>SGX-DC as a CCP will notify a clearing member in writing whenever its contributions (or part thereof) are applied. If any amount is paid out of a clearing member's contributions, the clearing member is required to, upon demand by SGX-DC, replenish the used contribution.</p> <p>For all defaults which occur within the multiple default period (i.e., a fixed period of 90 days after the first utilization of the clearing fund), the clearing fund will be continually drawn down through its various sources of funds in sequence, to meet SGX-DC's losses arising from all such defaults until the clearing fund has been fully depleted or the multiple default period has lapsed (SGX-DC Clearing Rule 7A.06.6).</p>

	Under the capital conditions prescribed by MAS, SGX-DC must at all times maintain at least 25 percent of the SGX-DC clearing fund. In the event that SGX-DC's clearing fund contribution in the replenished clearing fund has been utilized and falls below 25 percent, SGX-DC will replenish its Clearing Fund contribution at least up to the minimum aggregate contribution (i.e., an amount equivalent to at least 25 percent of the Clearing Fund size, with an amount of not less than 15 percent of the Clearing Fund size in the first layer).
Key Conclusions for Principle 4	SGX-DC applies a comprehensive credit risk management framework and maintains sufficient financial resources to cover the default of the clearing member and its affiliates with the largest exposure as well as the default of the two financially weakest clearing members. SGX-DC continuously monitors credit exposures during the day. A clearing fund is established to cover potential losses in extreme circumstances. The total financial resources are daily stress tested, taking into account various conservative historical and other scenarios. SGX-DC has defined a risk management waterfall for the use of financial resources in case of credit losses, which includes its own capital. The legal and regulatory framework supports this framework. SGX-DC is currently not considered as a CCP that is of systemic importance in multiple jurisdictions; however, in case volumes grow the coverage of its financial resources should include the default of the two largest clearing members.
Assessment of Principle 4	Observed
Recommendations and Comments	-

### Principle 5. Collateral

An FMI that requires collateral to manage its or its participants' credit exposure should accept collateral with low credit, liquidity, and market risks. An FMI should also set and enforce appropriately conservative haircuts and concentration limits.

Key Consideration 1 An FMI should generally limit the assets it (routinely) accepts as collateral to those with low credit, liquidity, and market risks.	<p>SGX-DC determination of eligible collateral aims to accept quality collateral with low credit, liquidity and market risks. Criteria to determine which collateral is eligible comprise:</p> <ul style="list-style-type: none"> <li>• the ability of SGX-DC to perfect security interest in the collateral;</li> <li>• the credit quality of the issuer;</li> <li>• high market liquidity;</li> <li>• the availability of reliable, timely, commonly accepted market prices; and</li> </ul>
---	---

- the ability of SGX-DC to measure and adjust for price volatility of the asset.

Collateral accepted by SGX-DC from clearing members comprises cash, government securities and stocks. SGX-DC does not allow exceptions to accepted collateral as described below.

SGX-DC accepts SGD, US\$, JPY and euro cash collateral.

Government securities are accepted from Singapore and countries with strong credit ratings and ample market liquidity, such as U.S., Japan, Germany and France.

Eligible stocks, including listed business trusts, should be included in Singapore's key stock market indices, i.e., the MSCI Singapore Free Index and the FTSE Straits Times Index. In addition, the stocks must meet minimum market capitalization and liquidity requirements.

Irrevocable LCs are only accepted from the CME as inter-clearing house margin collateral for exposures arising from trades cleared via the MOS link between SGX-DC and the CME. LC margin collateral is accepted from CME because:

- CME does not account for a significant proportion of SGX-DC's clearing activity (about two percent);
- Margin requirements are determined at a minimum of 99 percent confidence level for CME;
- CME is a strong counterparty with its own clearing fund of approximately US\$ 4.5 billion, and rated AA- by S&P.
- CME is regulated by the US CFTC and must comply with the requirements of a DCO under the Dodd Frank Act. CME is a global clearing house with a wide pool of diversified members and it would be expected to meet CPSS-IOSCO standards to be a qualifying CCP.
- Only LCs issued by banks with Moody's bank financial strength rating of C and above are accepted.

Currently no clearing member has pledged Singapore stocks as collateral. Other than the LCs posted by CME, all other collateral posted by SGX-DC's clearing members are cash and government securities.

SGX-DC adjusts its requirements for acceptable collateral when there are changes in underlying risk. This includes changes in issuer credit quality, market liquidity, the availability of prices and SGX-DC's ability to measure and adjust for price volatility. Additionally, SGX-DC monitors collateral requirements of other

	<p>major clearing houses. For Singapore shares, SGX-DC will review and adjust the list of eligible securities on a quarterly basis. The acceptance of new collateral types requires the submission of an appropriate risk framework that is subject to approval from the MAS.</p> <p>SGX-DC uses COSMOS, which is an electronic system used by clearing members for collateral withdrawals, deposits, and transfers, and by SGX-DC to manage and monitor collateral.</p> <p>Specific wrong-way risk arising from Singapore stocks posted by clearing members is prevented by prohibiting the acceptance of related collateral and the setting of conservative haircuts. SGX-DC does not accept related collateral, which in the case of Singapore stocks, refers to securities of the clearing member or securities of its affiliates. Additionally, a 30 percent haircut is applied to Singapore shares. This haircut is conservative and calibrated to provide the necessary coverage even where the collateral and exposures exhibit significant positive correlation. This is because the haircut is based on stressed price movements of the Singapore stocks and is independent of the exposures the collateral is provided for.</p>
<p>Key Consideration 2</p> <p>An FMI should establish prudent valuation practices and develop haircuts that are regularly tested and take into account stressed market conditions.</p>	<p><b>Valuation practices</b></p> <p>To ensure that collateral value held is commensurate with the risk exposures of SGX-DC, SGX-DC values collateral daily against prices obtained from public sources. Government securities are marked-to-market once a day, using Bloomberg quoted bond prices. Singapore stocks are marked-to-market once a day, using closing prices of the day. The foreign currency collaterals are re-valued at least once a day.</p> <p>In the event that assets/collaterals lodged by a clearing member are found in any way to be unacceptable, for example, market prices do not represent true value of the collateral, SGX-DC may assign zero value to such assets/collaterals (SGX-DC clearing rule 7.03A.6). Replacement margin will be immediately required from the clearing member in such an event.</p> <p><b>Haircutting practices</b></p> <p>For government securities, haircuts are determined through a volatility-based approach. To ensure robustness and to account for time-zone differences that may affect market liquidity, haircut rates are based on the 99.9th percentile price decline (0.1th percentile) over a two-day holding period, evaluated on a historical sampling period of 10 years.</p> <p>For Singapore stocks, a standard 30 percent haircut rate applies. This haircut must be sufficient to cover the 99.9th percentile price decline (0.1th percentile)</p>

	<p>over a two-day holding period, evaluated on a historical sampling period of ten years.</p> <p>For margin collateral, a cross-currency haircut is applied if collateral in one currency is used to cover exposures denominated in another currency. This cross-currency haircut is imposed on top of asset type haircuts. Cross-currency haircuts are determined through a volatility-based approach. The haircut for each currency pair is based on the 99.9th percentile price decline (0.1th percentile) over a one-day holding period, evaluated on a historical sampling period of ten years.</p> <p>Haircuts are reviewed on a quarterly basis or more frequently when adverse news surfaces. Ad-hoc reviews of the haircut rates are triggered whenever adverse news on Singapore stocks and the issuing countries of acceptable government securities emerges. Haircut rates will be adjusted if the specified rates are insufficient to cover the price movements.</p> <p>The clearing risk unit reviews its haircut methodologies on an annual basis to verify that valuations of collateral assets are sufficient to cover the obligations they are posted against and are reflective of current market conditions. The reviews are validated by the risk management unit.</p>
<p>Key Consideration 3</p> <p>In order to reduce the need for pro-cyclical adjustments, an FMI should establish stable and conservative haircuts that are calibrated to include periods of stressed market conditions, to the extent practicable and prudent.</p>	<p>Haircut rates are conservative, prudent and stable. The need for pro-cyclical adjustments is offset by the fact that haircut rates are calibrated to cover extreme price movements observed during periods of stressed market conditions.</p>
<p>Key Consideration 4</p> <p>An FMI should avoid concentrated holdings of certain assets where this would significantly impair the ability to liquidate such assets quickly without significant adverse</p>	<p>To further protect SGX-DC from adverse price effects at liquidation, SGX-DC sets limits on collateral concentration to prevent undue concentration of any particular asset class and prevent excess concentration with any specific security or end-creditor.</p> <p>Margin collateral pledged with SGX-DC shall comprise:</p> <ul style="list-style-type: none"> <li>• Cash and/or government securities if the total margin requirements are US\$1 million or less.</li> <li>• For clearing members whose total margin requirements are more than</li> </ul>

<p>price effects.</p>	<p>US\$1 million, cash and/or government securities must constitute the first US\$1 million of the total margin requirements.</p> <p>There is an additional requirement that 60 percent of the total margin requirements must be in the form of cash and/or government securities. (SGX-DC clearing rule 7.20.2)</p> <p>There is no limit on Singapore government securities. SGX-DC has assessed that concentration and liquidity risks arising from Singapore government securities are small given that these government securities are widely tradable in the domestic interbank market. In addition, SGX-DC can pledge/repo these Singapore government securities as collaterals to tap liquidity from MAS.</p> <p>For other acceptable government securities of the U.S., Japan, France and Germany, secondary market liquidity is very substantial relative to the amount posted with SGX-DC, i.e., government securities held by SGX-DC represent less than 0.001 percent of total outstanding government securities. Nevertheless, a concentration limit of 10 percent applies for each issue for all government securities.</p> <p>For Singapore stocks, the aggregate of a single security that is accepted by both SGX-DC and CDP shall not be more than two percent of a security's issued shares. For a single security at clearing member level, each clearing member shall not pledge more than 20 percent of the average daily trading volume in the preceding quarter of the security.</p> <p>SGX-DC will review the concentration policies and practices if market conditions change significantly.</p>
<p>Key Consideration 5 An FMI that accepts cross-border collateral should mitigate the risks associated with its use and ensure that the collateral can be used in a timely manner.</p>	<p>Cross border collateral accepted by SGX-DC consists of cash in the currencies SGD, US\$, Yen and euro and government securities from the U.S., Japan, Germany and France. By accepting cross-border collateral key risks faced by SGX-DC include:</p> <p>(a) Legal risk (collateral enforceability) This relates to the enforceability of collateral arrangements upon the occurrence of a specified event or default. Specifically, this is the risk that collateral arrangements in place are deemed not to be legally enforceable in all relevant jurisdictions (because they might be stayed, voided or reversed in a situation of insolvency).</p> <p>(b) Market and liquidity risks As a result of daily market movements in asset prices and liquidity conditions, collateral value may decline relative to the exposures it is pledged against.</p>

	<p>(c) Operational risk</p> <p>Operational challenges of operating across borders and/or time zones in the event that liquidation of cross-border collateral is necessary.</p> <p>To mitigate legal risk, SGX-DC has legal security interest over cross-border collaterals. Security interests are subject to requirements of perfection (to ensure SGX-DC's rights are enforceable in the event of default).</p> <p>To ensure consistency with the legal basis in all relevant jurisdictions, due diligence and analysis is performed by SGX-DC prior to accepting any new foreign government securities as eligible collateral to ensure that the perfection requirements have been met under the applicable laws and that SGX-DC's collateral arrangements will continue to be enforceable.</p> <p>All cross-border collaterals are held with custodian banks under SGX-DC's name. In this way, SGX-DC is recognized as the holder of these collaterals and therefore will be able to give instructions for the use or liquidation of collateral as soon as required.</p>
<p>Key Consideration 6</p> <p>An FMI should use a collateral management system that is well-designed and operationally flexible.</p>	<p><b>Collateral management system design</b></p> <p>COSMOS has several functions:</p> <ul style="list-style-type: none"> <li>• Handle the four asset types (cash, government securities, LC, Singapore stocks)</li> <li>• Multi-currency calculations (in SGD, US\$, JPY and EUR)</li> <li>• It contains a generic algorithm for computing excess margin and validating withdrawal requests to allow for timely calculation and execution of margin calls, management of margin call disputes etc.</li> <li>• It supports configurable haircuts, which are differentiated by outstanding tenure and currency</li> <li>• It supports various levels of concentration limits</li> <li>• It supports various types of concentration limits (per issue of ISIN, bank exposure limits, LC concentration limit)</li> <li>• Ability to value individual issue at zero value should it be unacceptable as collateral or when market price does not represent true value of the collateral assets</li> </ul> <p>SGX-DC does not reuse the collateral. Collateral in cash deposits are placed at regulated banks in current and fixed deposit accounts. For government securities, the title of the securities is transferred to SGX-DC and the government securities are immobilized and safe kept in national depositories through custodian services of global custodian banks. For Singapore stocks,</p>

	<p>such securities are statutorily charged to SGX-DC and will be earmarked and recorded by the national CSD CDP.</p> <p><b>Operational flexibility</b></p> <p>All clearing members have access to COSMOS to submit their deposit, withdrawal and transfer requests for collateral. All requests submitted by clearing members before the processing cut-off time are processed by SGX-DC within the same day unless the request carry a forward value date.</p> <p>SGX-DC uses COSMOS to manage its margin collateral. COSMOS keeps records of collateral posted by each clearing member. During clearing cycles, these records are interfaced to the margin call system to determine the sufficiency of collateral.</p> <p>The monitoring of concentration limits is automated. Revisions to haircuts and/or concentration limits are easily implementable.</p> <p>Should new asset types be accepted as collateral, system changes will be made to accommodate any new requirements. The system changes will be adequately tested before officially used.</p> <p>During times of market stress or should a default situation arise, COSMOS will be given close support and oversight by the relevant technology and operations teams to ensure operations continue smoothly.</p> <p>In the event of a default, SGX-DC’s operational readiness has been tested and is assessed to be adequate. Recent crises, such as market stress caused by the MF Global default, support these findings. Staff has been trained. Procedures are documented in standard operating procedures.</p>
Key Conclusions for Principle 5	SGX accepts cash, government securities and shares as collateral to cover credit exposures. Collateral is subject to conservative haircuts. Government bonds are accepted from the U.S., Japan, France and Germany. Shares have only recently been admitted and face a haircut of 30 percent. In practice, the majority of collateral is deposited in cash. Collateral is marked to market on a daily basis.
Assessment of Principle 5	Observed
Recommendations and Comments	Concentration limits can be defined per clearing member, in addition to the current concentration limits that define a maximum threshold per issue.

### Principle 6. Margin

A CCP should cover its exposure to its participants for all products through an effective margin system that is risk-based and regularly reviewed.

#### Key Consideration 1

A CCP should have a margin system that establishes margin levels commensurate with the risks and particular attributes of each product, portfolio, and market it serves.

#### Description of margin methodology

SGX-DC requires all participating clearing members to post both initial and variation margin, to protect the clearinghouse from current and potential financial losses that may arise from a participant's failure to meet the financial obligations arising from its trades.

With respect to potential future exposure, SGX-DC adopts a two-tier margin structure, which it calls initial margin and maintenance margin. SGX-DC's maintenance margin is conceptually equivalent to the PFMI's initial margin terminology. SGX-DC's initial margin is the level of margin that participants are required to collect from their customers for new trades and is set at 1.1 times that of the maintenance margin. For the purpose of this detailed assessment, all references to initial margin should be read as equivalent to SGX-DC's maintenance margin and PFMI's initial margin.

SGX-DC has two different initial margin methodologies:

- For exchange traded derivatives and OTC commodities products (collectively referred to as exchange traded derivatives and OTC commodities products).
- For OTC financial (OTCF) products

To cover the current exposure to each participant's origin portfolio, SGX-DC mark-to-market every product to the latest available market prices via its intra-day and end-of-day clearing cycles.

The margin methodology is described in the document 'margin framework for SGX-DC products', which is available to participants. For exchange traded derivatives and OTC commodities participants also have access to the SPAN tools, while the SPAN margining algorithm is well documented and available on the website.

#### Credit exposures

SGX-DC's credit exposures are determined by market attributes, product attributes and portfolio attributes.

#### Market attributes

In terms of market attributes, the credit exposure of SGX-DC is significantly driven by events that will affect the equity markets. This is because the clearing activity is concentrated in the equity index products based on the Nikkei 225,

MSCI Taiwan, MSCI Singapore, CNX Nifty and FTSE China A50 indices.

**Product attributes**

Credit exposure of SGX-DC is likely to be driven by:

- Price volatility of each product
- Linear risk of the plain vanilla futures and swaps
- Non-linear risk of the plain vanilla options
- Non-linear risk characteristics of the OTCF in the form of term structure risk exposure, with basis risk between the different tenures of a contract.
- Liquidation risk arising from different market liquidity conditions for different products
- Gap risks for NDF products arising from changes in government regimes and/or policies

Credit risk is considered commensurate with the credit risk exposures related to product type attributes. The risk of the linear products is managed directly by the historical volatility based margin model. The initial margin model determines the margin level based on the respective product's estimated distribution of future exposure at a single-tail confidence level of at least 99 percent. For all products, the margin requirements take into consideration the liquidity profile to determine the close-out period.

**Portfolio attributes**

Credit exposure to SGX-DC is driven by the potential liquidation loss of the defaulted portfolio following a participant's default. In addition to the market conditions following the default, factors like the size of the portfolio and position concentration are relevant.

In the event of a participant's default, all positions in house origin accounts will be promptly liquidated on a net basis. However, where SGX-DC has reasonable grounds to form an opinion that the participant's default is directly attributable to a failure of its direct customer, then the positions of that failed customer will also be liquidated. SGX-DC will seek to transfer the positions of non-defaulting customers to other participants.

Excess house origin margins and collaterals will be used to cover the liquidation loss of the failed customer's positions, before tapping the non-defaulted customers' margins and clearing fund. Therefore, in the event of a participant's default, SGX-DC's net credit exposure is effectively equal to the net liquidation

	<p>loss (if any) across all positions in the house origin, less the house's collateral. In the event the participant's default is directly attributable to a failure of its direct customer, then SGX-DC's net credit exposure is equal to the sum of the house's net liquidation loss (as described above), and the net liquidation loss across all positions belonging to the failed customer(s), less all relevant collateral monies.</p> <p>With initial margin requirement determined on a gross basis at the origin level, it should theoretically be more or at least equal to the credit exposure (net basis) of each participant's origin's portfolio, at a minimum of 99 percent confidence level.</p> <p>By margining on a gross basis for the customer origin, SGX-DC provides for greater ease of porting of positions and transfer of margins in the event of a participant default. Margining on a gross basis gives greater assurance that the clearing house will have sufficient collateral available for transfer by direct customers of a defaulted participant. If the participant's default results from a failed customer, then with gross margin, the customer's margin collateral should be adequate to cover the net liquidation loss of its portfolio in at least 99 percent of the time.</p> <p><b>Operational components</b></p> <p>SGX-DC executes three intra-day cycles and an end-of-day clearing cycle daily. During the intra-day cycles, new positions will be subjected to initial margin, while variation losses will be subjected to variation margin. At any cycle, margin calls will be made to participants whose collateral is insufficient to meet these margin requirements.</p> <p>In addition, for the OTCF products, SGX-DC executes hourly novation cycles throughout the clearing day. New trades submitted for clearing are novated only if the resulting portfolio (original novated position plus new trades) risk is fully covered by available margin collateral. Otherwise, participants are required to post additional margin collateral to support the risk-increasing trades.</p> <p>The SGX-DC clearing rules require participants to make and complete payments of margin within the prescribed timelines. A failure by a participant to do so may be deemed as an event of default.</p>
<p>Key Consideration 2 A CCP should have a reliable source of timely price data for its margin system. A CCP</p>	<p><b>Sources of price data</b></p> <p>SGX-DC uses the daily settlement price per product as input for the initial margin system. It obtains daily settlement prices from the following sources:</p> <ul style="list-style-type: none"> <li>• For exchange-traded products, the primary source is the traded prices on SGX-DT. Where necessary, SGX-DC may supplement this with prices of similar</li> </ul>

<p>should also have procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable.</p>	<p>products executed on other trading venues or poll for market assessments.</p> <ul style="list-style-type: none"> <li>• SGX-DC relies on third-party sources to price OTC products. For each of the products, the sources may include a combination of price vendors, brokers or market players.</li> </ul> <p><b>Estimation of prices</b></p> <p>SGX-DC has in place reliable and timely price information, including that from third-party sources. Products must fulfill this requirement before being approved for clearing by SGX-DC. The Daily Settlement Price methodology is designed to be sufficiently robust to derive reliable prices directly from the market in both liquid and illiquid conditions.</p> <p>The risk management unit validates the models, which are developed by the clearing risk unit. As part of its validations the risk management unit assesses the reasonableness of the assumptions against industry practices and theoretical soundness, and identifies and assesses the materiality of model limitations for its intended usage.</p>
<p>Key Consideration 3</p> <p>A CCP should adopt initial margin models and parameters that are risk-based and generate margin requirements sufficient to cover its potential future exposure to participants in the interval between the last margin collection and the close out of positions following a participant default. Initial margin should meet an established single-tailed confidence level of at least 99 percent with respect to the estimated distribution of future exposure. For a CCP that calculates</p>	<p><b>Initial margin model</b></p> <p><b><i>For exchange traded derivatives and OTC commodities</i></b></p> <p>SGX-DC adopts a historical volatility based margin model, and determines the margin rate at the product level. The initial margin rate is set at single-tailed confidence level of at least 99 percent of each product's estimated distribution of future exposure. This potential future exposure is determined based on the highest of the historical volatilities over look-back period of between 1 to 12 months. A minimum margin level is imposed to manage pro-cyclicality risks. Close-out periods of one to three days are used, depending on the liquidity profile of each product. Offsets or reductions to the margin may be applied to correlated sets of contracts.</p> <p>The margin requirements for options are determined together with futures contracts on a portfolio basis using the SPAN loss-estimation methodology. For the plain vanilla options, the non-linear risk is measured and managed by using an appropriate option pricing model, together with the SPAN margin system. SPAN evaluates overall portfolio risk by calculating the worst possible loss that a portfolio of instruments might reasonably incur under different market conditions (a total of 16 scenarios, corresponding to varying combinations of price change, implied volatility change, and decrease in the time to expiry). The worst loss under all scenarios is the portfolio margin requirement.</p> <p>SGX-DC reviews the initial margin rate on a regular basis. Ad-hoc reviews are triggered during volatile or exceptional market events (including the instance</p>

<p>margin at the portfolio level, this requirement applies to each portfolio's distribution of future exposure. For a CCP that calculates margin at more-granular levels, such as at the sub-portfolio level or by product, the requirement must be met for the corresponding distributions of future exposure. The model should (a) use a conservative estimate of the time horizons for the effective hedging or close out of the particular types of products cleared by the CCP (including in stressed market conditions), (b) have an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products, and (c) to the extent practicable and prudent, limit the need for destabilizing, procyclical changes.</p>	<p>when market movement exceeds the prescribed margin rates). As part of the margin review process, SGX-DC complements the historical-based margin model with forward-looking qualitative evaluation by constantly scanning the environment for potential market events that may warrant higher margin requirements.</p> <p><b>For OTCF products</b></p> <p>The OTCF products are margined using historical value at risk (HSVaR) margining methodology. These products have term structure risk exposure, and SPAN-like margining methodology may not be effective. In addition, (FX Gap Risk) margin add-ons may be applied to mitigate the gap risks of OTCF-NDF products that may arise from sudden changes, including political events or government policies.</p> <p>The minimum required margin is imposed as HSVaR and may be small relative to the portfolio size when the intra-bucket risk exposures offset each other.</p> <p>Margins add-on that may be applied to each participant and are applicable to both OTCF and exchange traded derivatives and OTC commodities. SGX-DC may also apply margin add-ons to specific participants to address risk concerns which include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Credit risk add-on, which may be imposed when there are concerns about the solvency or credit-worthiness of a participant, or if the tail risk in the event of a participant default is excessive</li> <li>• Concentration or large exposure add-on, which may be imposed if the open interest in a product is highly concentrated</li> <li>• Gap risk add-on, applicable to OTCF-NDF products only. This is to mitigate exposures to changes in government regimes and/or policies that may have an impact on the participant's positions.</li> </ul> <p><b>Total margin requirements</b></p> <p>The total initial margin requirement across all products for an account is the sum of respective requirements for its portfolio of exchange traded derivatives and OTC commodities products and that of OTCF products. The total initial margin requirement across all products for each participant's origin is the sum (gross basis) of the total initial margin requirement across all accounts.</p> <p><b>Closeout and sample periods</b></p> <p>SGX-DC assumes a close-out period for calculating the initial margin rates. This varies to reflect the differing market liquidity across products, and is in the range of one to three days for listed products and OTC Commodity products and five days for OTCF.</p>
--	--

	<p>The potential liquidity is determined by considering factors such as the type of instruments, projected volume, open interest, and the likely spread or concentration of market participants</p> <p>A shorter liquidation period for the standardized products would suffice as these can generally be more easily liquidated or perfectly hedged as compared to the non-standardized products.</p> <p>SGX-DC augments the close-out period with other risk mitigating strategies:</p> <ul style="list-style-type: none"> <li>• To address position concentrations which can lengthen close-out timeframes, SGX-DC may impose additional margin on participants with significant concentration to mitigate the liquidation risk. SGX-DC periodically surveys participants if expected concentration levels can be liquidated in stress times without moving the markets. SGX-DC has three intra-day and one end-of-day clearing cycles, where positions are marked and variation loss collateralized. This ensures all marked-to-market losses are collected and reduces the liquidation loss in the event of default.</li> </ul> <p>Sample periods differ per type of product. For exchange traded derivatives and OTC commodities SGX-DC considers factors such as margin stability and responsiveness to market conditions. The methodology adopts a conservative approach by covering volatility for sample periods of between 1 to 12 months balancing responsiveness to recent volatility and adequate reflection of historical volatility.</p> <p>The initial margin model incorporates a floor on the margin rate to ensure coverage during low volatility periods and reduce pro-cyclical margin calls when volatility suddenly increases. The floor is estimated by observing the multi-years volatility cycle.</p> <p>For new products without much history, the margin may be estimated historical price data of appropriate proxies.</p> <p>The HSVaR margin methodology for OTCF uses a sample period of five years. This period is chosen to adequately capture different permutations of risk related to the HSVaR model and the non-linear risk of the OTCF products. The five-year sample period is in line with the practices in other well established international CCPs for OTCF products. For products with missing historical data for a small period, SGX employs data filling tools such as regression.</p> <p><b>Rationale for prompt liquidation</b></p> <p>The general principle of the default management process is to minimize systemic risk to the market. Positions belonging to the defaulting entities</p>
--	---

	<p>should ideally be liquidated as promptly as possible to avoid further losses due to adverse price movements. In case prompt liquidation is considered less appropriate, for example due to the size of the positions relative to the liquidity and size of the market, then SGX-DC may use other risk-reducing procedures such as hedging, cash settlement or assignment of positions.</p> <p><b>Pro-cyclicality and specific wrong-way risk</b></p> <p>The initial margin model for exchange traded derivatives and OTC commodities products addresses pro-cyclicality by using a minimum margin level as explained above.</p> <p>To mitigate potential pro-cyclicality for OTCF products, a sufficiently long sample period is used so as to cover a large set of market scenarios.</p>
<p>Key Consideration 4</p> <p>A CCP should mark participant positions to market and collect variation margin at least daily to limit the build-up of current exposures. A CCP should have the authority and operational capacity to make intraday margin calls and payments, both scheduled and unscheduled, to participants.</p>	<p>SGX-DC collects variation margin in addition to initial margin. Positions are marked to the latest available market prices during the intraday and end-of-day cycles to prevent accumulation of losses throughout the day.</p> <p>SGX-DC determines for each participant's account, the net mark-to-market profit and loss during each clearing cycle. For intraday margin calls, participants are required to fund these losses, but variation gains are withheld by SGX-DC. This prevents accumulation of variation losses. For the end-of-day cycle, the participant's profits and losses are settled on a net basis. Margin calls will be made to participants whose collateral is not sufficient to cover the variation loss.</p> <p>Following a margin call, the participant's settlement bank is required to confirm, according to strict deadlines (within an hour), that funds will be settled on the value date (depending on currency). Settlement banks serve as an additional layer of protection in the settlement process.</p> <p>There are four margin cycles a day and settlement banks confirm within one hour to SGX-DC that the clearing members are able to deposit the money. The actual deposit will take place at 4:00 p.m. on T+1 (for SGD, US\$ and euro) and at 4:00 p.m. on T+2 (for yen). Once the settlement bank provided its confirmation to SGX-DC, the settlement bank guarantees that SGX-DC will receive the collateral, even if the clearing member defaults.</p> <p>SGX-DC has the right to make and complete intraday margin calls through the powers as prescribed in its clearing rules. The margin call functionality is automated. It can be triggered on a scheduled or ad hoc basis to determine the intraday/end-of-day margin calls for initial and variation margin. Once triggered, the system compares the collateral holdings of each member against the margin requirements of the participant.</p>

	<p>Intraday margin call will be calculated using updates prices and positions. The collateral is revalued on a daily basis. Any adverse price movements affecting the value of the collateral are captured by the collateral haircuts.</p>
<p>Key Consideration 5</p> <p>In calculating margin requirements, a CCP may allow offsets or reductions in required margin across products that it clears or between products that it and another CCP clear, if the risk of one product is significantly and reliably correlated with the risk of the other product. Where two or more CCPs are authorized to offer cross-margining, they must have appropriate safeguards and harmonized overall risk-management systems.</p>	<p><b>Portfolio margining</b></p> <p>SGX-DC allows reductions in margin requirements across products, but it does not provide cross-margining facilities with another CCP. SGX-DC allows portfolio margining between products for the same asset class, but not between products across different asset classes.</p> <p>For exchange traded derivatives and OTC commodities SGX-DC allows reductions in the required margin amounts between products only if there is price correlation and a meaningful economic relationship between the market dynamics of the products.</p> <p>SGX-DC also allows reductions in the required margin amounts between risk offsetting positions in different contract months of the same product. Such reductions are allowed as the different contract months are correlated.</p> <p>Portfolio margining is only applicable where one position is long and the other is short. The margins are determined based on the volatility of the spread (i.e., correlation), calculated in a similar manner as the outright margin, and at a minimum of 99 percent confidence level. The correlations are reviewed regularly with additional reviews during stress market conditions. The spread margins are revised accordingly.</p> <p>For all products, any offsets or reductions in required margin are applicable only to positions belonging to the same account (i.e., same beneficial owner). No reduction is allowed across accounts even if these are in the same participant's origin.</p> <p><b>Robustness of methodologies</b></p> <p>SGX-DC conducts daily portfolio back testing at origin level to test the robustness of the margining methodology against realized market movements for a given portfolio</p> <p>As part of the stress test analysis, it has been observed that the correlations between most pairs of (spread) products in the same asset class tend to increase during stressed period. As higher correlation would have implied lower spread margin, this suggests that there is buffer in the amount of spread margin collected.</p>
<p>Key Consideration 6</p> <p>A CCP should analyze</p>	<p><b>Back testing and sensitivity analysis</b></p> <p>SGX-DC conducts daily portfolio back testing, determining the robustness of the</p>

<p>and monitor its model performance and overall margin coverage by conducting rigorous daily back testing—and at least monthly, and more-frequent where appropriate, sensitivity analysis. A CCP should regularly conduct an assessment of the theoretical and empirical properties of its margin model for all products it clears. In conducting sensitivity analysis of the model's coverage, a CCP should take into account a wide range of parameters and assumptions that reflect possible market conditions, including the most-volatile periods that have been experienced by the markets it serves and extreme changes in the correlations between prices.</p>	<p>margining methodology including all margining offsets or reductions offered, against realized market movement for a given portfolio. Exceptions of losses exceeding the margins at origin level will be investigated as part of daily risk monitoring, and escalated for further action if required.</p> <p>SGX-DC evaluates the circumstances of each exception to the target confidence level (i.e., 99 percent) and adopts Basel's zoning methodology in determining if the model is appropriate. The different levels of exceptions calculated based on appropriate historical data will determine the additional action that is required. For example, any results that fall in the red zone (after analyzing the validity of the exceptions), may result in recalibration of the margining models after careful considerations.</p> <p>In addition, the margin back testing is also performed at the outright contract level daily to ensure the margin rates are appropriate to meet the price movement observed based on the prescribed holding period.</p> <p>The sensitivity analysis adopted by SGX-DC for both its OTCF and exchange traded derivatives and OTC commodities products includes both historical and hypothetical conditions. The former is calculated purely on the basis of selected relevant highly stressed market conditions. The latter is calculated on the basis of both the existing and historical stressed market conditions. The sensitivity analysis will be conducted on every participant's origin portfolio to understand the level of margin in such highly stressed market conditions. Different confidence levels are used to understand the impact in the tail spectrum. The analysis will be conducted on a monthly basis.</p> <p><b>Margin model performance</b></p> <p>For exchange traded derivatives and OTC commodities, the potential shortcoming of the initial margin model is that within the singular model it is highly responsive to recent volatility and tends to over-estimate the margin rate.</p> <p>For OTCF products, the shortcoming of the margin model includes the shortcoming of HSVaR. This includes:</p> <ul style="list-style-type: none"> <li>• The margin model manages incremental risk types in an add-on fashion. This therefore does not address the dependency of one risk with that of another. For instance, the margin model covers for downgrades through an application of credit-add-on. It does not capture the interaction of credit risk with market risk in a singular model.</li> <li>• VaR is not sub-additive. Hence adding the margins (derived using VaR) of two portfolios is not equivalent to the (VaR) risk of the combined portfolio (at the</li> </ul>
---	--

	same confidence level).
Key Consideration 7 A CCP should regularly review and validate its margin system.	<p>A review of the margining methodology is conducted annually or when there are substantive market developments or changes in trading patterns.</p> <p>Any revisions and adjustments of the margin methodology must be approved by the CRRO before submission to the EXCO and RMC. Minor adjustments can be approved by EXCO, with RMC and MAS kept informed.<sup>30</sup> Major changes require RMC and MAS' approval.</p> <p>SGX-DC discloses the margin methodology and provides sufficient information as well as tools for participants to independently determine their margin obligations. Results of SGX's reviews of the validation of margin methodology will be shared with MAS, where requested. MAS also conducts in-depth reviews of the assumptions and parameters of the margin models.</p>
Key Conclusions for Principle 6	<p>All products cleared by SGX-DC are subject to an effective margin system. The margin model is risk based and comprises both initial and variation margin. Initial margin should cover potential future exposures. Variation margins are called to ensure the coverage of current exposures. Margin models apply international standards and are subject to back testing, sensitivity analysis and in-depth reviews by the internal risk management unit and the MAS. The initial margin is calculated with at least 99 percent confidence level with a close-out period from one to five days, depending on the liquidity of the contract. SGX-DC allows for offsets in a conservative way. Another conservative feature is that clients are margined on a gross basis, although certain exemptions exist for clients that belong to the same legal beneficiary owner. SGX-DC is able to make intraday margin calls, based on updated prices and positions.</p>
Assessment of Principle 6	Observed
Recommendations and Comments	SGX-DC is encouraged to further reduce the time between the margin calls and the actual deposit of margin.

<sup>30</sup> The PFMI assessment was conducted in July 2013, and was based on the 2006 Revised Edition of the SFA. With effect from August 1, 2013, amendments to the SFA such as the new authorisation regime for CCPs and the licensing regime for TRs came into effect. Under the revised SFA, SGX-DC shall seek MAS' prior approval for any change to its margin methodology pursuant to Regulation 12 of the Securities and Futures (Clearing Facilities) Regulations.

### Principle 7. Liquidity Risk

An FMI should effectively measure, monitor, and manage its liquidity risk. An FMI should maintain sufficient liquid resources in all relevant currencies to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate liquidity obligation for the FMI in extreme but plausible market conditions.

#### Key Consideration 1

An FMI should have a robust framework to manage its liquidity risks from its participants, settlement banks, nostro agents, custodian banks, liquidity providers, and other entities.

#### Liquidity risk sources

In the normal course of business, SGX-DC is not required to use its own liquid resources to complete clearing and settlement.

However, the following scenarios may expose SGX-DC to liquidity risk.

The nature of its liquidity requirements are derived under stressed scenarios:

- Clearing member(s) default: SGX-DC has to provide funding to cover the time needed to liquidate the defaulted clearing member's non-cash collateral.
- Settlement bank default: In the event of a settlement bank default before settlement finality, clearing members are required to meet their obligations to SGX-DC and make payments through other means. Clearing members are discharged from their obligations to SGX-DC only after settlement is final.
- Default of a CME: SGX-DC receives LCs as margin collateral from the CME. SGX-DC has assessed the safeguards in place and formed the view that the likelihood of CME's default is remote.
- Custodian bank or deposit-taking bank default: SGX-DC will require liquidity to facilitate withdrawals in the situation where a clearing member requests to withdraw their excess cash collateral and the withdrawal amount exceeds the pool of cash held with non-defaulting banks, following such a default.
- Bank liquidity provider default: in that case SGX-DC has no access to liquidity.
- Clearing member default resulting from settlement bank default: If the settlement bank defaults before payment finality, the clearing member would have to make funding available through other means.

#### Liquidity risk management

SGX-DC manages the liquidity risks it faces through its liquid resources in various forms, including cash holdings and committed bank credit lines.

On a daily basis SGX-DC stress tests its liquidity risks arising from clearing members and bank counterparts. On a quarterly basis, the risk management unit computes SGX-DC's estimated liquidity funding requirement based on an historical period of one year and communicates the results to the finance unit,

based on which adjustments are made to the level of liquid resources (including committed bank credit lines and SGX-DC's cash holdings) to be maintained.

SGX has developed a bank counterparty limit framework to mitigate liquidity risk that result from concentrations to bank counterparties. Under the framework, SGX aggregates and monitors potential risk from bank counterparties in their various roles a clearing member, settlement bank, custodian bank, deposit taking bank and liquidity provider. A ceiling on exposure is set for individual bank counterparties based on their Moody's BFSR. Furthermore, prescribed risk limits such as the ratio of exposures against the shareholders' funds of individual banks and concentration limits are established to mitigate excessive exposure to one single bank counterparty. RMC will be notified when the aggregated exposures reach the prescribed threshold.

The risk management, finance and operations functions monitor the market for any adverse news including credit rating downgrades of the bank counterparties and take mitigating actions if needed, such as the reduction of limits.

Bank liquidity providers provide liquid resources to SGX-DC if needed. SGX performs due diligence to assess the bank liquidity providers' ability to meet their obligations. SGX meets with potential bank liquidity providers to ensure clarity of circumstances under which SGX (including SGX-DC) could draw on the credit line. In addition, the selected liquidity providing banks must be licensed by MAS and must maintain a minimum of a C rating under the Moody's BFSR and A rating under the Moody's long term unsecured debt rating.

### **Size of Liquidity Requirements**

In addition to daily monitoring, SGX-DC reviews its liquidity requirement quarterly. The liquidity requirement is sized to cover the daily liquidity stress testing over the past 12 months, utilizing a wide-range of scenarios from the core stress test scenario set (see Principle 4). The sizing covers a default of the clearing member with the largest exposure and its affiliates and two financially weakest members. The size of the liquidity required is covered by the available liquid resources of SGX.

An entity and its affiliates may play multiple roles with respect to SGX-DC. As an example, a bank and its affiliates may have the following roles with respect to SGX-DC:

- SGX-DC Clearing Member
- OTC Financial Derivatives Clearing Member

	<ul style="list-style-type: none"> <li>• SGX-DC Settlement Bank</li> <li>• Custodian Bank or Deposit-Taking Banks</li> <li>• Bank Liquidity Provider</li> </ul> <p>The risk of a participant who plays multiple roles are monitored individually in its respective role daily and reported at an aggregated level weekly.</p> <p>The size of liquidity requirements for settlement banks is zero as this does not create a liquidity need for SGX-DC, but for clearing members.</p> <p>The size of liquidity requirement in the case of a deposit-taking bank default will be the lower of SGX-DC's cash holding with the bank and the total excess cash collateral held by SGX-DC (as this determines the maximum withdrawal that can be made by clearing members). Custodian bank holds non-cash assets and a default is unlikely to trigger any liquidity requirements for SGX-DC.</p>
<p>Key Consideration 2</p> <p>An FMI should have effective operational and analytical tools to identify, measure, and monitor its settlement and funding flows on an ongoing and timely basis, including its use of intraday liquidity.</p>	<p>SGX-DC uses the following operational tools to monitor settlement and funding flows:</p> <ul style="list-style-type: none"> <li>• Operational arrangements between SGX-DC and settlement banks to conduct confirmation of margin calls. Settlement banks are required to confirm within an hour after a margin call that the margin calls will be settled. Once such confirmation is made, the settlement bank is obliged to meet the margin call to SGX-DC. If a negative confirmation is received, escalation procedures will be initiated.</li> <li>• Internet banking portals and SWIFT messages for confirmation of credit.</li> </ul>
<p>Key Consideration 3</p> <p>A payment system or SSS, including one employing a DNS mechanism, should maintain sufficient liquid resources in all relevant currencies to effect same-day settlement, and where appropriate intraday or multiday settlement, of payment obligations with a high degree of confidence under a wide range of potential</p>	<p>NA</p>

<p>stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions.</p>	
<p>Key Consideration 4 A CCP should maintain sufficient liquid resources in all relevant currencies to settle securities-related payments, make required variation margin payments, and meet other payment obligations on time with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important</p>	<p><b>Sufficient liquid resources</b></p> <p>Liquidity need by currency:</p> <ul style="list-style-type: none"> <li>• The committed bank credit lines can be drawn down in multi-currencies, such as, SGD, US\$ and JPY, which are the main settlement currencies for SGX-DC.</li> <li>• Considering the depth of the Singapore foreign exchange market there's a high probability that available currencies can be converted or swapped into SGX-DC settlement currencies (US\$ and JPY).</li> <li>• In addition, all SGX-DC liquidity providing banks have access to the Singapore central bank.</li> <li>• At least one of the liquidity providers has access to the foreign central banks of issues for the required currencies.</li> </ul> <p>SGX-DC estimates quarterly the amount of liquidity needs in the event of a default of the largest clearing member (and its affiliates) and in addition the two financially weakest clearing members. Until now, SGX-DC never had to draw on its clearing fund or credit lines for the purpose of managing a default by participants.</p> <p>Based on the latest liquidity risk management review conducted for 2012, SGX-DC does not have any liquidity shortfall as the collaterals deposited by clearing members and clearing fund resources are adequate to cover any potential liquidity need in the event of a default by the clearing member and its affiliates with the largest exposure and two financially weakest clearing members.</p> <p><b>Risk profile and systemic importance in multiple jurisdictions</b></p> <p>SGX-DC is not considered a systemically important financial institution beyond Singapore, and does not clear complex products such as CDS.</p>

<p>in multiple jurisdictions should consider maintaining additional liquidity resources sufficient to cover a wider range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions.</p>	
<p>Key Consideration 5</p> <p>For the purpose of meeting its minimum liquid resource requirement, an FMI's qualifying liquid resources in each currency include cash at the central bank of issue and at creditworthy commercial banks, committed lines of credit, committed foreign exchange swaps, and committed repos, as well as highly marketable collateral held in custody and investments that are readily available and convertible into cash with prearranged and highly reliable funding</p>	<p><b>Composition of qualifying liquid resources</b></p> <p>The available liquid resources include:</p> <ul style="list-style-type: none"> <li>• Cash margin collateral</li> <li>• SGX-DC clearing fund contributions in cash by SGX-DC and clearing members</li> <li>• committed bank credit lines in clearing currencies of SGX-DC's choice</li> <li>• Margin and clearing fund collateral in government securities</li> <li>• SGX-DC's cash holdings (used to advance liquidity to facilitate clearing and settlement, in its role as a CCP, when judged necessary).</li> </ul> <p>If there is a need for additional liquidity, SGX-DC's own cash holdings may be used to advance liquidity to facilitate clearing and settlement, in its role as a CCP, where judged necessary.</p> <p><b>Availability and coverage of qualifying liquid resources</b></p> <p>The liquid resources will be available in time for SGX-DC to facilitate timely settlement. Cash can be withdrawn from the banks for same day value, if instructions are provided to the banks within the customary notice period of 12 noon–2:00 p.m. The committed bank credit lines are available for drawdown in multi-currencies. The bank credit lines (in SGD or US\$) can be drawn upon for value same day and (in JPY) for value next day if the draw-down notice is given to the bank by 4:00 p.m. and 2:00 p.m. respectively.</p>

<p>arrangements, even in extreme but plausible market conditions. If an FMI has access to routine credit at the central bank of issue, the FMI may count such access as part of the minimum requirement to the extent it has collateral that is eligible for pledging to (or for conducting other appropriate forms of transactions with) the relevant central bank. All such resources should be available when needed.</p>	<p>For diversification purposes, the committed bank credit lines are currently provided by five banks which are financially sound and meet SGX's admission and ongoing criteria. SGX-DC also tests annually, its procedures to draw upon on the committed bank credit lines.</p> <p>For non-cash collateral like government securities, which are either held with Custodian Banks or CDP, they are likely to be subject to one-day (or up to three days) trade settlement upon divestment.</p> <p>MAS provides a Standing Facility, allowing SGX-DC to repo Singapore government securities and other eligible collateral with MAS for overnight SGD funding.</p>
<p>Key Consideration 6</p> <p>An FMI may supplement its qualifying liquid resources with other forms of liquid resources. If the FMI does so, then these liquid resources should be in the form of assets that are likely to be saleable or acceptable as collateral for lines of credit, swaps, or repos on an ad hoc basis following a default, even if this cannot be reliably prearranged or guaranteed in extreme market conditions.</p>	<p><b>Composition of supplemental liquid resources</b></p> <p>A portion of Clearing Members' contribution to the SGX-DC clearing fund is made up of contingent contributions. As of February 2013, this amount is equivalent to about 25 percent of the SGX-DC clearing fund.</p> <p><b>Availability of supplemental liquid resources</b></p> <p>The requirement for non-defaulting clearing members to deposit contingent contributions to SGX-DC when called upon is an obligation that they have to meet during in an event of a default of another clearing member. In addition, the acceptable collateral for such obligation is met in either cash or government securities, which are liquid assets. Nonetheless, the amount of supplemental liquid resources is excluded from the risk management unit's computation of estimated liquidity funding requirement for determination of the amount of credit lines required. Eligible government securities can be used as collateral to obtain additional liquidity from the central bank.</p> <p>The results of the periodic stress tests indicate that SGX-DC has sufficient supplemental and qualifying liquid resources to cover its total liquidity needs.</p>

<p>Even if an FMI does not have access to routine central bank credit, it should still take account of what collateral is typically accepted by the relevant central bank, as such assets may be more likely to be liquid in stressed circumstances. An FMI should not assume the availability of emergency central bank credit as a part of its liquidity plan.</p>	
<p><b>Key Consideration 7</b> An FMI should obtain a high degree of confidence, through rigorous due diligence, that each provider of its minimum required qualifying liquid resources, whether a participant of the FMI or an external party, has sufficient information to understand and to manage its associated liquidity risks, and that it has the capacity to perform as required under its commitment. Where relevant to assessing a liquidity provider's performance reliability with respect to a particular currency, a liquidity</p>	<p><b>Use of liquidity providers</b></p> <p>SGX-DC's liquidity providers are:</p> <ul style="list-style-type: none"> <li>• The committed bank credit lines from five banks;</li> <li>• MAS provides a standing facility for repo.</li> </ul> <p><b>Reliability of liquidity providers</b></p> <p>The five banks which provide the committed bank credit lines are MAS-licensed and regulated banks who are obligated to understand their commitment in accordance with the commercial loan agreements construed in accordance with the laws of Singapore. All of the banks are established global banks or strong local banks and SGX-DC conducts annual tests to ensure the lines of credit are available when drawn.</p> <p>The size of the credit lines extended to SGX-DC by each bank liquidity provider is small compared to the size of their respective balance sheets. SGX-DC diversifies its funding sources with credit lines from three commercial banks.</p> <p>SGX-DC takes into account a bank liquidity provider's ability to access credit at central bank of issue, which is a major consideration when selecting banks as liquidity providers, in addition to other stringent bank counterparty admission criteria.</p> <p>SGX-DC's current liquidity providers are able to provide liquidity in SGD, US\$ and JPY.</p>

<p>provider's potential access to credit from the central bank of issue may be taken into account. An FMI should regularly test its procedures for accessing its liquid resources at a liquidity provider.</p>	<p>All liquidity providers have access to credit at MAS for SGD.</p>
<p><b>Key Consideration 8</b> An FMI with access to central bank accounts, payment services, or securities services should use these services, where practical, to enhance its management of liquidity risk.</p>	<p>SGX-DC may use the MAS standing facility for repo. SGX-DC does not use any other central bank services as it is not an eligible participant in the central bank payment system for the foreign currencies.</p> <p>In market conditions where there is systemic financial risk, SGX-DC will deposit as much as practicable, Singapore dollar funds, in its MEPS+ account with MAS, where safety of the funds is an important consideration.</p>
<p><b>Key Consideration 9</b> An FMI should determine the amount and regularly test the sufficiency of its liquid resources through rigorous stress testing. An FMI should have clear procedures to report the results of its stress tests to appropriate decision makers at the FMI and to use these results to evaluate the adequacy of and adjust its liquidity risk-management framework. In conducting stress testing, an FMI should consider a wide range of relevant scenarios. Scenarios should</p>	<p><b>Stress test program</b></p> <p>On a quarterly basis, SGX-DC's estimated liquidity funding requirement is computed and communicated to the finance unit. The risk management unit conducts a liquidity assessment on a quarterly basis. The assessment is reviewed and approved by the Head of the risk management unit and the CRRO.</p> <p>The results of the liquidity assessment are reported to the CFO who ensures that liquid resources are available to meet the liquidity requirements of SGX-DC during a default. The CEO will be kept informed if needed.</p> <p><b>Stress test scenarios</b></p> <p>The stress testing framework takes into account historical and forward-looking hypothetical stress test scenarios to ensure that the scenarios are relevant.</p> <p>Peak historical price volatilities and shifts in market factors are covered under the historical stress testing scenarios which cover historical stress events in the last 20 years. The historical scenarios cover both sudden market shock events such as September 11 and protracted financial crises such as the Asian Financial Crisis and the 2008 Global Financial Crisis with the collapse of Lehman Brothers. Such historical events would have accounted for multiple defaults over a period</p>

<p>include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions. Scenarios should also take into account the design and operation of the FMI, include all entities that might pose material liquidity risks to the FMI (such as settlement banks, nostro agents, custodian banks, liquidity providers, and linked FMIs), and where appropriate, cover a multiday period. In all cases, an FMI should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount and form of total liquid resources it maintains.</p>	<p>of time and significant pressures in the funding and asset market.</p> <p>A spectrum of forward-looking events is also included. Hypothetical scenarios have been designed to cover for a seven standard deviation event.</p> <p><b>Review and validation</b></p> <p>Reviews of the stress-testing assumptions are undertaken at least annually, in line with the review frequency of the historical scenarios for stress testing.</p>
<p>Key Consideration 10</p> <p>An FMI should establish explicit rules and procedures that enable the FMI to effect same-day and,</p>	<p><b>Same day settlement</b></p> <p>SGX-DC has various rules and procedures in place to settle its payment obligations on time during a default. The same rules apply, and SGX-DC will continue to settle payment obligations on time.</p>

<p>where appropriate, intraday and multiday settlement of payment obligations on time following any individual or combined default among its participants. These rules and procedures should address unforeseen and potentially uncovered liquidity shortfalls and should aim to avoid unwinding, revoking, or delaying the same-day settlement of payment obligations. These rules and procedures should also indicate the FMI's process to replenish any liquidity resources it may employ during a stress event, so that it can continue to operate in a safe and sound manner.</p>	<p>SGX-DC clearing rule 7.23 Emergency Margins and Advance Call for Settlement and clearing rule 2.34 Market Disorders, Impossibility of Performance, Emergency Situations and Powers of Clearing House allow SGX-DC to call for additional margins or funds from clearing members, and effect payment on time.</p> <p>The bulk of SGX-DC's exposure is in simple, plain vanilla derivatives with no optionality feature, and hence there is no uncovered liquidity shortfall. There are no secondary risk factors embedded in these products. SGX-DC does not clear CDS or products with jump-to-default characteristics.</p> <p><b>Replenishment of liquidity resources</b></p> <p>The SGX-DC clearing rules 7A.06.4.2 and 7A.06.8 allow for replenishment of the clearing fund when it has been used. For a settlement bank default, committed bank credit lines will be utilized to manage withdrawals, until the recovery of funds.</p>
<p>Key Conclusions for Principle 7</p>	<p>SGX-DC also has an effective framework for the management of liquidity risks. SGX-DC is able to identify, measure and monitor its settlement and funding flows on an ongoing basis. SGX-DC monitors its liquidity exposures to both its clearing members as well as servicing banks on a daily basis. If needed SGX-DC can draw on several credit lines provided by several commercial banks. The liquidity providers need to comply with specific criteria. SGX-DC does not have a specific plan to manage multicurrency needs, as the FX market in Singapore is considered deep and liquid. MAS also provides a standing facility, allowing SGX-DC to repo Singapore government securities and other eligible collateral with MAS for overnight SGD funding.</p>
<p>Assessment of Principle 7</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>The assumption of availability of FX markets should be challenged as part of one of the scenarios of the recovery plan (see Principle 3).</p>

### Principle 8. Settlement Finality

An FMI should provide clear and certain final settlement, at a minimum by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intraday or in real time.

#### Key Consideration 1

An FMI's rules and procedures should clearly define the point at which settlement is final.

#### Point of settlement finality

SGX-DC conducts four types of settlement:

- Daily intraday and final settlement of contracts
- Final settlement of physically delivered commodities products
- Settlement of collateral (cash and non-cash)
- Settlement under MOS with the CME

These types of settlement can comprise settlements of cash, non-cash collateral and physical delivery of commodities.

#### Cash settlement

For cash settlement and other payment, the points of finality vary depending on the method of settlement or payment between SGX-DC and clearing members, which include the following:

- settlement of cash collateral—upon confirmation (set out in SGX-DC clearing rule 7B.2)

Payments of cash collaterals through approved settlement banks are final upon confirmation by the relevant SBs of the payment instruction, pursuant to a fixed process that is encapsulated in LOUs issued by each settlement bank to SGX-DC. The SGX-DC clearing rules ensure that payments conducted through SBs become irrevocable and unconditional once the SB confirms that it will carry out SGX-DC's payment instruction (see SGX-DC clearing rules 7B.2.5). The SFA also provides that in the event that insolvency proceedings are commenced (e.g., against the SB), cash collateral paid through SBs pursuant to the SGX-DC clearing rules will be given precedence over the operation of insolvency laws and be protected from interference by a Singapore court applying the Singapore law of insolvency (s81F).

- settlement of daily mark-to-market and final settlement of contracts – where relevant deduction and/or credit is effected (set out in SGX-DC clearing rule 7.14).

Payments of cash collaterals (mark-to-market variations and final cash settlements) are final at the point where application or credit takes place. The payments are made by applying the clearing member's cash margins held with SGX-DC towards payment (in the case of payment by the clearing member) or crediting the clearing member's cash margins held with SGX-DC with payment

(in the case of payment by SGX-DC). Application or crediting takes place daily. After every daily margin cycle, a recap ledger is produced for each clearing member. Application of or crediting to a clearing member's cash margin for the purpose of mark-to-market and final cash settlement will take place whenever the member's recap ledger shows that such settlements amount are payable. When a recap ledger shows that such settlement amounts are payable, application of or crediting to a clearing member's cash margin will take place at the cut-off time for SBs to confirm any margin call that may be made in that recap ledger. (see SGX-DC clearing rules 7.10 and 7.14)

***Non-cash collateral***

There are currently two types of non-cash collateral accepted by SGX-DC: government securities and book-entry securities, as defined in section 130A of the Companies Act.

Finality with respect to the deposit and return of government securities occurs when the government securities are received in the intended recipients' accounts.

Finality with respect to the deposit of book-entry securities by a clearing member with SGX-DC occurs when the charge over such securities becomes effective in accordance with section 130N of the CA. Finality with respect to the return of book-entry securities by SGX-DC to a clearing member occurs when the charge over such securities is discharged in accordance with section 130N of the Companies Act.

***Physical delivery of commodities***

SGX-DC's obligation in a physical delivery is that of an escrow agent. At expiration of the relevant contract and upon conditions in the contract specifications being met, SGX-DC ceases to be a CCP and is released from its obligations as such. Settlement finality of the buyer and seller occurs at the point when payment of contract value has been made to the seller and transfer of legal title of the commodity to the buyer is completed.

***Money settlements under MOS***

Money settlement under the MOS is governed by the MOS Account Operating Agreement which provides that payment instructions, once matched and verified by the bank, are irrevocable and the bank will notify the relevant parties that the payment has become irrevocable. Finality of settlement occurs at the point of verification by the bank.

Money settlements under MOS become final, irrevocable and unconditional once the relevant payment instruction is matched and verified by the bank

	<p>appointed for such settlement. (see article 9 of the Agreement to Renew Mutual Offset System and article 3.2 of the Mutual Offset Settlement Accounts Operating Agreement)</p> <p>Aside from money settlement under MOS, all other points of settlement finality are defined in the SGX-DC clearing rules, which are publicly available on SGX's website. In respect of MOS, the point of settlement finality of MOS transactions is stated in the MOS Account Operating Agreement.</p> <p>The statutory requirements (SFA sections 72(1)(b) and 73) safeguard the enforceability of the SGX-DC clearing rules as a binding contract.</p> <p><b>Foreign jurisdictions</b></p> <p>While SGX-DC's activities are primarily conducted in Singapore, SGX-DC also admits clearing members incorporated outside Singapore and accepts government securities from other jurisdictions.</p> <p>The finality provisions that are set out in contractual documents are binding and enforceable legal obligations among all the relevant parties, including parties incorporated in foreign jurisdictions. Further, Singapore law is the governing law of the SGX-DC rules, the LOU, and their construction.</p> <p>However, if insolvency proceedings are commenced in a foreign jurisdiction, the insolvency laws of that foreign jurisdiction would apply. As such, there is a potential risk that such foreign insolvency laws may affect SGX-DC's rights over payments deemed final under its rules. However this risk is considered sufficiently mitigated as set out in Principle 1.</p>
<p>Key Consideration 2</p> <p>An FMI should complete final settlement no later than the end of the value date, and preferably intraday or in real time, to reduce settlement risk. An LVPS or SSS should consider adopting RTGS or multiple-batch processing during the settlement day.</p>	<p><b>Final settlement on the value date</b></p> <p>SGX-DC's processes and operations are designed to provide for final settlement on the specified value date. In respect of each margin call, the LOU states that the SBs must confirm SGX-DC's payment instructions in respect of a margin call on the same day as the margin call. Upon the SBs' confirmation, final settlement is considered completed.</p> <p>For certain SGX-DC futures and options contracts, the contract specifications provide for the deferral of final settlement, in order to cater for unforeseen events, such as natural disasters, which may delay the determination of the final settlement price. The margin requirements for such contracts would already take into account the possibility of any deferral of final settlement, hence settlement risks is mitigated on an ongoing basis.</p> <p>One such example would be the deferral of final settlement to the next business</p>

	<p>day for Taiwan futures and options contracts in August 2012. Because of unforeseen weather conditions, the underlying Taiwan equities market was not opened for trading. In accordance with the contract specifications, the final settlement was deferred to the next business day when Taiwan markets reopened. As the above contingency is already explicitly covered under the relevant futures and options contract specifications, SGX-DC was not required to take further steps.</p> <p>SGX-DC provides for intraday settlement through its three intraday margin cycles. Margin calls are issued to clearing members and settlement for intraday margin call is final upon confirmation given by the respective SBs on the same day. For the intraday cycle 3, the settlement variation and margin calls will be issued by 6:00 p.m. and confirmed by the settlement bank by 7:00 p.m. The funds will be credited by 4:00 p.m. on the value date.</p> <p>In the event that a clearing member does not have enough funds at the settlement time, and hence is unable to meet its financial obligations to SGX-DC, SGX-DC may declare a default on that clearing member and the circumstance will be managed under the default management procedures.</p>
<p>Key Consideration 3</p> <p>An FMI should clearly define the point after which unsettled payments, transfer instructions, or other obligations may not be revoked by a participant.</p>	<p>The legal framework, as described above, prohibits unilateral revocation of accepted and unsettled payments, transfer instructions or obligations after the point of finality.</p> <p>The SGX-DC clearing rules and LOU provide that payment instructions become irrevocable once they are confirmed by the SB. As such, a payment instruction (whether to pay SGX-DC or to pay the clearing member) may be revoked by SGX-DC before the instruction is confirmed. SGX-DC can revoke by sending out a subsequent instruction to override the original instruction before the SB gives a confirmation. The detailed process is set out in the LOU undertaken by the SB to SGX-DC.</p> <p>SGX-DC does not allow exceptions and extensions to the revocation deadline (for payment instructions) stipulated in the SGX-DC clearing rules.</p> <p>Information relating to the revocability of payment instructions is defined in the SGX-DC clearing rules 7B, which is publicly available on the SGX website, and in the LOUs.</p>
<p>Key Conclusions for Principle 8</p>	<p>Settlement finality is provided for settlements in cash as well as securities that are deposited as collateral. The SGX-DC contractual arrangements clearly specify the moment of finality. The contractual obligations are set out in the SGX-DC clearing rules, the letter of undertaking with the settlement banks and the MOS agreement with the CME. The SFA support the enforceability of the contractual obligations at a statutory level. Finality occurs real time as soon as settlements are considered complete in accordance with the contractual</p>

	obligations.
Assessment of Principle 8	Observed
Recommendations and Comments	-

### Principle 9. Money Settlements

An FMI should conduct its money settlements in central bank money where practical and available. If central bank money is not used, an FMI should minimize and strictly control the credit and liquidity risks arising from the use of commercial bank money.

#### Key Consideration 1

An FMI should conduct its money settlements in central bank money, where practical and available, to avoid credit and liquidity risks.

SGX-DC does not conduct money settlement in central bank money. Main reasons are that for settlement in euro, US\$ and yen central bank money is not available as SGX-DC does not have direct access to the issuing central banks of those currencies.

SGX considers the use of MEPS+ for settlement in SGD not practicable as the SGD settlement value accounts for a small percentage of total settlement. Also, not all SGX-DC members have access to MEPS+.

SGX-DC conducts, via its SBs the following types of money settlement:

- Daily mark-to-market settlements
- Final settlement on expiration of contracts
- Settlement of cash collateral
- Final settlement of physically delivered commodities products
- Settlement under MOS with the CME

SGX-DC completes money settlement through commercial banks who are admitted by SGX-DC as SB. SGX-DC and its clearing members maintain accounts with these SBs. Money payment by a clearing member in relation to a margin call is effected through the SB of the clearing member. All the SBs have executed LOU in favor of SGX-DC setting out the settlement process. Furthermore, each clearing member has executed a letter of authorization. This letter authorizes its SB to effect transfers from the clearing member's account in accordance with any and every instruction given by SGX-DC.

Each clearing member must maintain two settlement accounts (customer and

	<p>house origin settlement account) for each settlement currency with a SB of their choice. At the end of each settlement cycle and where margin calls are required, SGX-DC sends direct debit instructions via SWIFT to clearing members' appointed SBs to debit the clearing members' accounts for margin calls and the corresponding funds are credited to SGX-DC's accounts held with these SBs.</p> <p>Under the LOU, SGX-DC will instruct each SB to transfer, by SWIFT and by stipulated times on each settlement day, the money settlement amount in respect of the relevant clearing members. The LOU further provides that by stipulated times (an hour after a margin call is made), the SB is to confirm if it is able to meet such instructions.</p> <p>SGX-DC uses four currencies, namely US\$, SGD, JPY and euro for settlement. Settlement of cash takes place on value date T+1 for US\$, euro and SGD at 4:00 p.m., while JPY is settled on T+2 at 4:00 p.m. The different value date for the settlement of JPY is due to operational timing reasons for the banks to be able to effect the payment. Any funds received are immediately transferable.</p> <p>Settlement with CME is governed by an agreement that provides the process whereby both SGX-DC and CME will provide the appointed bank with the payment instructions. Once matched, the bank will effect the payments.</p> <p>Payments are made by SGX and CME on T+1 for US\$ and T+2 for JPY at 8:00 a.m. local time, using one settlement bank. In 2013 20 clearing members were actively using the link between SGX-DC and the CME.</p>
<p>Key Consideration 2 If central bank money is not used, an FMI should conduct its money settlements using a settlement asset with little or no credit or liquidity risk.</p>	<p>SGX-DC ensures that it only admits commercial banks that meet the stringent credit criteria for SBs. The appointed SB should possess a minimum C rating, which demonstrate adequate intrinsic safety and soundness, on its bank financial strength from Moody's. In addition, the appointed SB must have at least an A rating on its long-term debt. Capital strength and qualitative aspects (e.g. the bank's ability to meet requirements of SGX-DC's settlement operations) are also considered when admitting an SB. The appointed SB must also be supervised by a recognized regulator and have a local presence in Singapore, holding a banking license, to support SGX-DC's banking operational needs. These SBs are licensed and supervised by the MAS under the Banking Act.</p> <p>The framework for governing the admission criteria is approved by the RMC and reviewed periodically. The admission criteria for SBs are disclosed in SGX-DC's Disclosure documents, which are publicly available.</p> <p>SGX-DC ensures that concentration risk from the use of commercial bank money is minimized by diversifying its risk over eight SBs, which are among the largest global and local banks, and setting concentration risk limits for these</p>

	<p>SBs. A concentration limit is set for every settlement bank. All eight SB's are able to settle all four currencies.</p> <p>SGX-DC maintains committed bank lines which are available for drawdown in all four currencies.</p>
<p>Key Consideration 3</p> <p>If an FMI settles in commercial bank money, it should monitor, manage, and limit its credit and liquidity risks arising from the commercial settlement banks. In particular, an FMI should establish and monitor adherence to strict criteria for its settlement banks that take account of, among other things, their regulation and supervision, creditworthiness, capitalization, access to liquidity, and operational reliability. An FMI should also monitor and manage the concentration of credit and liquidity exposures to its commercial settlement banks.</p>	<p>In monitoring, managing and limiting the credit and liquidity risks from commercial SBs, SGX-DC adopts a number of safeguards.</p> <ul style="list-style-type: none"> <li>• First, SGX-DC diversifies the credit and liquidity risks of commercial SBs by using 8 SBs. As a policy, which aids the diversification of risks, SGX-DC does not limit the number of banks who qualify to be SBs. Exposure limits are set for individual SBs based on their credit rating. Also, to mitigate SGX-DC's risks to the SBs, the total exposure as a percentage of shareholders' funds of individual SBs cannot exceed a prescribed threshold. In addition, concentration limits are established to mitigate SGX-DC's exposure to any single SB.</li> <li>• Second, SGX-DC's exposure to each SB is monitored on an ongoing basis to ensure that the prescribed exposure and concentration limits are not exceeded. Exposures exceeding the allocated limit will be escalated immediately to the CRRO and CEO as relevant. Depending on the severity of the breach, the RMC may be notified as well. Prompt actions will be taken to address the breach of limit. These exposures, which are described as settlement and term exposures, are also reported to the CFO at the end of each week and to EXCO and the Board as part of the monthly risk update.</li> <li>• Third, SGX-DC also monitors the market closely for any adverse news or developments relating to all its bank counterparties. These enable SGX-DC to take comprehensive and prompt actions to mitigate credit and liquidity risks across SGX-DC as necessary and appropriate. The credit ratings of all banks are monitored regularly to ensure that the banks that SGX-DC is exposed to are of an acceptable level of financial strength.</li> <li>• Fourth, at times when the management deems an SB to be a credit concern or potential default risk, SGX-DC will apply heightened monitoring on the SB, which includes monitoring all payments associated with the SB and requiring the SB to immediately sweep funds out of SGX-DC's account to minimize any routing risk. Hence, when an SB's credit rating has deteriorated or becomes a concern, SGX-DC has the capabilities to require expedited sweeping of funds to significantly narrow the payment turnaround time.</li> <li>• Fifth, in addition to the application of on-going heightened SB monitoring, SGX-DC has the further ability to take pre-emptive risk-elimination actions by changing the accounts involved in the intra-day routing process. In the first instance, SGX-DC can change its instructions to the SB to route payments to a destination account with another SB. Depending on the gravity of the situation, SGX-DC can also change its payment routing to use source accounts of clearing members with other SBs to bypass the SB with the risk concerns. These actions can be effected within the same day.</li> <li>• Lastly, SGX-DC maintains committed bank lines and its own cash that can be</li> </ul>

	drawn upon to meet liquidity requirements, if required.
<p>Key Consideration 4</p> <p>If an FMI conducts money settlements on its own books, it should minimize and strictly control its credit and liquidity risks.</p>	NA
<p>Key Consideration 5</p> <p>An FMI's legal agreements with any settlement banks should state clearly when transfers on the books of individual settlement banks are expected to occur, that transfers are to be final when effected, and that funds received should be transferable as soon as possible, at a minimum by the end of the day and ideally intraday, in order to enable the FMI and its participants to manage credit and liquidity risks.</p>	<p>For money settlements (except for payments related to the CME link) the relevant agreement between SGX-DC and its SBs is the LOU. The LOU provides that SGX-DC is to issue, by a designated process and by a stipulated time on each day, payment instructions to each SB regarding the amounts of cash to be debited and credited to clearing members.</p> <p>The LOU provides that once the SB confirms a payment instruction to SGX-DC:</p> <ul style="list-style-type: none"> <li>• SGX-DC's instructions become irrevocable;</li> <li>• a debit or credit entry to SGX-DC's account is final regardless of value date except when there is gross error;</li> <li>• in respect of transfer instructions in favor of SGX-DC, if the carrying out of the instruction is prevented or impeded, the SB will ensure that SGX-DC's account will receive and be entitled to keep such sums in respect of which the confirmation or deemed confirmation has been given and will credit such account from its own funds.</li> </ul>
<p>Key Conclusions for Principle 9</p>	<p>SGX-DC conducts money settlements through commercial banks that are selected by SGX-DC as settlement banks. Most settlements are in U.S. dollar, Japanese Yen and euro. SGX-DC has no direct access to the respective central banks of issue. Settlements in Singapore dollar are relatively small and not all clearing members have access to the MEPS+ system. Settlement bank risk is reduced by applying strict selection criteria for settlement banks, such as capital ratios, creditworthiness, access to liquidity and operational reliability. SGX-DC monitors compliance with these criteria on a regular basis. In addition, SGX-DC monitors its concentration to the settlement banks and reduces its exposures if concentration limits are reached.</p>

Assessment of Principle 9	Observed
Recommendations and Comments	SGX-DC should consider using MEPS+ for direct settlements in Singapore dollars.

<b>Principle 10. Physical Deliveries</b>	
An FMI should clearly state its obligations with respect to the delivery of physical instruments or commodities and should identify, monitor, and manage the risks associated with such physical deliveries.	
<p>Key Consideration 1</p> <p>An FMI's rules should clearly state its obligations with respect to the delivery of physical instruments or commodities.</p>	<p>The following commodities are accepted by SGX-DC for physical delivery:</p> <ul style="list-style-type: none"> <li>• TSR20 Rubber</li> <li>• RSS3 Rubber</li> <li>• Fuel Oil 380 CST</li> </ul> <p>These contracts are all traded on SGX-DT.</p> <p>SGX-DC becomes the escrow agent of any document, letter of credit, financial instrument, property or money (the escrow asset) in connection with the delivery of the underlying commodity, by holding the escrow asset on behalf of the depositing party. As the escrow agent, SGX-DC acts solely as a stakeholder for the convenience of the depositing party and in accordance with the terms for escrow holding as set out in the SGX-DC clearing rules or the relevant contract specifications. The obligations of SGX-DC with respect to the delivery contract are limited to the discharge of its escrow obligations.</p> <p>SGX-DC also offers clearing members the option to choose alternate delivery procedures, which allow the buyer and seller of the commodities to take and make delivery without the involvement of SGX-DC using their own negotiated or agreed terms, thereby releasing SGX-DC of all delivery obligations and responsibilities.</p> <p>SGX-DC defines its obligations and responsibilities with respect to the delivery of physical instruments or commodities in Chapter 6 of the SGX-DC clearing rules, which are publicly available on the SGX website. In addition SGX-DC informs its clearing members via circulars and briefing sessions on the physical delivery process for new contracts.</p>
<p>Key Consideration 2</p> <p>An FMI should identify,</p>	<p>As an escrow agent, SGX-DC does not bear the risk and cost associated with the storage and delivery of physical instruments or commodities. The risks and costs</p>

<p>monitor, and manage the risks and costs associated with the storage and delivery of physical instruments or commodities.</p>	<p>of storage and delivery are borne by the seller or buyer under the terms as set out in contract specifications.</p> <p>However, SGX-DC has developed procedures and controls to track and manage the delivery process of its clearing members. These procedures and controls include the appointment of local agents to perform the necessary validation that the warehouse receipts presented by the seller are valid for delivery, as well as the collection of necessary documents and deposits. Any event of non-delivery by the seller, or where deliveries do not meet product standards established in the contract specifications, can be addressed through arbitration in accordance with the SGX-DC clearing rules and contract specifications. The buyer, if granted an award through arbitration, may make a claim against the performance deposit of the seller, as set out under the SGX-DC clearing rules.</p> <p>The circumstances where SGX-DC will match participants for delivery and receipt are spelt out in the relevant contract specifications. SGX-DC's clearing members are subject to physical delivery and receipt of the commodity if they have remaining open positions on the last trading day of the contract. Open positions below the minimum delivery size will be cash settled. SGX-DC will take into consideration the quantity of delivery lots, location, method of delivery or any other criteria as provided in the relevant contract specifications when conducting the matching. While SGX-DC endeavors to minimize the number of ultimate parties, locations and methods of delivery involved, matching will be at the sole discretion of SGX-DC and binding on the matched participants. Legal obligations of SGX-DC for delivery are spelt out in chapter 6 of the clearing rules and the relevant contract specifications.</p> <p>SGX-DC's clearing members who engage in physical deliveries are required to have the necessary capabilities which includes tracking and meeting the various delivery timelines such as the due date for submission of requisite documents to SGX-DC, e.g. shipping instructions, nomination advices, provisional documents and final documents. Clearing members are expected to notify SGX-DC early if there is any delivery issue.</p> <p>SGX-DC independently tracks the delivery performance of its clearing members by maintaining a delivery log that tracks the various deadlines for submission of documents, and dates of payment obligations to SGX-DC throughout the delivery process.</p> <p>With regard to resources, SGX-DC collects performance deposits from its participants to secure the performance of the participants' obligations under the delivery contract.</p>
---	---

Key Conclusions for Principle 10	For physical settlements SGX-DC acts as the escrow agent and does not guarantee the delivery of contracts. Commodity contracts for rubber and oil are accepted for physical delivery. SGX-DC's clearing rules describe the obligations of market participants as well as procedures and controls to manage the delivery process.
Assessment of Principle 10	Observed
Recommendations and Comments	-

### Principle 13. Participant-default Rules and Procedures

An FMI should have effective and clearly defined rules and procedures to manage a participant default. These rules and procedures should be designed to ensure that the FMI can take timely action to contain losses and liquidity pressures and continue to meet its obligations.

Key Consideration 1 An FMI should have default rules and procedures that enable the FMI to continue to meet its obligations in the event of a participant default and that address the replenishment of resources following a default.	<p><b>Participant default rules and procedures</b></p> <p>SGX-DC has established a default management framework, rules and procedures supporting SGX-DC to take timely action in the event that a participant fails to meet its obligations.</p> <p>The SGX-DC clearing rules define an event of default if one or more of the following situations occur (SGX-DC clearing rule 7A.01A.1):</p> <ul style="list-style-type: none"> <li>• A clearing member's security deposit, margins on deposit with SGX-DC, or any of its other assets or securities available to SGX-DC are insufficient to fully discharge the clearing member's obligations to SGX-DC.</li> <li>• Where SGX-DC's counterparty is another market (for example, the CME under the MOS, its collateral is insufficient to fully discharge its obligations to SGX-DC.</li> <li>• The insolvency of a clearing member (as determined under SGX-DC clearing rule 7A.01.3) or any other market whose contract(s) are cleared by SGX-DC.</li> <li>• Conversion, theft, breach of trust, embezzlement, or any other similar cause, caused or suffered by or in connection with a clearing member.</li> </ul> <p>In addition, SGX-DC is also entitled to suspend or restrict the membership of any clearing member, or the clearing and settlement of exchange trades in general or in particular, or the clearing and settlement of exchange trades of any clearing member for a specific duration if in the opinion of SGX-DC (SGX-DC clearing rule 7A.01):</p> <ul style="list-style-type: none"> <li>• the functioning of SGX-DC is or is likely to be impaired by any event or</li> </ul>
---	---

	<p>circumstance;</p> <ul style="list-style-type: none"> <li>• such action is in the general interest of SGX-DC and/or its clearing members; or</li> <li>• an event of default has occurred in respect of that clearing member.</li> </ul> <p>SGX-DC's rules and procedures address the following key aspects of a participant default:</p> <p><b><i>Actions that SGX-DC can take when a default is declared.</i></b></p> <p>These actions relate to risk mitigating measures, declaration of default, key actions to be taken by SGX-DC and the conclusion of a default exercise.</p> <p><i>Risk mitigating measures</i> include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Escalate monitoring efforts on the clearing members.</li> <li>• Require additional collateral and/or contributions to the SGX-DC clearing fund.</li> <li>• Restrict the withdrawal of clearing member's excess monies and assets.</li> <li>• Facilitate the transfer of customer positions.</li> </ul> <p>Upon <i>declaration of a default</i> by SGX-DC, the defaulting clearing member's clearing privileges will be suspended. A default notice will be disseminated to the defaulting clearing member. Communication with other market participants and the public will be managed to provide information to the market while avoiding any possible loss of confidence in the clearing system.</p> <p>The <i>key actions</i> that SGX-DC can undertake in relation to a default of exchange-traded derivatives and OTC commodity contracts include:</p> <ul style="list-style-type: none"> <li>• Utilization of financial resources held with SGX-DC</li> <li>• Porting and liquidation of clearing member/customer's positions, see Principle 14.</li> <li>• Hedging of positions</li> <li>• Consultation with market participants on liquidation of defaulting clearing member/customer's positions</li> <li>• Liquidation of positions</li> <li>• Cash settle or invoice back remaining positions.</li> </ul> <p>In the case of OTC derivatives contracts, <i>key actions</i> undertaken after the declaration of default includes, in sequence of action:</p>
--	--

- Activation of OTCF default management group
- Risk reduction and hedging
- Competitive auction process
- Compulsory assignment process
- Post auction/compulsory assignment process

Upon the *conclusion of any default proceeding* commenced by SGX-DC, as required under Section 81H of the SFA, SGX-DC will make a report on such default proceedings which shall include the following details, as the case may be:

- the net sum, if any, certified by SGX-DC to be payable by or to the defaulting clearing member; or
- the fact that no sum is so payable.

This report shall be submitted to the MAS and any relevant office holder acting in relation to the defaulting clearing member. SGX-DC is also required to publish a notice to bring to the attention of the creditors of the defaulting clearing member regarding the existence of the report.

***Extent to which the actions are automatic or discretionary***

SGX-DC's declaration of a default is discretionary, but in line with the SGX-DC clearing rules, default management framework, manuals and procedures for its default management actions.

***Changes to the normal settlement practices***

SGX-DC may allow changes to its normal settlement process under the following circumstances:

- in the event of an operational disruption
- default of a clearing member

These procedures are documented in SGX-DC's suspension of clearing and settlement policy and default management procedures.

***Management of transactions at different stages of processing***

Upon declaration of a default, SGX-DC will manage all novated contracts of a defaulting member under the SGX-DC clearing rules within its default management procedures. All contracts that were not novated will be purged.

***Treatment of proprietary and customer transactions and accounts***

When a default is declared, SGX-DC will segregate defaulted proprietary and/or customer positions from those of non-defaulting customers.

SGX-DC may exercise its discretion not to transfer all or any part of the margins to a designated receiving clearing member where the default is due to a customer default. It may be necessary for SGX-DC to retain customer monies if the default is of customer origin. This provides SGX-DC with access to funds to meeting any clearing losses, in such manner permitted under the SFA.

***Roles, obligations, and responsibilities of the various parties, including non-defaulting participants***

The default management governance structure consists of the crisis management team and default recovery team. In addition default managers (only for OTCF) and non-defaulting participants have roles and responsibilities.

The crisis management team, which involves the CEO, chief operations and technology officer and CRRO, is the senior management decision-making body that provides leadership in a default management situation. Their main responsibilities are:

- serve as the decision making body to declare an event of default;
- when an event of default has been declared take decisions on the reporting to MAS, all public announcements of the default, closure of relevant markets and oversight of the whole default management process.

The main role of the default recovery team is to execute the default management procedures. Once activated, the team will:

- coordinate default management procedures with support from various SGX units; and
- ensure that recovery from the default is completed in a proper and timely manner and impact on the clearing system is minimized.

The responsibility of the default recovery team includes the right to appoint an on-site task force, which will be deployed at the defaulting clearing member's premises, to manage the default situation and uphold the interests of SGX-DC.

SGX-DC will appoint from amongst the OTCF clearing members, a minimum of three default managers who will act as execution agents of SGX-DC. These default managers will be engaged in an advisory capacity on the basis of their trading and market expertise. The documentation governing the role and appointment of default managers comprises:

- the OTCF default management agreement; and
- the default managers appointment letter.

The roles and responsibilities of default managers include the following:

- advise SGX-DC on and execute the appropriate hedges or liquidation to mitigate further adverse market movement of the defaulted portfolio, including where necessary any ongoing hedging;
- confirm that a portfolio is suitable for auction on completion of risk reduction hedging, and advising on an indicative reserve price for each auction portfolio;
- advise SGX-DC on any other issue where the default managers' expertise may be required for the proper and orderly conduct of SGX-DC's OTCF default management procedures;
- execute the default recovery team's instructions as directed; and
- participate in default management drills of SGX-DC.

In addition, the following documentation governs the obligations of non-defaulting clearing members who clear OTCF derivatives contracts comprise:

- the OTCF default management agreement; and
- the SGX-DC OTCF clearing members default management manual.

All non-defaulting clearing members who clear OTCF derivatives contracts are also required to participate in the orderly winding down of the defaulting portfolio by taking on the defaulting clearing member's positions through an auction and compulsory assignment process. Therefore, in addition to those obligations set out above, non-defaulting clearing members who clear OTCF derivatives contracts have additional obligations to meet in a situation of default. These are provided by way of private agreement between SGX-DC and each of the clearing members who clear OTCF derivatives contracts.

Finally, SGX-DC also needs to replenish financial resources. Under the clearing fund capital requirements established by MAS, SGX-DC must at all times maintain in cash an amount of at least 25 percent of the SGX-DC clearing fund. In the event that SGX-DC's clearing fund contribution has been utilized and falls below 25 percent of the clearing fund size following a default, SGX-DC will replenish its clearing fund contribution up to the minimum aggregate contribution (i.e., an amount equivalent to at least 25 percent of the clearing fund size).

***Existence of other mechanisms that may be activated to contain the impact of a default***

SGX-DC and SGX-DT may exercise their powers to take other actions as deemed

	<p>fit, such as closure of the SGX-DT market to contain any knock-on effect of the default (futures trading rule 7.3.7).</p> <p><b>Use of financial resources</b></p> <p>Where a SGX-DC clearing member has failed to discharge any of its obligations to SGX-DC in respect of its own proprietary contract, SGX may recover its losses by taking the following financial resources (SGX-DC clearing rule 7A.05.1.1):</p> <ul style="list-style-type: none"> <li>• the defaulting clearing member's security deposit and all other forms of security furnished to SGX-DC (but excluding security furnished in relation to a customer contract);</li> <li>• margins, assets or securities deposited by the defaulting clearing member in relation to proprietary contracts; and</li> <li>• in the case of a bank clearing member incorporated outside Singapore, the cash and/or acceptable government securities deposited by such BCM.</li> </ul> <p>Where a SGX-DC clearing member has failed to promptly discharge any of its obligations to SGX-DC in respect of a customer contract, SGX-DC may in addition to the above remedies, apply the margins, assets or securities of customers provided that the conditions in the SFA in relation to the permissible use of customers' money and assets are satisfied (SGX-DC Clearing Rule 7A.05.1.2).</p>
<p>Key Consideration 2</p> <p>An FMI should be well prepared to implement its default rules and procedures, including any appropriate discretionary procedures provided for in its rules.</p>	<p>SGX-DC has a clearly-defined default management framework, internal guidelines and procedures to provide guidance in handling and managing a default situation. The default management framework outlines the key responsibilities of the default recovery team and supporting teams.</p> <p>SGX-DC's default management framework is reviewed at least annually and more frequently if needed, e.g., in case of changes in regulatory requirements or any material changes in the SGX-DC clearing rules or procedures. While the review is conducted by the risk management unit, any material changes to the default management framework are subject to approval of the RMC.</p> <p>The management of the default of MF Global Singapore reinforced SGX-DC's default management procedures, and provided lessons for further refinement. During the crisis, SGX-DC executed all key elements of default management including portability. The exercise provided insights to further improve the process. Subsequently, SGX-DC clearing rules were refined to give clarity to the process. Other improvements relate to the process for transferring margin collaterals along with the positions, from the defaulting clearing member to the new clearing member.</p>

<p>Key Consideration 3</p> <p>An FMI should publicly disclose key aspects of its default rules and procedures.</p>	<p>The SGX-DC clearing rules, which are publicly available on the SGX website, define key aspects of its default management procedures. In addition, SGX published the SGX-DC OTCF members default management manual to provide the guiding principles and steps which will be taken in the event of a default by an OTCF clearing member.</p> <p>The following key aspects of SGX-DC's default rules and procedures are published:</p> <ul style="list-style-type: none"> <li>• Circumstances in which action may be taken</li> <li>• Who may take those actions</li> <li>• Scope of the actions which may be taken</li> <li>• Mechanisms to address an FMI's obligations to non-defaulting participants.</li> <li>• Mechanisms to help address the defaulting participant's obligations to its customers.</li> </ul>
<p>Key Consideration 4</p> <p>An FMI should involve its participants and other stakeholders in the testing and review of the FMI's default procedures, including any close-out procedures. Such testing and review should be conducted at least annually or following material changes to the rules and procedures to ensure that they are practical and effective.</p>	<p><b>Testing of default procedures</b></p> <p>Fire-drills are conducted annually to test the preparedness of the default recovery team in implementing default procedures promptly and effectively. With the results from these default management fire-drills, the default management procedures are refined and improved with experiences and insights. Stakeholders of the OTCF derivative segment are involved in the testing and review of default procedures for this segment.</p> <p>In October 2010, prior to the launch of SGX-DC's clearing services of OTCF derivative contracts, SGX-DC had engaged its clearing participants in the development of its default management procedures for OTCF derivative contracts. Subsequently, SGX-DC published the OTCF members' default management manual to provide clearing members the guiding principles and steps which will be taken in the event of a default by a clearing member that clears OTCF derivative contracts.</p> <p>SGX-DC has also published the OTCF fire-drill code of conduct for OTCF derivatives contracts, to provide a description of the guiding principles and steps that need to be taken to conduct testing of the default management procedures relevant to OTCF derivative contracts. The objectives of the testing include:</p> <ul style="list-style-type: none"> <li>• rehearsal of default management procedures relevant to OTCF derivative contracts on a regular basis to ensure they are practical and effective.</li> <li>• testing SGX-DC internal processes and the preparedness of the clearing</li> </ul>

	<p>members to undertake the hedging and auction elements of the default management procedures</p> <p>The scenarios covered during the test could encompass the type of products cleared, the declaration of default, risk reduction and hedging process, competitive auction process, compulsory assignment process, post auction process. In general, test results will be shared with the ERC and MAS.</p> <p>On July 15 and 21, 2011, SGX-DC conducted a default management exercise for the OTCF IRS contract. The testing was successfully conducted with all the participants meeting or exceeding the success criteria. In general, default management exercise for OTCF derivatives will be conducted at least annually or following material changes to the rules. Another default management exercise for OTCF derivatives (IRS and non-deliverable foreign exchange forwards) was conducted on August 17 and 24, 2012.</p> <p><b>Default scenarios</b></p> <p>The fire-drills include rehearsal of default management procedures in response to a participant default in the relevant market. These default exercises may focus on the detailed operational procedures that the default recovery team would take in response to a participant default and will be required to articulate their roles, drilling down to the specific steps of their respective unit's default management procedures.</p>
Key Conclusions for Principle 13	<p>SGX-DC has well-developed default rules and procedures to manage a participant's default. The SGX-DC clearing rules comprehensively describe the declaration of a default and risk mitigating actions to be taken by the CCP. The CCP also has appropriate discretionary power to implement these rules. In addition the CCP has internal guidelines and procedures to manage default situations. These procedures are tested on an annual basis with the involvement of clearing members. Key aspects of the default procedures are publicly available.</p>
Assessment of Principle 13	Observed
Recommendations and Comments	<p>SGX-DC is encouraged to conduct drills for the exchange traded derivatives and OTC commodities on an annual basis as well.</p>

### Principle 14. Segregation and Portability

A CCP should have rules and procedures that enable the segregation and portability of positions of a participant's customers and the collateral provided to the CCP with respect to those positions.

#### Key Consideration 1

A CCP should, at a minimum, have segregation and portability arrangements that effectively protect a participant's customers' positions and related collateral from the default or insolvency of that participant. If the CCP additionally offers protection of such customer positions and collateral against the concurrent default of the participant and a fellow customer, the CCP should take steps to ensure that such protection is effective.

#### Customer protection from participant default

Under SGX-DC clearing rules 7.09.1 and 7.16.1, clearing members are required to maintain positions for each disclosed customer in the clearing system. SGX-DC holds customer collateral on trust and separate from clearing members' collateral and its own assets, pursuant to Section 62 of the SFA. The trust arrangements under the SFA protect the customer collateral from the default or insolvency of clearing members. Customer collateral deposited by each clearing member with SGX-DC is commingled in a single omnibus bank account.

#### Customer protection from participant and fellow customer default

Where customer collateral is deposited with SGX-DC, it is considered to be subject to a degree of fellow-customer risk. However, non-defaulting customers' collateral may only be used under limited circumstances (section 63 of the SFA). Where a clearing member has failed to discharge any of its obligations to SGX-DC in relation to a customer contract, SGX-DC may only use other customers' collateral to meet the subject obligations if, among other things –

- SGX-DC is of the opinion that the failure of the member to meet the subject obligations is directly attributable to the failure of any of the customers of the member to meet that customer's obligations under any market contract;
- either—
  - both of the following have been wholly utilized to meet the subject obligations:
    - any money or assets deposited or paid for or in relation to contracts of the member itself and held by SGX-DC; and
    - any money or assets deposited by the member with SGX-DC as collateral or guarantee for the purpose of satisfying all obligations of the member to SGX-DC (excluding any customers' money or assets); or
  - SGX-DC has reasonable grounds for forming an opinion that the failure to use the customers' money or assets to meet the subject obligations may jeopardize the financial integrity of SGX-DC;

SGX-DC clearing rule 7A.05.1.2b provides that where a clearing member has failed promptly to discharge any of its obligations to SGX-DC in respect of a

	<p>customer contract, SGX-DC may apply collateral deposited by the clearing member in relation to customer contracts, provided that the conditions in the SFA in relation to the permissible use of customers' monies and assets are satisfied.</p> <p><b>Legal basis</b></p> <p>The statutory and regulatory requirements under the SFA and the contractual obligations between SGX-DC and each clearing member provide a high degree of assurance that they will support SGX-DC's segregation arrangements in respect of its clearing members' customers' positions and collateral.</p> <p><b>Foreign and remote participants</b></p> <p>The involvement of foreign-incorporated clearing members means that insolvency proceedings may be commenced in a foreign jurisdiction in which the enforceability of such arrangements may be called into issue. The foreign jurisdictions include the U.S., U.K., France, Germany, Sweden, the Netherlands, Switzerland, Malaysia and Hong Kong.</p> <p>In such an event with respect to the segregation and portability arrangements, the SGX-DC clearing rules would still have contractual force. For any cross border legal risks, see Principle 1.</p>
<p>Key Consideration 2</p> <p>A CCP should employ an account structure that enables it readily to identify positions of a participant's customers and to segregate related collateral. A CCP should maintain customer positions and collateral in individual customer accounts or in omnibus customer accounts.</p>	<p>SGX-DC's account structure facilitates clearing members to have an account for their proprietary positions and an omnibus account for customer's positions. In addition, clearing members may maintain an individual account for each customer. This facilitates identification of customers' position. If customers do not open an individual account their positions will be kept at an omnibus account.</p> <p>To ascertain positions of individual customers, SGX-DC reconciles its records daily with its clearing members' records. SGX-DC clearing rule 2.14.1 provides for the right of SGX-DC to inspect the clearing members' records on request.</p>
<p>Key Consideration 3</p> <p>A CCP should structure its portability arrangements in a way that makes it highly</p>	<p><b>Positions</b></p> <p>Under SGX-DC's portability arrangements, positions of a defaulted clearing member's customers will be transferred to one or more other clearing members, so long as the relevant conditions are met. The effectiveness of SGX-DC's portability arrangements has been tested and demonstrated in the MF Global</p>

<p>likely that the positions and collateral of a defaulting participant's customers will be transferred to one or more other participants.</p>	<p>incident in 2011.</p> <p>In the event of a clearing member's default, all customers' positions are protected through SGX-DC's portability arrangements. Under SGX-DC clearing rule 7A.02.1, SGX-DC has the power to transfer positions and/or margins from the books of a defaulted clearing member to one or more non-defaulting clearing members.</p> <p>As part of its operating procedures, SGX-DC obtains the written consent of the receiving clearing member, before porting positions and collateral. The transfer of positions will be made to such clearing member as requested by the customer of the defaulted clearing member, if the following conditions are met:</p> <ul style="list-style-type: none"> <li>• the identity of the customer (whether previously disclosed or undisclosed) is known to SGX-DC;</li> <li>• the customer positions can be ascertained, in the case of undisclosed customers;</li> <li>• the receiving clearing member agrees to carry the customer positions; and</li> <li>• the defaulted clearing member or its liquidator are in agreement with the transfer.</li> </ul> <p>SGX-DC will also verify that there is sufficient margin to cover remaining positions before transferring customer positions held in an omnibus customer sub-account.</p> <p>In an event of default, under SGX-DC's default management procedures, a customer is given two days to port its positions to an alternative clearing member, failing which, SGX-DC will liquidate the positions. The two-day time period is a general guideline. In the event that the market is quiet or is working in favor of the customer's positions, and if there is sufficient margin to cover a longer time period, SGX-DC may in its discretion extend the two-day time period to a longer time period.</p> <p>Where customer positions are transferred to an alternative clearing member, the alternative clearing member must deposit the required customer collateral with SGX-DC and collect initial margin from the customer, if any, as required under SGX-DC clearing rule 7.22.1.</p> <p><b>Collateral</b></p> <p>SGX-DC's portability arrangements also provide that the collateral of a defaulted clearing member's customers will be transferred to one or more other clearing members. SGX-DC clearing rule 7A.02.1.1 provides that when the positions of a</p>
--	---

	<p>defaulted clearing member's customers are transferred, collateral deposited with the defaulted clearing member in respect of those positions will also be transferred, subject only to limited circumstances.</p> <p><b>Facilitation</b></p> <p>SGX-DC clearing rule 7A.02.2 provides that the defaulted clearing member is required to cooperate with SGX-DC and the non-defaulting clearing members in respect of any of the actions that SGX-DC may take pursuant to rule 7A.02.1 for the transfer of customer positions and collateral.</p> <p>SGX-DC has the power to transfer open positions to its clearing members without having to obtain consent. As part of its operating procedures, SGX-DC obtains the written consent of the receiving clearing member, before porting positions and collateral.</p>
<p>Key Consideration 4</p> <p>A CCP should disclose its rules, policies, and procedures relating to the segregation and portability of a participant's customers' positions and related collateral. In particular, the CCP should disclose whether customer collateral is protected on an individual or omnibus basis. In addition, a CCP should disclose any constraints, such as legal or operational constraints, that may impair its ability to segregate or port a participant's customers' positions and related collateral.</p>	<p>SGX-DC's segregation and portability arrangements are disclosed in the SGX-DC clearing rules, which are publicly available on SGX's website. The account structure that allows for clearing members' customers' collateral to be protected on an omnibus basis is set out in the SGX-DC clearing rules and communicated to clearing members by way of circular.</p> <p>The following SGX-DC clearing rules disclose the relevant risks and uncertainties involved:</p> <ol style="list-style-type: none"> <li>1. SGX-DC clearing rule 7A.02.1 generally outlines the risks pertaining to the portability of customers' positions and collateral. Such risks include (i) the discretion of SGX-DC not to transfer margins to a designated clearing member if positions are held in an omnibus account; and (ii) if the customer collateral deposited with SGX-DC may be applied towards other obligations owing to SGX-DC arising from the failure of a clearing member to discharge any obligations to SGX-DC in respect of a customer contract.</li> <li>2. SGX-DC clearing rule 7A.02.1.3 discloses the risk that house or customer positions of a defaulted or suspended clearing member that have not been transferred pursuant to the SGX-DC clearing rules within such time as SGX-DC may prescribe may be liquidated.</li> <li>3. SGX-DC clearing rule 7A.02.1.1b discloses the possibility that where positions of a defaulted or suspended clearing member are transferred to one or more alternative clearing members, the margins transferred to the alternative clearing member may not be in such form as was originally deposited with SGX-DC.</li> </ol>

Key Conclusions for Principle 14	Customers' positions and related collateral are protected by segregation and portability arrangements in case of the default of their clearing member. SGX-DC holds customer collateral on trust and separate from clearing members' collateral and its own assets. Customers' positions are administrated in individual and omnibus accounts, with extensive possibilities for the CCP to collect information on customers' positions that are part of an omnibus structure. Portability arrangements allow customers as well as the CCP to transfer positions and collateral to surviving clearing members if needed. Portability of accounts has been conducted during recent defaults. Customers' positions may not always be transferred, but will sometimes need to be liquidated. The SGX-DC rules disclose these risks to customers.
Assessment of Principle 14	Observed
Recommendations and Comments	-

### Principle 15. General Business Risk

An FMI should identify, monitor, and manage its general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if those losses materialize. Further, liquid net assets should at all times be sufficient to ensure a recovery or orderly wind-down of critical operations and services.

Key Consideration 1 An FMI should have robust management and control systems to identify, monitor, and manage general business risks, including losses from poor execution of business strategy, negative cash flows, or unexpected and excessively large operating expenses.	<p>SGX-DC has defined its general business risks as the risks and potential losses arising from SGX-DC's administration and operation that are not related to participant default nor separately covered under credit or liquidity risk. These general business risks could result in losses from poor execution of business strategy, negative cash flows or unexpected and excessively large operating expenses.</p> <p>SGX's ERM framework is in place for the identification, monitoring and reporting of risks, including general business risk. The framework encompasses five key components, namely (i) risk governance structure; (ii) ERM policies; (iii) ERM processes; (iv) risk capabilities and culture; and (v) risk monitoring and reporting. It sets the tone from the top to the line units regarding risk culture, governance and risk appetite for consistency in SGX's risk management process across the organization. More details can be found in Principle 3.</p> <p>Of the key risks identified under the ERM framework, technology, operational, reputation, competition, staffing and fraud risks are classified as general business risk.</p>
--	--

	<p>In determining the effects of the key risks on SGX-DC's financial positions, SGX prepares annually a three-year business plan that includes a three-year financial forecast. This is based on a set of assumptions regarding the risks impacting SGX and SGX-DC and management's response to these risks. In this regard, SGX takes reference from the risks identified in the ERM framework.</p> <p>SGX also develops a three-year capital plan for SGX (including SGX-DC) based on the three-year business plan and financial forecasts. In this capital plan, SGX forecasts the capital over the next three years, taking into consideration the strategic directions and business structures changes, which will affect SGX's business in the short to medium term. SGX assesses the impact of business activities on SGX's (including SGX-DC's) capital positions and its ability to meet the regulatory capital requirements imposed by MAS via capital conditions on SGX-DC under both business-as-usual and business stress scenarios.</p> <p>SGX-DC monitors and manages its general business risks on an ongoing basis. On a day-to-day basis, the relevant risk owners assess and manage specific risks, including general business risks, as part of the ERM framework.</p> <p>In addition, the finance unit monitors and manages the financial risk through performance reviews. The finance unit prepares reports and monitors financial performance and forecasts of SGX-DC through the preparation of income statement, balance sheet, cash flows statement and projection, quarterly financial performance forecasts and regulatory capital compliance reports.</p> <p>The board and management committee are regularly updated on the financial performance, including KPIs. Quarterly and annual financial statements of SGX are presented to SGX audit committee and board for review and approval respectively.</p> <p>General business risks are also managed through the annual planning process. SGX prepares the annual budget as part of its business planning process. SGX's management must seek the board's approval on the annual budget prior to deployment of the resources.</p> <p>Any major new projects that have the potential to impact SGX's risk profile are subject to the approval of RMC. Prior to approval by the RMC, a risk assessment will be conducted</p>
--	--

<p>Key Consideration 2</p> <p>An FMI should hold liquid net assets funded by equity (such as common stock, disclosed reserves, or other retained earnings) so that it can continue operations and services as a going concern if it incurs general business losses. The amount of liquid net assets funded by equity an FMI should hold should be determined by its general business risk profile and the length of time required achieving a recovery or orderly wind-down, as appropriate, of its critical operations and services if such action is taken.</p>	<p>SGX-DC holds liquid net assets funded by equity to continue operations even if it incurs business losses. SGX reviews and monitors SGX-DC's capital positions on a monthly basis to ensure that business activities and growth are prudently funded.</p> <p>SGX-DC holds capital under the capital conditions issued by the MAS. The amount of capital, in the form of liquid net assets, is based on its capital plan (see Key Consideration 1). At the minimum, SGX-DC maintains liquid net assets funded by equity of at least the stipulated total risk requirement under the capital conditions. The total risk requirement comprises the risk charges for operational risks, investment risks and general counterparty risks. SGX has assessed under both business-as-usual and business stress scenarios that SGX-DC holds surplus capital in excess of the minimum regulatory capital requirement to meet potential losses arising from general business risks.</p> <p>To determine the amount of capital, in the form of liquid net assets SGX considers the following:</p> <ul style="list-style-type: none"> <li>• Three scenarios are considered in the capital plan, which are a (1) business-as-usual scenario; (2) business stress scenario of sustained low volumes; and a (3) systemic scenario which assumes multiple defaults of members;</li> <li>• The amount of minimum regulatory capital that is needed to support the three-year business plan in accordance with the capital plan; and</li> <li>• The projected free-and-available surplus capital after meeting the capital conditions to meet any business losses.</li> </ul> <p>SGX maintains insurance policies for the SGX group, including SGX-DC, to cover any extraordinary one-time loss, such as fraud. The various insurance policies maintained by the group, such as professional indemnity and crime, industrial all risks and public liability, are comprehensive and are assessed for adequacy annually.</p>
<p>Key Consideration 3</p> <p>An FMI should maintain a viable recovery or orderly wind-down plan and should hold sufficient liquid net assets funded by equity to implement this plan. At a minimum, an FMI should hold liquid net assets funded by</p>	<p>SGX-DC currently holds liquid net assets funded by equity of at least six months of operating expenses. In the event if the recovery and resolution process takes longer than six months, SGX-DC's holding company, i.e., SGX will provide the necessary resources to facilitate the process.</p> <p>SGX-DC holds base capital comprising of share capital, clearing fund reserves and retained earnings. This exceeds MAS' required minimum base capital of S\$10 million. This also exceeds SGX-DC's average six months of operating expenses.</p> <p>SGX-DC also holds surplus capital after meeting MAS regulatory capital conditions, which stipulate that liquid net assets funded by equity in excess of</p>

<p>equity equal to at least six months of current operating expenses. These assets are in addition to resources held to cover participant defaults or other risks covered under the financial resources principles. However, equity held under international risk-based capital standards can be included where relevant and appropriate to avoid duplicate capital requirements.</p>	<p>total risk requirement must be held.</p> <p>At various points during the year, SGX-DC will upstream dividends from profits to the holding company SGX, while ensuring that SGX-DC maintains excess capital to meet MAS' requirements. The capital of SGX-DC is solely dedicated to SGX-DC and is not shared even for extreme situations.</p> <p>As stipulated in the capital conditions, SGX-DC's financial resources that have been committed to SGX-DC clearing fund shall not be available to meet the financial resources requirements designated to cover business risks and losses.</p> <p>SGX-DC does not hold capital under any risk-based standards other than the capital conditions issued by MAS.</p>
<p>Key Consideration 4 Assets held to cover general business risk should be of high quality and sufficiently liquid in order to allow the FMI to meet its current and projected operating expenses under a range of scenarios, including in adverse market conditions.</p>	<p>SGX-DC's liquid net assets to cover general business risks, that are fully equity-funded, are predominantly in the form of cash and deposited in either current or fixed deposits accounts at regulated banks in Singapore. These deposits can be withdrawn on the same day if SGX-DC's withdrawal instruction is served to the bank by 2:00 p.m. Monitoring and management of bank counterparty risk are discussed in further details in the response to Principle 16.</p>
<p>Key Consideration 5 An FMI should maintain a viable plan for raising additional equity should its equity fall close to or below the amount needed. This plan should be approved by the board</p>	<p>SGX's and SGX-DC's capital plan contains a list of capital actions, including plans to raise additional equity, that can be undertaken by SGX-DC and/or SGX when SGX-DC's equity fall close to or fall below the amount needed, depending on the prevailing circumstances. The list of capital actions has only been crafted in 2012 and will be reviewed and developed more fully over time, including assessment/considerations metrics in determining the practicality and priority of each possible action.</p> <p>SGX-DC, through SGX, reviews the capital plan and recovery and resolution plans, which include scenarios to replenish equity capital, at least on an annual</p>

of directors and updated regularly.	<p>basis, to ensure relevance.</p> <p>The RMC reviews and endorses SGX and SGX-DC's capital plan, including plans to raise additional equity if needed, and the recovery and resolution plans annually. Upon RMC's endorsement, the capital plan will be presented to the board for approval. In addition, SGX-DC's capital plan and capital actions pertaining to the SGX-DC, including plans for raising additional equity, will be also presented to SGX board for approval.</p>
Key Conclusions for Principle 15	<p>The identification, monitoring and mitigation of general business risks is part of SGX's enterprise risk management system and financial and business plans. New products are analyzed on their risk implications before launching. SGX-DC holds sufficient liquid net assets funded by equity so that it can continue operations and services as a going concern if it incurs general business losses. The amount of liquid net assets is sufficient to cover six months of current operating expenses. If needed SGX-DC and/or SGX is able to raise additional equity if equity falls close to the amount needed.</p> <p>Competition risk may rise in the coming years, following increased competition with foreign CCPs, especially for OTC financial derivatives. The mandatory clearing obligation will shift bilateral clearing among banks to CCPs, increasing potential clearing volumes and subsequently competition between CCPs. Competition may lead to reduced clearing-related fees and improved clearing services; however, as collateral to cover CCPs risk exposures is costly, the CCP may face market pressures to reduce collateral requirements as well.</p>
Assessment of Principle 15	Observed
Recommendations and Comments	SGX and MAS are encouraged to continue complying with the international standards and not compromise on the safety of the CCP. This should not prevent them from searching for efficiencies in the risk management framework.

### Principle 16. Custody and Investment Risks

An FMI should safeguard its own and its participants' assets and minimize the risk of loss on and delay in access to these assets. An FMI's investments should be in instruments with minimal credit, market, and liquidity risks.

<p>Key Consideration 1</p> <p>An FMI should hold its own and its participants' assets at supervised and regulated entities that have robust accounting</p>	<p>Financial assets held by SGX-DC can be broadly categorized as (i) cash assets; and (ii) non-cash assets. SGX-DC holds these assets at supervised and regulated banks and national depositories.</p> <p>SGX-DC holds cash assets at regulated and supervised banks having operations in Singapore. Cash assets comprise SGX-DC's own cash holding; clearing fund</p>
--	--

<p>practices, safekeeping procedures, and internal controls that fully protect these assets.</p>	<p>contributions from SGX-DC and its clearing members; and other non-clearing fund related cash collaterals/margin monies received from SGX-DC's clearing members.</p> <p>Concerning non-cash assets SGX-DC holds Singapore government securities at the CDP CSD and foreign government securities at national depositories via regulated and supervised global custodian banks. Other non-cash assets comprise selected SGX-ST listed securities and letters of credit. Presently, SGX-DC only holds letters of credit and government securities from France, Germany, Japan, Singapore and the U.S. SGX-DC has ceased to accept new letters of credit as collateral upon expiry of the existing ones. Securities are not used yet as collateral.</p> <p>For cash assets:</p> <ul style="list-style-type: none"> <li>• Bank admission and ongoing criteria <ul style="list-style-type: none"> <li>• SGX only uses bank counterparties that are supervised by the relevant regulator. In addition, the banks are required to attain at least a C rating in Moody's BFSR and a long-term debt rating of at least A.</li> <li>• Other factors such as the bank's reputation, capital strength and qualitative aspects (e.g., the bank's ability to meet the requirements of SGX-DC's settlement operations) are also considered upon admission.</li> </ul> </li> </ul> <p>For non-cash assets:</p> <ul style="list-style-type: none"> <li>• Admission of custodians and ongoing criteria <ul style="list-style-type: none"> <li>• SGX only uses custodian banks and national depositories that are licensed by the relevant regulator.</li> <li>• All SGX's custodian banks must attain at least a C rating under Moody's BFSR, or an equivalent rating from Standard and Poor's or Thomas Murray.</li> <li>• SGX CEO's approval is required for the use of non-rated custodians with a predetermined exposure limit and RMC's approval will be sought in case the exposure limit is breached. Currently, SGX does not keep any non-cash assets with unrated custodians.</li> </ul> </li> </ul> <p>SGX takes the regulators and credit rating agencies opinion to obtain assurance that these entities uphold robust accounting practices, safekeeping procedures, and internal controls to protect SGX's, including SGX-DC's and their participants' financial assets.</p>
<p>Key Consideration 2 An FMI should have prompt access to its</p>	<p>SGX-DC in relation to assets received from its clearing members as collaterals</p> <p>SGX-DC has a sound legal basis to support enforcement of its rights in all assets collected from clearing members as collateral (see also Principle 1):</p>

<p>assets and the assets provided by participants, when required.</p>	<p>SGX-DC clearing rules act as the primary contract between SGX-DC and each of its clearing members. The rules set out the interest and rights of SGX-DC as the clearing house including the management and use of these assets. The rules are further complemented by the security deed which, among other things, creates a security interest over the assets that are accepted by SGX-DC as collateral. Legal opinions have been obtained to ensure that SGX-DC's security interests have been properly attached and perfected in all relevant jurisdictions.</p> <p>If insolvency proceedings are commenced in a foreign jurisdiction, the insolvency laws of the foreign jurisdiction would apply instead. SGX-DC has assessed that the risk that such foreign insolvency laws may affect SGX-DC's rights over collateral assets is small.</p> <p>SGX-DC ensures it has prompt access to its assets in the event of participant default.</p> <p>SGX-DC holds a majority of its total collateral in cash and the remaining in government securities and letters of credit (accepted from the CME as inter-clearing house margin collateral for exposures arising from trades cleared via the MOS link). Cash collateral is held in either current or short tenure deposit bank accounts at regulated and supervised banks having operations in Singapore. SGX-DC can withdraw these deposits promptly subject to the banks' customary notice periods. Instructions served to the banks before 2:00p.m. will ensure availability for same-day settlement for SGD and U.S. dollar deposits and it will be next-day settlement in the case of Japanese Yen deposits.</p> <p>SGX-DC holds the majority of non-cash assets with international custodian banks. SGX-DC has put in place a mechanism to ensure prompt access to these non-cash assets in the event of a clearing member default. International brokers have been appointed to liquidate these non-cash collaterals during a default. These brokers have international trading desk and are able to operate round the clock.</p>
<p>Key Consideration 3 An FMI should evaluate and understand its exposures to its custodian banks, taking into account the full scope of its relationships with each.</p>	<p>SGX has an established overarching policy framework to address counterparty credit and concentration risks arising from banks and custodians that SGX-DC uses for trade settlement and safekeeping of financial assets. In addition, the framework also sets out the counterparty admission criteria and the delegation of approval authority.</p> <p>This framework was approved by SGX's board and the RMC. It is administered and reviewed periodically by SGX's risk management unit.</p> <p>SGX applies various risk management tools to minimize risk of loss and delay</p>

	<p>in access to the assets.</p> <p><b>For cash assets:</b></p> <ul style="list-style-type: none"> <li>• The exposures are managed under the bank counterparty limit framework where prescribed limits are established taking into account the bank’s credit rating profile, shareholders’ funds and concentration thresholds.</li> <li>• Bank Counterparty Limit: The Board sets the prescribed risk ceiling and any deviation from the ceiling requires approval by the RMC.</li> <li>• Maximum limit of SGX’s exposure (in absolute dollar-term) to each individual bank based on their respective BFSR;</li> <li>• Maximum limit of SGX’s exposure relative to each individual bank’s shareholders’ funds;</li> <li>• To mitigate concentration risk to a single bank, SGX’s non-settlement related exposure to each bank is capped.</li> <li>• The prescribed bank counterparty limits are allocated to the finance and operations units for management of their day-to-day operational requirements and the compliance thereof.</li> <li>• Bank exposures reports are submitted to the CFO on a weekly basis, and to the EXCO and the board on a monthly basis.</li> <li>• SGX monitors closely for any adverse news, developments or potential risk of credit rating downgrades of the bank counterparties.</li> <li>• Early warning mechanisms are in place where the RMC will be notified when the individual bank counterparty exposure reaches the prescribed threshold.</li> <li>• In the event of a breach of the prescribed limits, the CRRO and CEO will be notified. If the breach is a result of an unexpected spike in exposures, the CEO is authorized to approve, with concurrence of SGX chairman and RMC chairman, a temporary increase in limit(s) on the condition that (a) the increase arises from operational needs; (b) the temporary increase does not last more than one month; and (c) the board will be notified by the next working day when the authority is exercised.</li> </ul> <p><b>For non-cash assets:</b></p> <ul style="list-style-type: none"> <li>• Credit risk in relation to non-cash assets kept with custodian banks and national depositories, which act as trustees, is assessed to be lower because assets held at these entities are protected under trust laws. As such, no prescribed limits are imposed on SGX’s exposures to national depositories and custodian banks with at least a ‘C’ rating (or equivalent). However, the CEO is authorized to approve the use of unrated custodian banks for exposures of up to the prescribed ceiling. RMC will need to be notified for such approval exceeding the prescribed early warning threshold. Presently, SGX does not</li> </ul>
--	--

	<p>hold assets at unrated custodian banks.</p> <ul style="list-style-type: none"> <li>• Nonetheless, SGX still monitors closely for any adverse news, development or potential risk of credit rating downgrades of the custodians so that preventive measures can be taken to mitigate increased risk in this regard.</li> </ul> <p>On an ongoing basis, banks/custodians are all required to provide statements on all SGX's (including SGX-DC's) accounts:</p> <ul style="list-style-type: none"> <li>• to facilitate reconciliation against SGX's records of asset holdings to ensure that all transactions and balances in each account are properly recorded; and</li> <li>• to serve as a confirmation that SGX's assets are properly segregated from the assets of the banks and custodians.</li> </ul> <p>In addition, SGX-DC's external auditors will perform independent verification and confirmation with banks and custodians on the asset holdings as part of the annual audit exercise.</p> <p><b>Managing full scope of exposure with a custodian bank</b></p> <p>A custodian bank may also be a clearing member of SGX-DC. The credit risk associated with clearing members is managed under SGX-DC's risk management framework (please refer to Principle 3 for more details), while all other counterparty credit risk is managed under the bank counterparty limit and custodian limit framework.</p>
<p>Key Consideration 4</p> <p>An FMI's investment strategy should be consistent with its overall risk-management strategy and fully disclosed to its participants, and investments should be secured by, or be claims on, high-quality obligors. These investments should allow for quick liquidation with little, if any, adverse price effect.</p>	<p><b>Investment strategy</b></p> <p>SGX is required to seek the board's and the RMC's approval for investing their own resources and collaterals received from SGX-DC's clearing members. In addition, SGX-DC is required to meet the requirements as set out in the SFA in relation to investment of customers' monies and assets.</p> <p>Presently, all of SGX-DC's own cash reserves and cash assets received from its clearing members as collaterals are kept in banks either in current or fixed deposit accounts. Non-cash assets received from SGX-DC's clearing members are only kept with the custodians and not invested.</p> <p>These are disclosed in SGX's annual report which is available and assessable by the public on SGX website.</p> <p><b>Risk characteristics of investments</b></p> <p>Not applicable as SGX-DC currently does not have any investments.</p>
<p>Key Conclusions for Principle 16</p>	<p>SGX-DC holds its own and its participants' assets in low risk investments at supervised and regulated entities to limit custody risks. SGX-DC has</p>

	appropriate selection criteria for custodians and regularly monitors compliance with these criteria. Assets are kept as cash and government bonds.
Assessment of Principle 16	Observed
Recommendations and Comments	-

**For Principle 17 on operational risk, please refer to the assessment of Principle 17 in the CDP CCP table.**

### **Principle 18. Access and Participation Requirements**

An FMI should have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.

<p><b>Key Consideration 1</b></p> <p>An FMI should allow for fair and open access to its services, including by direct and, where relevant, indirect participants and other FMIs, based on reasonable risk-related participation requirements.</p>	<p><b>Participation criteria and requirements</b></p> <p>SGX-DC has established admission and continuing participation requirements for clearing members that are publicly disclosed and risk-based.</p> <p>SGX-DC admits three classes of clearing members:</p> <ul style="list-style-type: none"> <li>• General clearing members that are permitted to clear their own transactions and transactions for clients and other trading members. General clearing members are non-bank institutions licensed as capital market services licensees by MAS.</li> <li>• Bank clearing members that are permitted to clear their own transactions and transactions for clients and other trading members. Bank clearing members are banks and must be authorized to conduct banking business in Singapore under the Banking Act. The transactions of bank clearing members on SGX-DC are subject to relevant provisions of the SFA and SGX-DC clearing rules, as for non-bank members.</li> <li>• Direct clearing members that clear their own proprietary trades and related companies' house trades directly with SGX-DC. Related companies' house trades refer to proprietary trades of direct clearing members' related companies.</li> </ul> <p>As of June 30, 2013, there are 22 general clearing members, 15 bank clearing members and no direct clearing member.</p> <p>Clearing members are expected to comply with legal, operational, financial and</p>
--	---

	<p>credit rating admission criteria and ongoing requirements.</p> <p>Legal requirements:</p> <ul style="list-style-type: none"> <li>• Bank clearing members must be authorized to conduct banking business in Singapore under the Banking Act (SGX-DC clearing rule 2.02B).</li> <li>• General clearing members and direct clearing members must hold a capital markets services license under the SFA unless otherwise exempted under the SFA or the SF(CF)R (SGX-DC clearing rules 2.02 and 2.02A).</li> <li>• General clearing members wishing to clear OTCF contracts must have a holding company which is a bank that is licensed and/or regulated by a financial authority (SGX-DC clearing rule 2.02).</li> </ul> <p>Operational requirements:</p> <p>All clearing members must maintain segregated and adequate back-office functions (SGX-DC clearing rules 2.02, 2.02A and 2.02B). In assessing the adequacy of a clearing member's back-office functions, SGX-DC will consider the systems that such clearing member uses for its clearing business with SGX-DC, e.g. operational systems, accounting systems and risk management systems, and the processes that ensure the robustness of its systems and business.</p> <p>Clearing members must have in place adequate systems and adequate staff for proper functioning of their clearing obligations, and ensure that managerial or executive staff has a high standard of integrity and deep level of knowledge with regard to the nature, risks, and obligations of the market or contract(s) being cleared (SGX-DC clearing rules 2.02, 2.02A and 2.02B).</p> <p>Financial requirements:</p> <ul style="list-style-type: none"> <li>• Other than bank clearing members and general clearing members that clear OTCF contracts, all other clearing members must maintain a base capital (or net head office funds for general and direct clearing members incorporated outside Singapore) of at least S\$5 million. If the clearing member is also a CDP member the minimum base capital is S\$8 million.</li> <li>• Financial resources should be above its total risk requirement (SGX-DC clearing rules 2.02, 2.02A, 2.02B, 2.07, 2.08).</li> <li>• General and direct clearing members are required to have group shareholders' funds of at least S\$100 million and ensure that aggregate indebtedness shall not exceed 1,200 percent of its aggregate resources (SGX-DC clearing rules 2.02, 2.02A, 2.07, 2.08).</li> <li>• General clearing members who clear OTCF contracts are required to maintain a base capital or net head office funds of S\$50 million (SGX-DC clearing rules</li> </ul>
--	--

	<p>2.02).</p> <ul style="list-style-type: none"> <li>• Bank clearing members or their parent banks are required to have at least S\$1 billion of paid-up ordinary share capital and unappropriated profit or loss.</li> <li>• Bank clearing members that clear OTCF contracts must place deposits with SGX-DC in the form of a liquidity margin multiplier that serves as an additional liquidity buffer in the event of any liquidity shortfall of the clearing member in meeting payment obligations to SGX-DC.</li> </ul> <p>Credit rating requirements: Bank clearing members (or their parent banks) and holding companies of general clearing members clearing OTCF contracts are subject to credit rating requirements:</p> <ul style="list-style-type: none"> <li>• a long term rating that indicates, at least, a strong overall creditworthiness supporting the fulfillment of its financial obligations; and</li> <li>• a rating that indicates, at least, adequate intrinsic safety and soundness, excluding external credit support and a limited ability to withstand adverse business or economic conditions;</li> </ul> <p>The rating may come from any registered rating agency. Direct clearing members must have obtained a long term rating from any registered rating agency that indicates, at least, a very strong overall creditworthiness supporting the fulfillment of its financial obligations (SGX-DC clearing rule 2.02A).</p> <p>SGX-DC's admission criteria and ongoing requirements are risk-based and commensurate with the risks undertaken by clearing members. SGX-DC promotes fair and open access by allowing all market participants who satisfy admission requirements to become SGX-DC clearing members. There is no restriction on admitting clearing members from different geographical jurisdictions. There is no restriction on the customer profile of clearing members. SGX-DC does not require a minimum transaction volume of clearing members. Also, SGX-DC imposes non-prohibitive admission and annual fees.</p> <p><b>Access to trade repositories</b></p> <p>NA</p>
<p>Key Consideration 2</p> <p>An FMI's participation requirements should be justified in terms of the safety and efficiency of the FMI and the markets</p>	<p><b>Justification and rationale of participation criteria</b></p> <p>The justification for the various participation requirements in terms of safety and efficiency are as follows:</p> <p>Legal requirements: License requirements ensure that clearing members also adhere to laws and regulations which are enforced by statutory regulators, in</p>

<p>it serves, be tailored to and commensurate with the FMI's specific risks, and be publicly disclosed. Subject to maintaining acceptable risk control standards, an FMI should endeavor to set requirements that have the least-restrictive impact on access that circumstances permit.</p>	<p>in addition to SGX-DC's clearing rules.</p> <p><b>Operational requirements:</b> Clearing members need to ensure that they have sufficient resources for adequate back office systems and fit and proper human resources. Proper and efficient functioning of clearing members' operations and business is of paramount importance to the safety and efficiency of SGX-DC.</p> <p><b>Financial requirements:</b> All clearing members have to contribute to the clearing fund and contributions are calibrated to the size of their activities. This helps ensure the financial soundness of SGX-DC and the markets it serves. SGX-DC's risk-based financial requirements for clearing members are tailored to commensurate with the risks undertaken by clearing members. The minimum financial requirements and scalability of these requirements are proportionate and tailored to the risks posed by clearing members to SGX-DC.</p> <p>Bank clearing members incorporated outside Singapore have their capital requirement deposited with SGX-DC to serve as an additional liquidity buffer during a crisis to address any cross-jurisdictional restrictions.</p> <p><b>Credit rating requirements:</b> This helps to ensure that clearing members are of good credit standing both at admission and on an ongoing basis.</p> <p>The three different classes of memberships have admission criteria calibrated to cater for different types of market participants, taking into account their size, needs and interest.</p> <p><b>Least restrictive access</b></p> <p>Reviews of admission criteria and ongoing requirements are conducted on an ad hoc basis, as the market environment and regulations require. The process of changing the access requirements includes a market consultation and notification to the MAS. The consultation process allows market participants to provide feedback and to understand the rationale behind regulatory policies which SGX-DC eventually chooses to adopt. This promotes regulatory transparency and accountability for SGX-DC with respect to its rule-making process and thereby promotes confidence amongst clearing members.</p> <p><b>Disclosure of criteria</b></p> <p>SGX-DC clearing rules on membership criteria, requirements and fees are publicly available on the SGX website and are accessible to all participants and prospective participants.</p>
--	--

<p>Key Consideration 3</p> <p>An FMI should monitor compliance with its participation requirements on an ongoing basis and have clearly defined and publicly disclosed procedures for facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, the participation requirements.</p>	<p><b>Monitoring compliance</b></p> <p>The risk management and regulation group is responsible for monitoring and overseeing the conduct of SGX-DC's clearing members. Early warning mechanisms and notification requirements are in place to allow SGX-DC to take preventive measures swiftly in case of a breach of the requirements by clearing members.</p> <p>On a daily basis, SGX-DC monitors current news, market trends, market movements and liquidity spreads.</p> <p>On a monthly basis, clearing members are required to submit its monthly financial returns within 14 calendar days after the end of each month (SGX-DC clearing rule 2.26). The risk management and regulation group conducts off-site reviews of monthly financial returns to check for any non-compliance with financial requirements. The review also looks at significant or unusual fluctuations in the statement of assets and liabilities, statement of profit and loss, and other relevant statements. For clearing members which pose financial concerns, SGX-DC can direct such submissions on a more frequent basis.</p> <p>On an annual basis clearing members are required to submit the following reports to SGX-DC:</p> <ul style="list-style-type: none"> <li>• Annual report to certify if the clearing members' internal control and risk management systems are adequate. Areas to be covered in the report include, among other systems and processes, effective segregation of dealing and settlement functions, daily monitoring of risk exposure of large position of customers, proper segregation of customer funds and adequate system for accurate and prompt reporting of positions and settlement of margins with SGX-DC.</li> <li>• Financial reports which have been certified by clearing member's external auditor.</li> </ul> <p>These reports enable SGX-DC to assess whether the clearing members have adequate back-office system and processes to monitor and manage risk exposures and concentration risk.</p> <p>Also, on an annual basis SGX-DC requires clearing members to submit a self-assessment questionnaire. In the self-assessment questionnaire, clearing members may be required to provide information such as risk management and controls, business continuity planning and others.</p> <p>SGX-DC has additional reporting requirements in place to ensure that the information SGX-DC uses to monitor compliance with participation criteria is</p>
--	---

timely and accurate. These include:

- Notification to SGX-DC on any breaches of SFA/ SF(CF)R/ SGX-DC clearing rules (SGX-DC rule 2.06A)
- Notification and early warning financial requirements (SGX-DC clearing rules 2.07, 2.07A, 2.07B, 2.08, 2.08A, 2.08B)
- Notification of changes or intended changes relating to clearing members, i.e., composition of board, engagement in new business activities, senior management responsible for its business (SGX-DC clearing rule 2.22)
- Appointment CEO (SGX-DC clearing rule 2.24)
- Under-margining of accounts (SGX-DC clearing rule 2.27)
- Credit facilities report (SGX-DC clearing rule 2.14)
- Limits of positions documents (SGX-DC clearing rule 2.20)

When SGX-DC discovers that the risk profile of a clearing member deteriorates, SGX-DC conducts enhanced surveillance and imposes additional controls on such clearing member, in addition to the existing daily monitoring.

Clearing members rated as high risk will be subject to closer monitoring and more regular onsite inspections. Higher priority will be accorded for various regular offsite reviews for such clearing members. In addition, SGX-DC can conduct an investigation and/or appoint any person or persons to assist in its investigation.

When the risk profile of a clearing member's operations is or is likely to be impaired by any event or circumstances, or such action is in the interests of maintaining a safe and efficient clearing facility, SGX-DC may increase margins or require additional funds, require the liquidation of positions and reduce position limits.

### **Suspension and orderly exit**

SGX-DC has procedures in place to manage the suspension and orderly exit of a clearing member that failed to meet participation requirements (SGX-DC clearing rule 2.06.1). When a clearing member is suspended, the clearing member shall not have any privileges of a clearing member during the period of its suspension and no further trades can be executed for clearing through the suspended clearing member. If the clearing member is also a trading member of SGX-DT, the clearing member is not allowed to take on or clear any new contracts or trades. The clearing member remains liable for all trades entered for clearing prior to point of suspension. Other clearing members will

	<p>also be kept informed of the suspension via a circular immediately after a formal notice of suspension is served on the clearing member in question. At members' request, SGX-DC will facilitate the transfer of their positions and where possible, margins.</p> <p>When a clearing member having open positions has defaulted upon its obligation to SGX-DC, or has been suspended for insolvency, SGX-DC may:</p> <ul style="list-style-type: none"> <li>• Transfer positions to one or more clearing members.</li> <li>• Execute hedging transactions, on behalf of and at the risk of the defaulted clearing member, to eliminate or reduce market risk resulting from such open positions.</li> <li>• Appoint one or more inter dealer brokers, clearing members or members of the applicable relevant market to close out such positions on the behalf of and at the risk of the defaulted clearing member (SGX-DC clearing rule 7A.02).</li> </ul> <p>SGX-DC may charge a clearing member or a former clearing member before a disciplinary committee. Depending on the severity of the breach, disciplinary actions include expelling or suspending the clearing member, imposing a fine on the member, publicly or privately reprimanding the member, imposing restrictions or conditions on the member and requiring a director or senior manager to step down from day-to-day conduct of the business affairs of the clearing member.</p>
Key Conclusions for Principle 18	Participant's access criteria allow for fair and open access to SGX-DC's services. Access criteria are publicly disclosed. Procedures are in place to facilitate the suspension and orderly exit of a participant that no longer meets the participation requirements. SGX-DC monitors compliance with its access criteria on an ongoing basis.
Assessment of Principle 18	Observed
Recommendations and Comments	-

### Principle 19. Tiered Participation Requirements

An FMI should identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements.

#### Key Consideration 1

An FMI should ensure that its rules, procedures, and agreements allow it to gather basic information about indirect participation in order to identify, monitor, and manage any material risks to the FMI arising from such tiered participation arrangements.

#### Tiered participation arrangements

Tiered participation for SGX-DC exists through both direct and indirect participants.

- Direct participants of SGX-DC are clearing members, which have access to SGX-DC's clearing services. They comprise broker-dealers and banks. Indirect participants of SGX-DC comprise direct customers and indirect customers of clearing members. The base is diverse and typically includes broker-dealers, banks, asset management companies, hedge funds and other funds, market makers, non-financial corporate entities, and individuals. Direct customers refer to customers who hold accounts directly with the clearing member. This could include trading members and clearing member's affiliates. Indirect customers refer to customers who do not hold accounts directly with the clearing member. They are mainly customers of intermediaries or customers of clearing members' affiliates.

Rules allow SGX-DC to gather detailed information on indirect participants via trading and clearing members to identify and evaluate SGX-DC's exposure to indirect participants:

- Reporting of identity of account holders (SGX-DC clearing rules and the futures trading rules).
- Reporting of position information cleared with SGX-DC, including ownership of positions within omnibus account (SGX-DC clearing rules and the futures trading rules).
- Reporting of position information cleared with other clearing houses (SGX-DC clearing rules).
- Notification of account which is under-margined by an amount which exceeds clearing member's aggregate resources (SGX-DC clearing rules).
- Powers to seek further information from members (SGX-DC clearing rules and the futures trading rules).

All members of SGX-DC and SGX-DT are required to disclose the identity of the account holders, within three business days after the account holder has commenced trading. Members should also notify any changes to the account information submitted previously, as soon as practicable (SGX-DC clearing rule 2.14.3A and futures trading rule 3.3.17).

All clearing members are required to report their open positions at end of each trading day (SGX-DC clearing rule 7.09 and futures trading rule 3.3.18). Both

	<p>account and position information are automatically fed into the risk management system, allowing the measurement and monitoring of SGX-DC's exposures to indirect participants. Stress test exposures are measured and updated daily. In addition, analysis of the clearing members' ability to fund incoming settlement obligations is also performed daily. Position information of indirect participants are also aggregated at each clearing member level as well as across clearing members, for identification of concentration risks.</p> <p>In addition, SGX-DC monitors members' interdependencies from its customers through a combination of SGX-DC's regular supervisory reviews and inspections of members.</p> <p><b>Risks to the FMI</b></p> <p>Ultimate responsibility for the financial performance of indirect participants lies with the clearing members. Therefore, SGX-DC evaluates the risks related to indirect participants in the context of the clearing member's ability to clear on their behalf.</p> <p>SGX-DC monitors the exposures of each clearing member to its participants (and in turn SGX-DC's risk to the clearing member) on a daily basis. Where significant exposures are noted, SGX-DC uses the information at its disposal to form an understanding of the nature of indirect participation risk.</p> <p>The measurements of risk arising from these dependencies are integrated into the daily, monthly and other regular risk evaluations conducted by the risk management unit. The following thresholds provide guidance on triggering a more detailed evaluation:</p> <ul style="list-style-type: none"> <li>• A member's margin concentration exceeds pre-determined threshold of SGX-DC's total margin requirement.</li> <li>• The position of the indirect participant in a particular contract exceeds pre-determined threshold of SGX-DC's open interest of the contract.</li> <li>• Stress test losses exceed the SGX-DC clearing fund, under scenarios which cover a comprehensive range of extreme but plausible stress events.</li> <li>• Potential payment obligations of the member are large relative to its reported liquid resources.</li> </ul> <p>SGX-DC will take measures if needed to mitigate the identified risks, for example by requiring additional collateral, imposing a higher level of liquid resources, and restricting the member's trading or clearing privileges for risk increasing positions. Material shortcomings are reported to management and a higher level of monitoring may be initiated.</p>
--	--

	<p>Through risk management and regulation group's annual risk profiling exercises, members are assigned internal ratings for the risks that they may pose to SGX-DC. Members accorded higher risk rating will be subject to closer offsite monitoring and more frequent onsite compliance visits and inspections.</p>
<p>Key Consideration 2 An FMI should identify material dependencies between direct and indirect participants that might affect the FMI.</p>	<p>Through the daily monitoring and evaluation of counterparty risks of clearing members, SGX-DC is able to identify members' interdependencies on the key indirect participants.</p> <p>In its review, SGX-DC will ascertain the financial standing of the indirect participant and the probability and impact of a potential default. Factors such as the clearing member's liquidity, credit and operational management (e.g., margin call process) will also be taken into consideration.</p> <p>See also the response to Key Consideration 1.</p>
<p>Key Consideration 3 An FMI should identify indirect participants responsible for a significant proportion of transactions processed by the FMI and indirect participants whose transaction volumes or values are large relative to the capacity of the direct participants through which they access the FMI in order to manage the risks arising from these transactions.</p>	<p>SGX-DC is able to identify (a) the proportion of activity that each direct participant conducts on behalf of indirect participants in relation to the direct participants' capacity, (b) direct participants that act on behalf of a material number of indirect participants, (c) indirect participants responsible for a significant proportion of turnover in the system, and (d) indirect participants whose transaction volumes or values are large relative to the capacity of the direct participant through which they access the FMI to manage risks arising from these transactions.</p> <p>SGX-DC also requires clearing members to adopt risk practices in relation to their customers (SGX-DC clearing rules and the futures trading rules). These practices include that clearing members should conduct daily monitoring against risk-based limits and demonstrate that a process is in place to manage limit excesses. Both clearing members and trading members are required to conduct pre-execution checks on their customers before orders are forwarded to SGX-DT. Clearing and trading members are required to call for initial margins from their customers and additional margins if needed (SGX-DC clearing rule 7.22 and futures trading rule 3.3.12).</p>
<p>Key Consideration 4 An FMI should regularly review risks arising from tiered participation arrangements and should take mitigating action when appropriate.</p>	<p>SGX-DC obtains regular information on the indirect participation risks from its daily risk monitoring and other risk management procedures. Indirect participation risks are an intrinsic part of the risk management and reporting to senior management and the RMC. Key information is reported to the board on a monthly basis.</p>

Key Conclusions for Principle 19	SGX-DC has effective measures in place to identify, monitor and manage risks arising from participants' customers. Rules allow the CCP to gather detailed information on customers to identify and evaluate related exposures. In its review the CCP will evaluate the financial soundness of the customers and the probability and impact of a potential default. Exposures are monitored on a daily basis. Key information is reported to the board on a monthly basis and measures are taken if needed.
Assessment of Principle 19	Observed
Recommendations and Comments	-

### Principle 20. Financial Market Infrastructure Links

An FMI that establishes a link with one or more FMIs should identify, monitor, and manage link-related risks.

Key Consideration 1 Before entering into a link arrangement and on an ongoing basis once the link is established, an FMI should identify, monitor, and manage all potential sources of risk arising from the link arrangement. Link arrangements should be designed such that each FMI is able to observe the other principles in this report.	<p>Link arrangements with other FMIs are assessed to identify potential risks prior to being established. The criteria used for the assessment are documented in SOP for Initiating New Link Arrangements which references the Guidelines for the identification of significant risk matters to RMC.</p> <p>In assessing the risk of proposed link arrangements, SGX-DC will examine potential risks related to legal, credit, liquidity, regulatory and operational areas that may have an impact on SGX-DC.</p> <p>Relevant units within the organization will be tasked to analyze the respective risk areas and propose necessary mitigating measures. The EXCO will then review the assessment made as well as mitigation proposals. As a next step the prospective link arrangement is sent to the RMC for approval. Any potential regulatory conflicts are dealt with by the RCC.</p> <p>Other non-financial risks such as reputational, legal and regulatory risks are reviewed should there be any material change to the link arrangement or the regulatory and legal framework that governs the Link and the counterparties. The process to perform such review is documented in the SOP for Initiating New Link Arrangements.</p> <p>If any significant aspect of the MOS Agreement changes, SGX-DC will review it to ensure that the link arrangement continues to meet regulatory requirements and international standards.</p>
---	---

The business unit responsible for the link will ensure that the link is reviewed at least annually, and in case of changes to regulatory requirements and international standards.

The only active link established by SGX-DC with another FMI is the MOS link with the CME. The link was established in 1984, through an agreement (MOS Agreement) signed between Singapore International Monetary Exchange (SIMEX), the predecessor of SGX-DT and SGX-DC, and the CME.

In accordance with this agreement, transactions in specific contracts executed at one exchange can be allocated to the clearing house of the other exchange for clearing.

The concerned contracts are:

- Eurodollar Futures;
- Euroyen TIBOR Futures;
- Nikkei 225 Index Futures, traded in JPY;
- US\$ Nikkei 225 Index Futures, traded in US\$; and
- CNX Nifty Index Futures

These contracts can be traded on both the SGX-DT as well as the CME. The MOS link offers market participants the opportunity to trade these contracts for extended hours. A customer of a SGX-DC member may execute a trade at CME and transfer the trade to SGX-DC member for clearing at SGX-DC, allowing the customer to benefit from margin offsets within one clearing house.

After a SGX-DC member accepts a trade from a CME member or vice versa, SGX-DC and CME will stand in as the intermediary and guarantee the settlement of the trade to the other clearing house on behalf of their respective clearing members. Vice versa SGX-DC will stand in as the intermediary for SGX-DC members and guarantee the settlement of that trade towards CME.

SGX-DC requires CME to post margin for the positions CME guarantees on behalf of its members. SGX-DC currently margins CME at 99th percentile one-tailed confidence level and marks to market CME's posted collateral on a daily basis.

SGX-DC's risk exposure to CME is low as CME does not account for a

	<p>significant proportion of SGX-DC's clearing activity.</p> <p>The risk management unit monitors its daily risk exposure to CME, as it does for all clearing members. It includes monitoring CME for news with implications to its credit and liquidity risk profiles. In addition, on a daily basis, the operations unit monitors the adequacy of CME's bank letters of credit in favor of SGX-DC.</p> <p>In terms of process, when a request from a CME member to transfer a trade is accepted by a SGX-DC member, the opposite trade is booked into the holding account of CME with SGX-DC in SGX-DC's system. Conversely, when a trade is transferred from SGX-DC to CME, the allocated trade is booked into CME's holding account in SGX-DC's system. Similar bookings are carried out by CME in its system. Reconciliation of the allocations is carried out twice a day to ensure that the records held by both clearing houses with respect to allocations are consistent.</p> <p>The LC is issued in a standardized format from banks having operations in Singapore.</p>
<p>Key Consideration 2</p> <p>A link should have a well-founded legal basis, in all relevant jurisdictions, that supports its design and provides adequate protection to the FMIs involved in the link.</p>	<p>SGX-DC and CME clearing activities are grounded respectively in the laws and regulations of Singapore and the U.S. The governing laws of the respective clearing rules and regulations are clearly stated.</p> <p>The rights and responsibilities of SGX-DC's members in relation to the MOS arrangement entered into between SGX-DC and CME are set out in the SGX-DC clearing rules. Chapter 8 of the clearing rules sets out the rules relating to all mutual offset systems, including the arrangement entered into with CME. Such rules include the conditions for an inter-exchange transfer and the responsibilities of the relevant SGX-DC members to SGX-DC before and after such transfer. Further, SGX-DC clearing rules 7A.01A.8, 7A.01A enable SGX-DC to manage a default of a 'Participating Market' (i.e., CME) with appropriate recourse to the Clearing Fund. The governing law of the Rules is clearly stated to be the laws of Singapore. The matters set out in this paragraph are therefore governed by Singapore law.</p> <p>The rights and responsibilities between SGX-DC and CME in relation to the MOS arrangement entered into between them are set out in the MOS Agreement. The MOS Agreement spells out the clearing process of the link (whether it is SGX-DC participating on CME or vice versa), rights and remedies between SGX-DC and CME, and various other terms of agreement. The governing law of the Agreement is clearly stated to be the laws of the State of New York, U.S.</p>

	<p>The enforceability of the SGX-DC clearing rules (which sets out the rights and responsibilities of SGX-DC's members in relation to the MOS arrangement entered into between SGX-DC and CME) is safeguarded by the SFA (see Section 72(1)(b) which mandates that the business rules of a designated clearing house operate as a binding contract between the designated clearing house and each participant; Section 73 which provides that the Singapore High Court may make an order directing the participant to comply, observe or give effect to those business rules; and Section 81F which affords proceedings of a designated clearing house precedence over insolvency laws).</p> <p>The enforceability of the MOS Agreement (which sets out the rights and responsibilities of SGX-DC and CME in relation to the MOS arrangement entered into between them) is also safeguarded. The governing law of the MOS Agreement is clearly stated to be the laws of the State of New York, U.S. Where Singapore law is not available as the preferred choice of law, U.S. law is considered acceptable given its foundation on common law, and its status as a recognized, developed and accepted legal system.</p> <p>In the context of its Rules and agreements, where necessary, SGX-DC protects itself by obtaining legal opinions. Given the protections afforded by the SFA, there is a high level of assurance that SGX-DC's actions in respect of a default of a 'Participating Market' would not be subject of a successful legal challenge.</p> <p>SGX-DC also manages its legal risk on an ongoing basis, with regular reviews of its Rules and major agreements. The most recent reviews of the MOS Agreement were in 2006 and 2010.</p>
<p>Key Consideration 3 Linked CSDs should measure, monitor, and manage the credit and liquidity risks arising from each other. Any credit extensions between CSDs should be covered fully with high quality collateral and be subject to limits.</p>	<p>NA</p>

<p>Key Consideration 4</p> <p>Provisional transfers of securities between linked CSDs should be prohibited or, at a minimum, the retransfer of provisionally transferred securities should be prohibited prior to the transfer becoming final.</p>	NA
<p>Key Consideration 5</p> <p>An investor CSD should only establish a link with an issuer CSD if the arrangement provides a high level of protection for the rights of the investor CSD's participants.</p>	NA
<p>Key Consideration 6</p> <p>An investor CSD that uses an intermediary to operate a link with an issuer CSD should measure, monitor, and manage the additional risks (including custody, credit, legal, and operational risks) arising from the use of the intermediary.</p>	NA
<p>Key Consideration 7</p> <p>Before entering into a link with another CCP, a CCP should identify and manage the potential spill-over effects from the default of the linked CCP. If a link has three or</p>	<p><b>Linked CCP default</b></p> <p>Prior to establishing any link arrangement, the business unit responsible for the link arrangement will work with relevant units within SGX-DC to perform the risk assessment. All relevant business risks, including regulatory and reputational risks, are considered. All link arrangements that have the potential to impact SGX-DC's risk profile, and the frameworks and policies to manage their risks, are reviewed by the RMC, after being reviewed by EXCO.</p>

<p>more CCPs, each CCP should identify, assess, and manage the risks of the collective link arrangement.</p>	<p>In the case of the MOS link, which is a clearing arrangement with a single CCP, CME is counterparty to SGX-DC and guarantees the performance of its members' positions. This exposes SGX-DC to the credit risk of CME, and therefore margin from CME is held to protect SGX-DC and other clearing members in the event of a default by CME. Mark-to-market is also settled on a daily basis to prevent accumulation of losses. These are the mitigating measures SGX-DC considers necessary to manage the risk brought on by CME through the link arrangement.</p> <p>SGX-DC, via the risk management unit, monitors the news of CME to check if there may be implications to its credit and liquidity risk profiles. CME enjoys a high credit rating and must meet US CFTC capital and liquidity requirements. Furthermore, CME is backed by its own clearing funds which will absorb losses due to a default of a member in its own market. Hence, the likelihood of any spill-over effect from the default of its member(s) is minimized.</p> <p>In the area of default management, SGX-DC Clearing Rule 7A.01A.8 and 7A.01A provides that the SGX-DC Clearing Fund may be utilized if a SGX-DC member or a Participating Exchange (i.e., CME in the case of MOS) defaults. The MOS Agreement states that should either clearing house default, the other clearing house may liquidate the collateral and positions in the holding account and use the proceeds to cover the liquidation losses.</p> <p><b>Collective link arrangements (three or more CCPs)</b></p> <p>NA</p>
<p>Key Consideration 8</p> <p>Each CCP in a CCP link arrangement should be able to cover, at least on a daily basis, its current and potential future exposures to the linked CCP and its participants, if any, fully with a high degree of confidence without reducing the CCP's ability to fulfill its obligations to its own participants at any time.</p>	<p><b>Exposures and coverage of exposures</b></p> <p>SGX-DC measures, monitors and manages the risk arising from the MOS link through margining and timely collection of gains and losses. Furthermore, daily risk monitoring is in place to provide SGX-DC with the opportunity to impose additional risk mitigating measures as and when necessary.</p> <p>On a daily basis, SGX-DC marks to market and margins CME for the positions in CME's holding account at the former's end of the daily clearing cycle. CME performs a similar process at the end of its business day. This ensures that there is no accumulation of gains and losses, and market risks are collateralized. Under the MOS link, the balance in the bank account used in the settlement of mark-to-market gains or losses is protected by bank letters of credit exchanged between the two clearing houses.</p> <p>The margins obtained from CME daily ensure that SGX-DC is able to cover its potential exposure without reducing its ability to fulfill its own obligations.</p>

	<p><b>Management of risks</b></p> <p>In the event of CME's default, the SGX-DC default management framework will apply to CME, as would be the case with other SGX-DC clearing members. As provided in the MOS agreement and in accordance with SGX-DC's default management framework, SGX-DC will liquidate CME's position using the bank letters of credit placed by CME to meet its obligations and thus cover liquidation losses. SGX-DC Clearing Rule 7A.01A.8 and 7A.01A provides that SGX-DC may use the clearing fund if the letters of credit, margins or any of its other assets or securities of a participating market (i.e., CME in the case of MOS) are insufficient.</p> <p>SGX-DC and CME do not contribute to each other's default fund.</p> <p><b>Information provided to participants</b></p> <p>In the event of a default, SGX-DC clearing rule 7A.01A states that SGX-DC may use the clearing fund. Non-defaulting SGX-DC clearing members' potential sharing of uncovered losses is limited to their security deposits and further assessment amounts pledged with SGX-DC.</p>
<p>Key Consideration 9</p> <p>A TR should carefully assess the additional operational risks related to its links to ensure the scalability and reliability of IT and related resources.</p>	<p>NA</p>
<p>Key Conclusions for Principle 20</p>	<p>Risks related to the link with the CME are daily monitored and mitigated by LCs issued by a consortium of banks. Five exchange-traded financial derivatives are eligible to be cleared via the link, which provides clearing members of the SGX-DC and CME with the opportunity to allocate transactions, executed at one exchange, to be cleared by their clearing house of choice. Although risks are assessed to be low, risk management procedures should be upgraded to be fully compliant with the PFMI.</p>
<p>Assessment of Principle 20</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>The LC should be covered by collateral or replaced in full by highly liquid assets with low credit risk. The SGX-DC clearing fund should not be used to cover potential losses related to the link, as this reduces the resources that the CCP holds to address the risks related to the potential default of clearing members.</p>

### Principle 21. Efficiency and Effectiveness

An FMI should be efficient and effective in meeting the requirements of its participants and the markets it serves.

#### Key Consideration 1

An FMI should be designed to meet the needs of its participants and the markets it serves, in particular, with regard to choice of a clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.

SGX-DC obtains feedback on changes to SGX-DC clearing rules, clearing and settlement processes, and on new product specifications via formal public consultation and informal market discussions

Furthermore, SGX-DC has a formal standing committee called the derivatives advisory committee, which meets a few times a year. This committee is chaired by a broking member and includes a broad spectrum of market practitioners including brokers, hedge funds, proprietary trading firms, individual trading members from both Singapore and overseas. They provide input and guidance on various SGX initiatives.

The OTC financial business unit has instituted a formal operating structure for engagement with its participants to ensure that products and service delivery meet with and are responsive to the needs of the market. This comprises a member steering committee which has remit on new products and services and three sub-committees with member representation which support new product delivery and execution.

SGX-DC has memberships in global industry groups such as the Futures Industry Association and World Federation of Exchanges, which facilitates SGX to follow key global trends and market needs.

#### Pricing and cost structure

SGX-DC regularly reviews its efficiency in terms of pricing structure and in particular system-related costs.

SGX-DC's pricing structure is mainly transaction-based. Service delivery fees are set based on a few factors: cost of provision of the services, fees chargeable by what other service providers are charging for similar services, internal business model and policies.

For OTC IRS and FXF, the pricing structure is a pay-as-you-use commercial structure i.e., transaction model pricing. There is no upfront infrastructure investment cost required of members.

For system-related costs, SGX has regular system reviews using a life-cycle approach which takes into account system implementation and maintenance costs. In addition, security control measures are intensely deliberated within

	<p>SGX to ensure that the right check and balance is struck between IT security requirements, operational efficiencies and cost considerations</p> <p>At the group level, SGX measures customer satisfaction of the efficiency and effectiveness of technology support services by conducting an annual survey among market participants.</p>
<p>Key Consideration 2</p> <p>An FMI should have clearly defined goals and objectives that are measurable and achievable, such as in the areas of minimum service levels, risk-management expectations, and business priorities.</p>	<p>The objectives of SGX are to deliver safety, sound risk management and efficiency for participants and markets SGX-DC serves. These involve timely processing of transactions, maintaining sufficient financial resources to minimize market disruptions in the event of a default by members and minimize system disruptions.</p> <p>Key performance levels are established annually to measure how well the technology unit is achieving its objectives. Our progress and achievements are being tracked and reported to the SGX management via:</p> <ul style="list-style-type: none"> <li>• The technology monthly report that captures the performance levels for incidents, problems and IT service availability. This report is submitted to chairman and the EXCO.</li> <li>• IT operations service delivery reports the management and analysis of operations incidents, together with the improvement made. This report is submitted to the RMC semi-annually.</li> </ul> <p>Technology and operational critical breaches are escalated and reviewed by EXCO to prevent recurrence and are reported to MAS. In addition, EXCO reviews the key operating statistics of the clearing and settlement functions on a monthly basis. Follow-up actions are taken whenever targets are not met.</p> <p>Within the SGX-DC business, the main goal is to run an efficient and effective clearing house with appropriate systems, controls and procedures such that the clearing facility operates reliably and has appropriate and adequate capacity to handle both current and potential activities. Other goals and objectives are to create growth opportunities for the exchange/clearing house and provide the best possible products and services to our existing and potential market participants. Some recent examples are:</p> <ul style="list-style-type: none"> <li>• New product offerings, such as the Nifty options, OTC options, Euro oil swaps, MSCI Indonesia futures, virtual steel mill–coking coal.</li> <li>• Enhance existing products, such as longer-dated futures, options and swaps.</li> <li>• Enhance functionalities, such as trade report API, pre-trade risk control, client post-trade data feed, OTC option automated strike generation, OTC option real-time limit checks.</li> </ul>

	<p>For clearing of OTC IRS and FXF, SGX-DC established a clearing service for OTC derivatives following demand from participants for credit risk mitigation in the aftermath of the global financial crisis in 2007</p> <p>SGX-DC notifies its participants of opening days and hours through its website and/or through the SGX-DC environment document and clearing member handbook and guide.</p>
<p>Key Consideration 3</p> <p>An FMI should have established mechanisms for the regular review of its efficiency and effectiveness.</p>	<p>SGX continuously measures the efficiency and effectiveness of its systems (including SGX-DC systems) to ensure optimal service availability. Therefore the uptime of its critical IT service necessary to support SGX systems (including SGX-DC systems) are reported on a regular basis to the relevant management.</p> <p>SGX regularly obtains feedback from meetings, public consultations and industry survey. This feedback from market participants and industry associations about effectiveness and efficiency are appropriately incorporated. The OTC Financial Member Steering Committee which meets frequently reviews the clearing activities for each new product launch and is the forum for members to provide feedback.</p>
<p>Key Conclusions for Principle 21</p>	<p>SGX-DC has arrangements in place to consult its participants on a regular basis to address their needs in the design of its operations and services. SGX-DC has established mechanisms for the regular review of its efficiency and effectiveness, such as customer satisfaction surveys, user groups and internal control procedures. SGX-DC reviews its pricing structure and system-related cost on a regular basis.</p>
<p>Assessment of Principle 21</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>-</p>

### Principle 22. Communication Procedures and Standards

An FMI should use, or at a minimum accommodate, relevant internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording.

<p>Key Consideration 1</p> <p>An FMI should use, or at a minimum accommodate, internationally accepted communication procedures and</p>	<p><b>Communication procedures</b></p> <p>SGX-DC has different communication procedures for different products and different connections:</p> <p><b>Clearing and Settlement Process/Systems</b></p> <ul style="list-style-type: none"> <li>Listed derivatives: SGX-DC uses a proprietary network, i.e., the OMnet</li> </ul>
---	--

standards.	<p>Application Programming Interfaces to enable straight-through processing from trade execution to clearing members' back-office systems for listed derivatives, including dissemination of trade records in real-time and dissemination of reports information.</p> <ul style="list-style-type: none"> <li>• OTC commodity swaps: SGX-DC uses an industry standard FIXML message protocol and provides a Web Application for the registration of trades related to OTC commodity swaps for inter-broker/dealers and clearing members.</li> <li>• OTCF: SGX-DC uses communication procedures of Calypso, which is a global provider of clearing and treasury market solutions.</li> </ul> <p><b>Banking settlement process/systems</b></p> <p>SGX-DC's margining and payment system generates SWIFT instructions which are sent to the respective settlement banks for money settlement with participants via the SWIFT network.</p> <p><b>Other reporting/communication process/systems</b></p> <ul style="list-style-type: none"> <li>• SGX-DC online portal: accessible via web interface, is provided for participants to perform activities including trades registration, post-trade and collateral management.</li> <li>• SGX Data Submission website: website accessible via SGX secured network for clearing members to report the identity of and any changes to their position-holding accounts.</li> <li>• SFTP: transmit files/reports to clearing members.</li> </ul> <p><b>Cross-border operations</b></p> <p>For communicating messages with the CME SGX-DC uses SWIFT for settlement messages, SFTP for communication of data and files and IBM Websphere Message Queue (MQ) to support messaging with CME's proprietary TREX messaging.</p> <p><b>Communication standards</b></p> <p>SGX-DC uses the following communication standards:</p> <ul style="list-style-type: none"> <li>• Messaging format of NASDAQ OMX clearing solution for the clearing of listed products, and OTC commodity products.</li> <li>• FIXML standard is adopted for the registration of trades for OTC Commodities and OTC Financial Derivatives products.</li> <li>• FpML standard is adopted for the registration of trades related to OTCF.</li> <li>• SWIFT ISO15022 message protocol for banking related instructions such as cash settlement</li> </ul>
------------	--

	<ul style="list-style-type: none"> <li>• ISIN codes to identify stock and government securities and Bank Identifier Codes (BIC) to identify counterparties.</li> <li>• For cross-border operations SGX-DC utilizes SWIFT ISO15022 message protocols for banking instructions and CME's TREX messaging.</li> </ul>
Key Conclusions for Principle 22	Internationally accepted communication procedures and standards are used for communication between SGX-DC, its clearing members, settlement banks, and other FMIs. The SGX owned systems generate SWIFT messages to the members' settlement banks for money settlement. The SWIFT messages are based on ISO15022 standards.
Assessment of Principle 22	Observed
Recommendations and Comments	-

### Principle 23. Disclosure of Rules, Key Procedures and Market Data

An FMI should have clear and comprehensive rules and procedures and should provide sufficient information to enable participants to have an accurate understanding of the risks and fees and other material costs they incur by participant in the FMI. All relevant rules and key procedures should be publicly disclosed.

<p><b>Key Consideration 1</b></p> <p>An FMI should adopt clear and comprehensive rules and procedures that are fully disclosed to participants. Relevant rules and key procedures should also be publicly disclosed.</p>	<p><b>Rules and procedures</b></p> <p>The following information relating to the rules and procedures of SGX-DC are available to clearing members:</p> <ul style="list-style-type: none"> <li>• Rules and attendant instruments;</li> <li>• Contractual agreements;</li> <li>• Handbooks and guides; and</li> <li>• General information.</li> </ul> <p><b>Disclosure</b></p> <p>The SGX-DC clearing rules, practice notes and SIAC DC arbitration rules are publicly available on the SGX website. These are updated prior to new rules coming into effect. Amendments to the rules are published prior to the effective date to give participants sufficient notice of the changes.</p> <p>Most other documents, except for some directives and circulars, are publicly available on the SGX website. Circulars are available to all clearing members. Where directives are issued to specific clearing members for prompt and</p>
--	--

	<p>decisive action, such directives are only visible to those members concerned. These are not appropriate for disclosure to third parties as such directives contain specific instructions entailing regulatory concerns which are only relevant to that clearing member.</p> <p>The contractual agreements above are private agreements between SGX-DC and the contracting party which contain mainly technical, operational and administrative details that are relevant to contracting parties and therefore are only disclosed to the contracting parties.</p> <p>The establishment and amendment of SGX-DC's clearing rules are subject to public consultation requirements under the SFA. Public consultations seek to provide assurance that relevant industry standards and market protocols are taken into consideration, and members may become familiar with such measures before any changes are introduced.</p> <p>In the course of introducing changes, SGX-DC further engages in informal discussions with clearing members and affected parties at an early stage in the development of any proposal to understand the concerns which they may have in relation to a proposed rule amendment. This provides ample opportunity for clearing members to raise any issues in relation to clarity and comprehensiveness of rules.</p> <p>Prior to the introduction of new procedures, SGX-DC conducts member briefings and engagements to explain the changes to market participants.</p>
<p>Key Consideration 2</p> <p>An FMI should disclose clear descriptions of the system's design and operations, as well as the FMI's and participants' rights and obligations, so that participants can assess the risks they would incur by participating in the FMI.</p>	<p>Participants have full access to all documents such as handbooks, guides and agreements that set out SGX-DC's design and operations (via circular, secure log-in and email) as well as all information available to the public via SGX's website.</p> <p>SGX-DC also publicly discloses the following information concerning:</p> <ul style="list-style-type: none"> <li>• contract specifications and terms and conditions of contracts cleared and settled by SGX-DC;</li> <li>• clearing and other fees charged by SGX-DC;</li> <li>• mark-to-market and margining, specifically on how the maintenance margin for each contract is set to cover the maximum of the historical volatilities computed sample periods;</li> <li>• the composition of SGX-DC's Clearing Fund under Chapter 7 of the SGX-DC clearing Rules and the SGX annual report. Chapter 7 of the SGX-DC clearing Rules describes procedures in case of default of a clearing member;</li> <li>• the daily settlement prices, volume and open interest for each contract settled</li> </ul>

	<p>or cleared by SGX-DC; and</p> <ul style="list-style-type: none"> <li>• its existing clearing members and membership criteria.</li> </ul> <p>Finally, SGX-DC provides the following information to participants assisting them to understand their potential financial risks:</p> <ul style="list-style-type: none"> <li>• daily reports to clearing members detailing their individual margin, security deposit and Further Assessment Amount requirements;</li> <li>• annually in SGX's Annual Report, the clearing fund structure, cash set aside by SGX-DC to meet its contributions to the clearing fund, total margins required by SGX-DC and total security deposits of clearing members in the previous financial year;</li> <li>• through the SGX-DC clearing rules, the clearing fund structure, upper limits for security deposits and Further Assessment Amount; and</li> <li>• beginning end-April 2013, discloses stress test scenarios to clearing members and inform each individual clearing member of their highest potential stressed loss to the clearing house over all the scenarios used, on a quarterly basis.</li> </ul>
<p>Key Consideration 3</p> <p>An FMI should provide all necessary and appropriate documentation and training to facilitate participants' understanding of the FMI's rules and procedures and the risks they face from participating in the FMI.</p>	<p>As part of the membership entry process, SGX-DC interacts with prospective clearing members to facilitate their familiarity with system infrastructure and requirements.</p> <p>An annual industry-wide BCM exercise, involving SGX, SGX vendors and market participants, is conducted by SGX to confirm the resiliency of the SGX business services such as a disaster at the primary data centre. Clearing systems are covered in these exercises. Industry-wide exercises are also held for the Singapore financial sector by the association of banks of Singapore and MAS. SGX and its participants participate in these periodic tests.</p> <p>SGX-DC also holds fire-drills for clearing members in OTC financials clearing on a periodic basis pertaining to default management procedures for its OTC financials clearing activities. With the disclosure of stress test scenarios and members' highest potential stressed loss to the clearing house on a quarterly basis, participants understanding of risks will also be enhanced.</p> <p>With regard to risk and regulatory issues, the Member Supervision unit provides guidance to clearing members on issues such as the computation of risk-based capital requirements, and holds briefing/training sessions for clearing members in relation to pertinent regulatory changes.</p>
<p>Key Consideration 4</p> <p>An FMI should publicly disclose its fees at the</p>	<p>SGX-DC discloses its full clearing fee schedule to the public via its website, and also all general rebates and discounts that accrue to members and public. The clearing fee schedule lists a single clearing fee for all the different products that SGX-DC clears and settles for each account type.</p>

<p>level of individual services it offers as well as its policies on any available discounts. The FMI should provide clear descriptions of priced services for comparability purposes.</p>	<p>Included on the website is a description of SGX-DC's policy on further discounts and incentive schemes.</p> <p>Market participants are informed of the effective date of proposed changes to the clearing fees and associated discounts by way of circulars. Typically, a two-week notice is provided before the changes take effect.</p> <p>For OTC financial contracts cleared by SGX-DC, SGX-DC informs the relevant participants of the effective date of changes to services and fees in the regular (monthly) OTCF Steering Committee Meetings. Participants are typically given at least a one week notice period prior to such changes taking effect.</p> <p>The public is notified of changes to services and fees via SGX's website, which is updated with the latest services and fees on a timely basis. Typically, a two-week notice is provided before the changes take effect.</p> <p>Members can estimate costs related to system design, technology and communication procedures based on information provided by SGX-DC during the on boarding period.</p>
<p>Key Consideration 5 An FMI should complete regularly and disclose publicly responses to the CPSS-IOSCO Disclosure framework for FMIs. An FMI also should, at a minimum, disclose basic data on transaction volumes and values.</p>	<p>SGX-DC has completed the disclosure framework in 2013, following the publication of the PFMI and the assessment methodology. SGX-DC has plans to update the document following material changes to it and its environment and, at a minimum, at least every two years.</p> <p>SGX also publishes a monthly statistics report which provides monthly aggregate numbers of cleared volume in various derivatives product classes and open interest.</p> <p>In its annual report, SGX publishes information on cash set aside by SGX-DC to meet its contributions to the clearing fund, total margins held by SGX-DC and total security deposits of clearing members, in the previous financial year.</p> <p>SGX-DC discloses all information in English, on the SGX website.</p>
<p>Key Conclusions for Principle 23</p>	<p>SGX-DC has disclosed responses to the CPSS-IOSCO Disclosure framework for FMIs, which enables participants to appropriately assess the risks they incur by participating in the CCP. SGX-DC disclosed its rules and regulations on its website. The website also contains statistics and various descriptions of the risk management and operational systems. Fees are also publicly disclosed.</p>
<p>Assessment of Principle 23</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>-</p>

## IV. DETAILED ASSESSMENT RESPONSIBILITIES AUTHORITIES

### Responsibility A: Regulation, Supervision, and Oversight of Financial Market Infrastructures

FMI should be subject to appropriate and effective regulation, supervision, and oversight by a central bank, market regulator, or other relevant authority.

Key Consideration 1  
Authorities should clearly define and publicly disclose the criteria used to identify FMIs that should be subject to regulation, supervision, and oversight.

MAS is responsible for the supervision of FMIs which comprise payment systems, CSDs, SSS, CCPs and TRs in Singapore.

#### **Payment systems**

MAS' powers for the supervision of payment systems are derived from the PS(O)A. Under section 7(1) of the PS(O)A, MAS may designate a payment system as a designated payment system, and subject the designated payment system to various regulatory requirements, if:

- A disruption in the operations of the payment system could trigger, cause or transmit further disruption to participants or systemic disruption to the financial system of Singapore;
- A disruption in the operations of the payment system could affect public confidence in payment systems or the financial system of Singapore; or
- It is otherwise in the interests of the public to do so.

Section 3.3 of the monograph on supervision of FMIs (monograph) in Singapore further elaborates that:

- Systemically important payment systems are systems where a disruption could trigger, cause or transmit further disruption to participants or cause systemic disruption to the financial system of Singapore; and
- System-wide important payment systems are systems where a disruption could affect public confidence in payment systems or the financial system of Singapore.

In addition, the criteria used to determine the need for designating payment systems for supervision include (section 3.4 of the monograph):

- number and value of transactions processed;
- number and type of participants;
- markets served;
- market share;

	<ul style="list-style-type: none"> <li>• interconnectedness with other payment systems and other financial institutions; and</li> <li>• available alternatives to using the payment system at short notice.</li> </ul> <p><b>CCP and SSS</b></p> <p>MAS' supervision of CCPs and SSSs is guided by the SFA and its accompanying regulations. Any CCP or SSS that seeks to offer its services in Singapore is required to be authorized by MAS before it may commence operations.<sup>31</sup></p> <p>Pursuant to Part III of the SFA, clearing facilities are defined to include SSSs and CCPs. Corporations operating clearing facilities are regulated as DCHs. Section 55 of the SFA specifies the criteria by which MAS may designate a person operating a clearing facility as a DCH, which include:</p> <ul style="list-style-type: none"> <li>• a disruption in the operations of the clearing facility could trigger, cause or transmit further systemic disruptions to capital markets or the financial system of Singapore;</li> <li>• a disruption in the operations of the clearing facility could affect public confidence in capital markets, financial institutions or the financial system of Singapore; or</li> <li>• it is in the interests of the public to do so.</li> </ul> <p>In addition, section 57 of the SFA specifies other general criteria that MAS takes into consideration when designating a person operating a clearing facility as a DCH, including:</p> <ul style="list-style-type: none"> <li>• the size and structure, or proposed size and structure, of the clearing facility;</li> <li>• the nature of the services provided, or to be provided, by the clearing facility;</li> <li>• the nature of the transactions cleared, or to be cleared, by the clearing facility;</li> <li>• the market where the transactions cleared through the clearing facility are traded or to be traded;</li> <li>• the nature of the investors or participants, or proposed investors or participants, who may use or have an interest in the clearing facility;</li> </ul>
--	--

<sup>31</sup> The PFMI assessment was conducted in July 2013, and was based on the 2006 Revised Edition of the SFA. Amendments to the SFA such as the new authorization regime for CCPs and the licensing regime for TRs, which took effect on August 1, were not included in the following write-up.

- whether the person operating the clearing facility is otherwise regulated by the Authority under the SFA or any other written law;
- whether the clearing facility takes on counterparty risks, through novation or otherwise, in the clearing or settlement of transactions;
- the parties who may be affected in the event that the clearing facility runs into difficulties;
- the interests of the public; and
- any other circumstances that MAS deem relevant.

These factors are further elaborated in the guidelines on the regulation of clearing facilities. Accordingly, MAS regulates all systemically-important clearing facilities, i.e., CCPs and SSSs, as DCHs.

MAS' approach to the supervision of FMIs in Singapore is set out in the monograph. As explained in the monograph section 3.6, capital market FMIs, i.e., CCPs, SSSs, CSDs and TRs, have the potential to trigger or transmit systemic disruptions due to their critical functions in the Singapore capital markets and are therefore deemed to be systemically important.

The Singapore Parliament passed amendments to the SFA on 15 November 2012. As part of the amendments, a new authorization regime for clearing facilities was introduced, requiring all persons operating clearing facilities to be regulated as approved clearing houses or recognized clearing houses (RCHs).

Under the amended SFA, corporations seeking to establish clearing facilities will be required to seek authorization to be approved as approved clearing houses or recognized as RCHs. Systemically-important clearing facilities, i.e., CCPs and SSSs, will be regulated under the approved clearing house regime, which generally equates to the DCH regime, while other clearing facilities will be regulated as RCHs. All existing DCHs, including CDP and SGX-DC, will be deemed to be approved as approved clearing houses under the new regime.

### **CSD**

There is only one CSD in Singapore, operated by the CDP, which supports the main securities market in Singapore, operated by SGX-ST. CDP is also a CCP and SSS in respect of the securities market operated by SGX-ST, the functions of which are regulated under the SFA as described above.

CDP as a CSD is regulated under the Companies Act and the Companies

	<p>(Central Depository System) Regulations. These regulations provide MAS with powers to conduct supervision over CDP, including powers to conduct inspections of CDP's CSD activities, to obtain information from CDP, and to approve depository fees. Breaches of the Companies Act or the regulations are referred to the Accounting and Corporate Regulatory Authority (ACRA) for action, which is the responsible authority for the Companies Act. CDP is regulated by MAS as part of MAS' consolidated supervision over CDP in its functions as a CCP, SSS and CSD.</p> <p><b>TRs</b></p> <p>The Singapore Parliament passed amendments to the SFA on November 15, 2012, which among others expanded the scope of the SFA by introducing a new licensing regime for TRs to be regulated as licensed trade repositories or licensed foreign trade repositories.</p> <p>TRs which seek licensing will be regulated as either licensed trade repositories or licensed foreign trade repositories, depending on the place of incorporation of the TR. Such TRs may then facilitate reporting of trades subject to reporting mandates issued by MAS. As there are currently no TRs in operation in Singapore, MAS does not conduct any supervision of TRs.</p> <p>All relevant laws and regulations, including the SFA and monographs are publicly available.</p>
<p>Key Consideration 2 FMIs that have been identified using these criteria should be regulated, supervised, and overseen by a central bank, market regulator, or other relevant authority.</p>	<p>MAS has identified the following FMIs, which are regulated, supervised and overseen by the MAS in accordance with the criteria set forth in key consideration:</p> <p>Payment Systems</p> <ul style="list-style-type: none"> <li>• MEPS+</li> <li>• Singapore Dollar Cheque Clearing System (SGDCCS)</li> <li>• U.S. Dollar Cheque Clearing System (USDCCS)</li> <li>• Interbank GIRO System (IBG system)</li> <li>• NETS Electronic Fund Transfers at Point of Sale (EFTPOS).</li> </ul> <p>CCPs, SSSs, CSDs, TRs</p> <ul style="list-style-type: none"> <li>• SGX-DC</li> </ul>

	<ul style="list-style-type: none"> <li>• CDP</li> <li>• SMXCC</li> </ul>
Key Conclusions for Responsibility A	FMI in Singapore are subject to effective regulation and supervision of the MAS. MAS' powers for the supervision of payment systems are derived from the PS(Oversight)A. MAS' supervision of CCPs, SSS and TRs is governed by the SFA and related regulations. CSDs are regulated under the Companies Act and related regulations. These laws and regulations are publicly disclosed.
Assessment of Responsibility A	Observed
Recommendations and Comments	-

### Responsibility B. Regulatory, Supervisory, and Oversight Powers and Resources

Central banks, market regulators, and other relevant authorities should have the powers and resources to carry out effectively their responsibilities in regulating, supervising, and overseeing FMIs.

<p>Key Consideration 1</p> <p>Authorities should have powers or other authority consistent with their relevant responsibilities, including the ability to obtain timely information and to induce change or enforce corrective action.</p>	<p><b>Powers or other authority consistent with relevant responsibilities</b></p> <p><b>Payment Systems</b></p> <p>Under PS(O)A, MAS' regulatory powers over designated payment systems include those to impose an access regime, impose restrictions and conditions, establish standards, make regulations, approve and remove chief executive officers and directors, approve substantial shareholders and other controllers, issue directions and inspect the designated payment systems (section 3.5 of the monograph).</p> <p><b>CSDs, SSSs, and CCPs</b></p> <p>Part III and Part IX of the SFA provide MAS with the powers to supervise DCHs on an ongoing basis to ensure that they comply with their statutory obligations under the SFA. MAS' powers include powers to obtain information, impose restrictions (including access restrictions), conditions and directions, approve and remove chief executive officers and directors, approve substantial shareholders and other controllers, and conduct inspections of the operations (section 3.9 of the monograph).</p> <p>MAS' powers over CDP, as a CSD, include powers to conduct inspections, and obtain information from CDP.</p> <p>Pursuant to section 47 of the SFA, MAS' objectives in regulating DCHs are:</p>
--	--

	<ul style="list-style-type: none"> <li>• to promote the safety and efficiency of clearing facilities that support systemically-important markets or form an integral part of the financial infrastructure; and</li> <li>• to reduce systemic risk.</li> </ul> <p><b>Powers to obtain timely information</b></p> <p><b><i>Payment Systems</i></b></p> <p>Section 6 of the PS(O)A empowers MAS to collect information from all payment systems in Singapore. Specifically, MAS has powers to require the provision of payment system-related information by the operators, settlement institutions or participants of any payment system in Singapore. This enables MAS to monitor the development of the payment system industry in Singapore and make informed policy decisions.</p> <p>In addition, part V of PS(O)A imposes obligations on the operators and settlement institutions of designated payment systems to notify MAS of businesses and acquisition of corporations and of certain events listed in the act as follows:</p> <ul style="list-style-type: none"> <li>• an intention to make a material change to the nature of the operating rules, settlement procedures or activities of the DPS;</li> <li>• an event or irregularity that impedes or prevents access to, or impairs the usual operations of the DPS or its settlement operations;</li> <li>• the operator or settlement institution becoming or likely to become insolvent or unable to meet its financial statutory, contractual or other obligations;</li> <li>• and other event that the Authority may prescribe by regulations.</li> </ul> <p>Section 27 of PS(O)A also provides MAS with powers to inspect, under conditions of secrecy, the books of an operator or a settlement institution of a designated payment system.</p> <p><b><i>CSDs, SSSs and CCPs</i></b></p> <p>The SFA empowers MAS to collect information from DCHs on an ongoing basis. Under sections 66 and 67 of the SFA, a DCH is required to submit periodic reports, and provide assistance to MAS, if required, for the performance of MAS' functions and duties. This includes providing information (i) relating to the business of the DCH, or (ii) in respect of any transaction or class of transactions cleared or settled by the DCH. This allows MAS to monitor the activities of the FMIs, in order to assess the impact of their activities to the capital markets in Singapore.</p>
--	---

In addition, sections 142 to 144, 154 and 163 of the SFA provide MAS with regulatory and investigative powers to obtain all data, information, documents, statements and records from persons (whether regulated or unregulated) who may have information relevant to the inquiry or investigation. Section 150 of the SFA also provides for MAS to inspect, under conditions of secrecy, the books of a DCH.

The regulations under the Companies Act provide MAS with powers to conduct supervision over CDP, including powers to inspect the books, accounts, documents and transactions of CDP. The CDS Regs also require CDP to submit:

- a auditor's report of its annual accounts (regulation 25); and
- a quarterly report on the outcome of its scrip verification (regulation 19).

#### **Periodic information**

FMIIs are required to provide periodic information to MAS.

#### **Payment Systems**

An operator of a designated payment system is required under section 11 of PS(O)A to notify MAS as soon as practicable after the occurrence of any of the following events:

- the carrying on of any business by the operator of the designated payment system other than –
  - the business of operating a payment system;
  - a business incidental to operating a payment system; or
  - such business or class of businesses as MAS may prescribe
- the acquisition by the operator of a substantial shareholding in a corporation which does not carry on –
  - the business of operating a payment system;
  - a business incidental to operating a payment system; or
  - such business or class of businesses as MAS may prescribe.

The operator is also required under regulation 6 of the Payment Systems (Oversight) Regulations 2006 (PS(O)R) to submit to MAS its annual report, auditor's report and other reports as MAS may require.

Under regulation 11 of PS(O)R, the operator is required to immediately notify

	<p>MAS of any activation of its business continuity plan and of any action taken or intended to be taken to restore safe and efficient operations of the DPS. The operator is also required to, within 14 days or such longer period as may be permitted by MAS, inform MAS of any material change to the business continuity plan and submit, at the request of MAS, a copy of the new plan to MAS.</p> <p>Also, under section 12 of PS(O)A and regulation 5 of the PS(O)R, as soon as practicable after the occurrence of any events that impact the business of the designated payment system, such as operational disruptions, legal proceeding or insolvency.</p> <p>In addition, under section 6 of the PS(O)A, MAS may require additional information from the DPS. For instance, DPS submit quarterly and semi-annual transaction volume/value statements to MAS.</p> <p><b>CSDs, SSSs and CCPs</b></p> <p>A DCH is required to provide the following information as prescribed by MAS under regulation 11 of the Securities and Futures (Clearing Facilities) Regulations:</p> <ul style="list-style-type: none"> <li>• a copy of its annual report, directors' reports and auditors' long form report within three months after the end of its financial year;</li> <li>• a copy of its profit and loss accounts and balance sheet for the first three quarters of the financial year within 45 days after the end of each quarter;</li> <li>• a report on how the DCH has discharged its responsibilities within 3 months after the end of a financial year;</li> <li>• any other report as MAS may require for the proper administration of SFA: MAS receives various reports on stress test results, regulatory capital adequacy, and other statistics such as open position data.</li> </ul> <p>In addition, pursuant to section 60 of the SFA, a DCH should, as soon as practicable, notify MAS of:</p> <ul style="list-style-type: none"> <li>• the carrying on of any business other than— <ul style="list-style-type: none"> <li>• the business of operating a clearing facility;</li> <li>• a business incidental to operating a clearing facility; or</li> <li>• such business or class of businesses as MAS may prescribe;</li> </ul> </li> <li>• the acquisition of a substantial shareholding in a corporation which does not carry on—</li> </ul>
--	---

	<ul style="list-style-type: none"> <li>• the business of operating a clearing facility;</li> <li>• a business incidental to operating a clearing facility; or</li> <li>• such business or class of businesses as MAS may prescribe;</li> <li>• the DCH becoming aware of a financial irregularity or other matter which may affect: <ul style="list-style-type: none"> <li>• its ability to discharge its financial obligations;</li> <li>• the ability of a member of the DCH to meet its financial obligations to the DCH;</li> </ul> </li> <li>• the DCH reprimanding, fining, suspending, expelling or otherwise taking disciplinary action against a member;</li> <li>• any other matter MAS may prescribe by regulations or specify by notice in writing to the DCH; such matters, as prescribed under regulation 9 of the Securities and Futures (Clearing Facilities) Regulations, include— <ul style="list-style-type: none"> <li>• any civil or criminal legal proceeding instituted against the DCH, whether in Singapore or elsewhere;</li> <li>• any disciplinary action taken against the DCH by any regulatory authority, whether in Singapore or elsewhere, other than the MAS;</li> <li>• any significant change to the regulatory requirements imposed on the DCH by any regulatory authority, whether in Singapore or elsewhere, other than MAS;</li> <li>• any admission or cessation of a bank to act as a settlement bank for the DCH;</li> <li>• any failure by any party to debit or credit the relevant accounts for the purposes of the settlement of transactions, including the settlement of moneys, securities or physically delivered futures contracts; and</li> <li>• any disruption of or delay in any clearing or settlement procedures of the DCH, including those resulting from any system failure.</li> </ul> </li> </ul> <p><b>Powers to induce change or enforce corrective action</b></p> <p><b><i>Payment Systems</i></b></p> <p>MEPS+, a systemically important payment system, is the only payment system in Singapore required to adhere to the PFMI. MAS oversees MEPS+ and induces the necessary change through a formalized internal arrangement.</p> <p>For other designated payment systems, part VI of the PS(O)A provides MAS</p>
--	--

	<p>with oversight powers including the power to:</p> <ol style="list-style-type: none"> <li>(a) impose conditions;</li> <li>(b) establish standards; or</li> <li>(c) issue directions.</li> </ol> <p><b>CSDs, SSSs and CCPs</b></p> <p>Under section 78 to 81 of the SFA, MAS has formal regulatory powers to:</p> <ul style="list-style-type: none"> <li>• impose conditions or restrictions relating to any activities, any products or the nature of investors;</li> <li>• issue directions to a DCH;</li> <li>• order cessation of a DCH; or</li> <li>• remove officers of a DCH.</li> </ul> <p>The range of regulatory actions that MAS may take in respect of a breach of a provision in the SFA:</p> <ul style="list-style-type: none"> <li>• issuing a supervisory warning;</li> <li>• issuing a reprimand (section 344 of the SFA);</li> <li>• making an offer of composition (Securities and Futures (Composition of Offences) Regulations);</li> <li>• directing cessation of business of the DCH (section 54 of the SFA);</li> <li>• removing any officer of the DCH (section 81A of the SFA);</li> <li>• issuing a written direction to the DCH to take specific action (section 79 of the SFA).</li> </ul> <p>Apart from formal regulatory powers, MAS also uses mechanisms such as</p> <ol style="list-style-type: none"> <li>(i) regular or ad-hoc dialogue with management of a DCH; and</li> <li>(ii) presentation of a supervisory report to the board of the DCH, which includes a section on findings arising from on-site inspection, to express any concerns or highlight certain regulatory issues.</li> </ol> <p>As CDP is regulated under the SFA for clearing facility activities, MAS supervises CDP on a consolidated basis, for its multiple roles as CSD, SSS and CCP, and approaches the supervision of CDP as a CSD based on the standards under the SFA.</p> <p>The SGX group (including CDP and SGX-DC) is required to conduct a comprehensive annual self-assessment on how it has discharged its responsibilities under the SFA during the preceding financial year. The self-</p>
--	---

	<p>assessment covers all regulatory, risk, operations and technology functions, as well as all major projects for the year. MAS also conducts an annual inspection of the SGX group.</p>
<p>Key Consideration 2</p> <p>Authorities should have sufficient resources to fulfill their regulatory, supervisory, and oversight responsibilities.</p>	<p><b>Resources</b></p> <p>MAS is a self-financing statutory board. Its overall budget consists of income and expenditure from foreign investments and Singapore dollar operations as well as currency issuance, operation of the electronic payments system, custody fees etc.</p> <p>Internally, each department is allocated an amount of funds each year, and may utilize its allocation as the department head deems necessary within MAS' existing policy guidelines. Should the need arise, departments may request for additional resources than originally allocated to them in their budget.</p> <p>Section 17 of the MAS Act provides that MAS may appoint employees as it thinks fit, and determine all matters relating to their remuneration and terms and conditions of appointment and employment.</p> <p>With regard to manpower, MAS conducts annual manpower planning reviews to ensure that adequate staffing levels are maintained. As part of the reviews, departments work out the human resources and skills required to deliver on the strategic and day-to-day operational objectives of the department, in support of MAS' broader mandate. Any assessed needs for increase in headcount each year are submitted to the Board of Directors for approval.</p> <p>In addition, MAS provides ongoing training to MAS officers through the MAS academy. The academy was set up by MAS to centralize in-house professional and leadership training programs for all departments. Staff resources available for FMIs amount approximately to 40 people.</p> <p><b>Legal protections</b></p> <p>Section 22 of the MAS Act provides immunity to MAS officers discharging their responsibilities. No action, suit or other legal proceedings shall lie against MAS officers for anything done or omitted to be done in good faith during the course of work.</p>

Key Conclusions for Responsibility B	The powers and resources of the MAS are considered sufficient. Under the respective laws the MAS has powers to obtain relevant and comprehensive information in a timely manner and enforce corrective action. The SFA allows MAS to impose conditions or restrictions on activities or products, issue directions, order cessation or remove officers of a DCH. MAS has sufficient financial and staff resources to fulfill its responsibilities.
Assessment of Responsibility B	Observed
Recommendations and Comments	-

<b>Responsibility C. Disclosure of Policies with Respect to Financial Market Infrastructures</b>	
Central banks, market regulators, and other relevant authorities should clearly define and disclose their regulatory, supervisory, and oversight policies with respect to FMIs.	
Key Consideration 1 Authorities should clearly define their policies with respect to FMIs, which include the authorities' objectives, roles, and regulations.	<p>MAS' approach in its supervision of FMIs in Singapore is described in the monograph 'Supervision of FMIs in Singapore' published by MAS in January 2013. The monograph highlights MAS' supervisory objectives of ensuring the safety and efficiency of FMIs. The monograph also provides an overview of the regulatory framework for FMIs as set out by the PS(O)A and SFA.</p> <p>To achieve the objectives, MAS monitors and assesses existing and new FMIs to ensure that FMIs have proper structures, processes, and rules in place (section 2.3 of the monograph).</p>
Key Consideration 2 Authorities should publicly disclose their relevant policies with respect to the regulation, supervision, and oversight of FMIs.	<p>The monograph is publicly available. In addition, MAS' policies and objectives are publicly disclosed on MAS' website in relevant guidelines as well as in the CPSS Red Book (Singapore Chapter).</p> <p>There are also public documents in which MAS explains the intent behind its powers as contained in the statutes. These include:</p> <ul style="list-style-type: none"> <li>• public consultation papers seeking comments on the policy intent, and draft of, rules being proposed, as well as MAS' responses to feedback;</li> <li>• the explanatory brief and second reading speech made when introducing the bill in Parliament for the first and second reading respectively; and</li> <li>• explanatory statements relating to the provisions in the bill.</li> </ul>

Key Conclusions for Responsibility C	MAS' supervisory approach of FMIs is described in a dedicated monograph, which is publicly disclosed. The monograph sets out MAS' supervisory objectives, regulatory framework and supervisory approach. The monograph is published on MAS' website along with relevant guidelines and other public documents.
Assessment of Responsibility C	Observed
Recommendations and Comments	-

<b>Responsibility D. Application of the Principles for Financial Market Infrastructures</b>	
Central banks, market regulators, and other relevant authorities should adopt the CPSS-IOSCO Principles for financial market infrastructures and apply them consistently.	
Key Consideration 1 Authorities should adopt the CPSS-IOSCO Principles for financial market infrastructures.	<p>The monograph states MAS' adoption of the PFMI (section 1.2). Specifically, all systemically important payment systems, CCPs, SSSs and CSDs in Singapore are required to comply with the PFMI.</p> <p>In addition, as explained in the monograph, MAS may impose higher or more specific requirements on FMIs, as appropriate, in the context of specific risks, or in the context of wider financial sector stability (section 1.4 of the monograph).</p> <p>Legislation has been passed to introduce a new licensing regime for TRs. TRs regulated under this regime will be required to comply with the PFMI as well.</p>
Key Consideration 2 Authorities should ensure that these principles are, at a minimum, applied to all systemically important payment systems, CSDs, SSSs, CCPs, and TRs.	<p>As disclosed in the monograph, MAS applies the principles to all systemically important payment systems, CSDs, SSSs, CCPs and TRs in Singapore, namely:</p> <ul style="list-style-type: none"> <li>• MEPS+</li> <li>• SGX-DC</li> <li>• CDP</li> <li>• SMXCC</li> </ul> <p>The respective FMIs have been informed by MAS that they are expected to comply with the PFMI. To facilitate compliance with the PFMI, MAS has actively engaged the FMIs to discuss how the principles can be best implemented.</p>
Key Consideration 3 Authorities should apply these principles	MAS is the regulator for all FMIs operating in Singapore and will apply the PFMI consistently. For FMIs operating across jurisdictions, MAS would generally place reliance on the home supervisor of the FMI or cross-border

<p>consistently within and across jurisdictions, including across borders, and to each type of FMI covered by the principles.</p>	<p>oversight arrangements (e.g., CLS Oversight Committee), and ensure that the FMI meets the standards expected of MAS (e.g., compliance with PFMI).</p> <p>MAS is the owner and operator of MEPS+. To maintain an effective oversight of MEPS+, there is a separation of the payment systems oversight and MEPS+ operations functions within MAS. The Payment Systems Division is responsible for the operations of MEPS+, while the specialist risk department is responsible for the oversight of MEPS+. The operations and oversight departments function independently and have separate management reporting lines to different management fora.</p> <p>The objectives of MEPS+ oversight are to ensure that the system adheres to international standards, and have adequate risk management and controls for its system design, operations, processes and rules. Specific oversight activities performed by specialist risk department include the monitoring of key MEPS+ developments (such as strategies, testing and incidents), discussing risk issues with the operational departments, and reviewing the self-assessment of MEPS+ conducted by the payment systems division against international standards.</p> <p>If an FMI does not observe all applicable principles, MAS will engage the FMI on key findings, and work with the FMI on appropriate and timely actions to improve the functioning of the FMI, to ensure that the regulatory objectives are met.</p>
<p>Key Conclusions for Responsibility D</p>	<p>The MAS has publicly announced that it adopts the PFMI. The monograph ‘Supervision of FMIs in Singapore’ published by the MAS in January 2013 states that the MAS adopts the PFMI when carrying out its supervision of FMIs. MAS’ approach is to adopt the PFMI through compliance of the FMIs with the relevant laws and subsidiary legislation, which encompass specific requirements of the PFMI.</p>
<p>Assessment of Responsibility D</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>-</p>

### Responsibility E. Cooperation with Other Authorities

Central banks, market regulators, and other relevant authorities should cooperate with each other, both domestically and internationally, as appropriate, in promoting the safety and efficiency of FMIs.

<p>Key Consideration 1 Relevant authorities</p>	<p>The only FMI which is subject to active cooperative oversight by MAS is the Continuous Linked Settlement (CLS). CLS is regulated and supervised by the</p>
---	---

<p>should cooperate with each other, both domestically and internationally, to foster efficient and effective communication and consultation in order to support each other in fulfilling their respective mandates with respect to FMIs. Such cooperation needs to be effective in normal circumstances and should be adequately flexible to facilitate effective communication, consultation, or coordination, as appropriate, during periods of market stress, crisis situations, and the potential recovery, wind-down, or resolution of an FMI.</p>	<p>U.S. Federal Reserve as an Edge corporation. The U.S. Federal Reserve also chairs the CLS Oversight Committee, in which MAS participates alongside other central banks whose currencies are in CLS.</p> <p>The U.S. Federal Reserve organizes and administers the CLS Oversight Committee, which operates in accordance with the protocol for cooperative oversight of CLS. The protocol was adopted by the CLS Oversight Committee to avoid duplication of oversight effort by the central banks, foster consistent, transparent communications between the central banks and CLS Bank, and enhance transparency among the participating central banks regarding the development and implication of international and domestic policies applicable to CLS Bank.</p> <p>The CLS Oversight Committee has an established crisis communication protocol which would be activated during a crisis situation. For example, the lead overseer of the Federal Reserve Bank of New York may initiate conference call if necessary to share information and to seek CLS- Oversight Committee's views on issues relating to the crisis.</p> <p>In addition, MAS has a cooperation agreement with the relevant U.S. regulators responsible for CME in relation to the MOS link, which is the CFTC. There is a MOU signed by MAS and the CFTC (U.S. SEC is also signatory to the MOU) which sets out the general principles regarding mutual assistance and exchange of information, scope of assistance between MAS and U.S. regulators, permissible uses of information etc.</p> <p>For all other FMIs, they currently operate domestically in Singapore. MAS is a signatory to the IOSCO MOU and The Declaration on Cooperation and Supervision of International Futures Markets and Clearing Organizations (as amended March 1998), and also informs authorities within CPSS on developments in payment systems, as well as other FMIs in Singapore.</p>
<p>Key consideration 2</p> <p>If an authority has identified an actual or proposed operation of a cross-border or multicurrency FMI in its jurisdiction, the authority should, as soon as it is practicable, inform other relevant authorities that may have an interest in the FMI's observance of</p>	<p>The USDCCS is a cross-border payment system, but is not considered a systemically important payment system by MAS. It is designated as a system-wide important payment systems under the PS(O)A. MAS identifies cross-border or multicurrency FMI based on the following:</p> <ul style="list-style-type: none"> <li>• Whether an FMI in Singapore processes non-SGD transactions</li> <li>• Whether an FMI outside of Singapore processes SGD transactions.</li> </ul> <p>CDP and SGX-DC have products which are settled in foreign currencies, as well in Singapore dollars. SMXCC's products are only settled in U.S. Dollars.</p> <p>Criteria uses by MAS to determine whether other relevant authorities should be notified are the nature of the FMI, and potential impact, if any, of the FMI,</p>

<p>the CPSS-IOSCO Principles for financial market infrastructures.</p>	<p>for example whether any disruption in the FMI could have contagion effect to other FMIs in other jurisdictions.</p> <p>Notice is given either by email or phone call to the central bank of issue of the foreign currency. This is sometimes carried out through CPSS if many currencies are involved.</p>
<p>Key Consideration 3</p> <p>Cooperation may take a variety of forms. The form, degree of formalization and intensity of cooperation should promote the efficiency and effectiveness of the cooperation, and should be appropriate to the nature and scope of each authority's responsibility for the supervision or oversight of the FMI and commensurate with the FMI's systemic importance in the cooperating authorities' various jurisdictions. Cooperative arrangements should be managed to ensure the efficiency and effectiveness of the cooperation with respect to the number of authorities participating in such arrangements.</p>	<p><b>Forms of cooperation</b></p> <p>The cooperative oversight of CLS is a formalized arrangement under the CLS Oversight Committee.</p> <p>MAS did conclude an MOU with the U.S. authorities regarding the MOS link, however, contact with the US authorities in relation to the MOS link is not frequently conducted.</p> <p>MAS has no formal arrangement with the Accounting and Corporate Regulatory Authority (ACRA) which is the statutory regulator of CDP as a CSD under the Companies Act. No formal arrangements among domestic agencies are required, as they are expected to act in the public interest and cooperate with each other. MAS works closely with ACRA and where there is a breach of the Companies Act by CDP, MAS will highlight and recommend appropriate actions for ACRA to take.</p> <p><b>Efficiency and effectiveness of cooperation</b></p> <p>The formalized cooperative oversight framework for CLS states the responsibilities of the lead overseer and each member, allowing clear understanding of the oversight arrangement. This helps to promote efficiency and effectiveness by avoiding duplication of oversight activities.</p>
<p>Key Consideration 4</p> <p>For an FMI where cooperative arrangements are appropriate, at least one authority should accept</p>	<p>For CLS the Federal Reserve Bank of New York is the leading authority.</p> <p>In the case of the MOU with the U.S. authorities no lead authority is appointed.</p>

<p>responsibility for establishing efficient and effective cooperation among all relevant authorities. In international cooperative arrangements where no other authority accepts this responsibility, the presumption is the authority or authorities with primary responsibility in the FMI's home jurisdiction should accept this responsibility.</p>	
<p>Key Consideration 5 At least one authority should ensure that the FMI is periodically assessed against the principles and should, in developing these assessments, consult with other authorities that conduct the supervision or oversight of the FMI and for which the FMI is systemically important.</p>	<p>The Federal Reserve Bank of New York is responsible for ensuring that the CLS is periodically assessed against the PFMI.</p> <p>The Federal Reserve Bank of New York consults on and shares assessments on CLS with other relevant authorities via the CLS Oversight Committee. This may be in the form of email, teleconference or in-person meeting.</p> <p>With regard to the MOU with the U.S. authorities, both authorities are responsible for the assessment of the CCP in their jurisdiction.</p>
<p>Key Consideration 6 When assessing an FMI's payment and settlement arrangements and its related liquidity risk-management procedures in any currency for which the FMI's settlements are systemically important against the principles, the authority or</p>	<p>MAS is the sole regulatory authority in respect of FMIs in Singapore, which currently operate domestically. Specifically for USDCCS which offers its services to Singapore based banks, MAS assessed the payment and settlement arrangement and its liquidity risk management.</p>

<p>authorities with primary responsibility with respect to the FMI should consider the views of the central banks of issue. If a central bank of issue is required under its responsibilities to conduct its own assessment of these arrangements and procedures, the central bank should consider the views of the authority or authorities with primary responsibility with respect to the FMI.</p>	
<p>Key Consideration 7 Relevant authorities should provide advance notification, where practicable and otherwise as soon as possible thereafter, regarding pending material regulatory changes and adverse events with respect to the FMI that may significantly affect another authority's regulatory, supervisory, or oversight interests.</p>	<p>MAS would consider feedback from other authorities. For CLS, MAS may obtain feedback directly from members of the CLS Oversight Committee through emails. MAS may also conduct public consultation and take feedback from interested authorities.</p> <p>With regard to the link with CME, the MOU with the U.S. authorities contains general provisions on the sharing of relevant information.</p>
<p>Key Consideration 8 Relevant authorities should coordinate to ensure timely access to trade data recorded in a TR.</p>	<p>NA</p>

<p>Key Consideration 9</p> <p>Each authority maintains its discretion to discourage the use of an FMI or the provision of services to such an FMI if, in the authority's judgment, the FMI is not prudently designed or managed or the principles are not adequately observed. An authority exercising such discretion should provide a clear rationale for the action taken both to the FMI and to the authority or authorities with primary responsibility for the supervision or oversight of the FMI.</p>	<p>The cooperative arrangements in which MAS participates do not discourage MAS to use its discretion if needed.</p>
<p>Key Consideration 10</p> <p>Cooperative arrangements between authorities in no way prejudice the statutory or legal or other powers of each participating authority, nor do these arrangements constrain in any way an authority's powers to fulfill its statutory or legislative mandate or its discretion to act in accordance with those powers.</p>	<p>There are no restrictions in place on MAS' powers under the CLS Oversight Committee, or in the cooperation arrangements with the U.S. authorities.</p>

Key Conclusions for Responsibility E	MAS cooperates with other domestic and global regulators to coordinate supervisory activities. MAS is part of the CLS Oversight Committee. MAS, the SEC and CFTC have an MOU covering information sharing agreements, which also covers the link between SGX-DC and the CME.
Assessment of Responsibility E	Observed
Recommendations and Comments	The MAS should extend its MOU with the relevant U.S. authorities by adding formalized cooperative crisis management arrangements to the current provisions, particularly with regard to the link between SGX-DC and the CME. The common crisis management framework could define the roles and responsibilities of the MAS and the U.S. authorities in crisis scenarios. The crisis management framework should be regularly tested. Such a framework may facilitate effective and timely communication and potentially avoid losses or reduce the size of financial losses following financial or operational crisis events.

## V. AUTHORITIES' RESPONSE

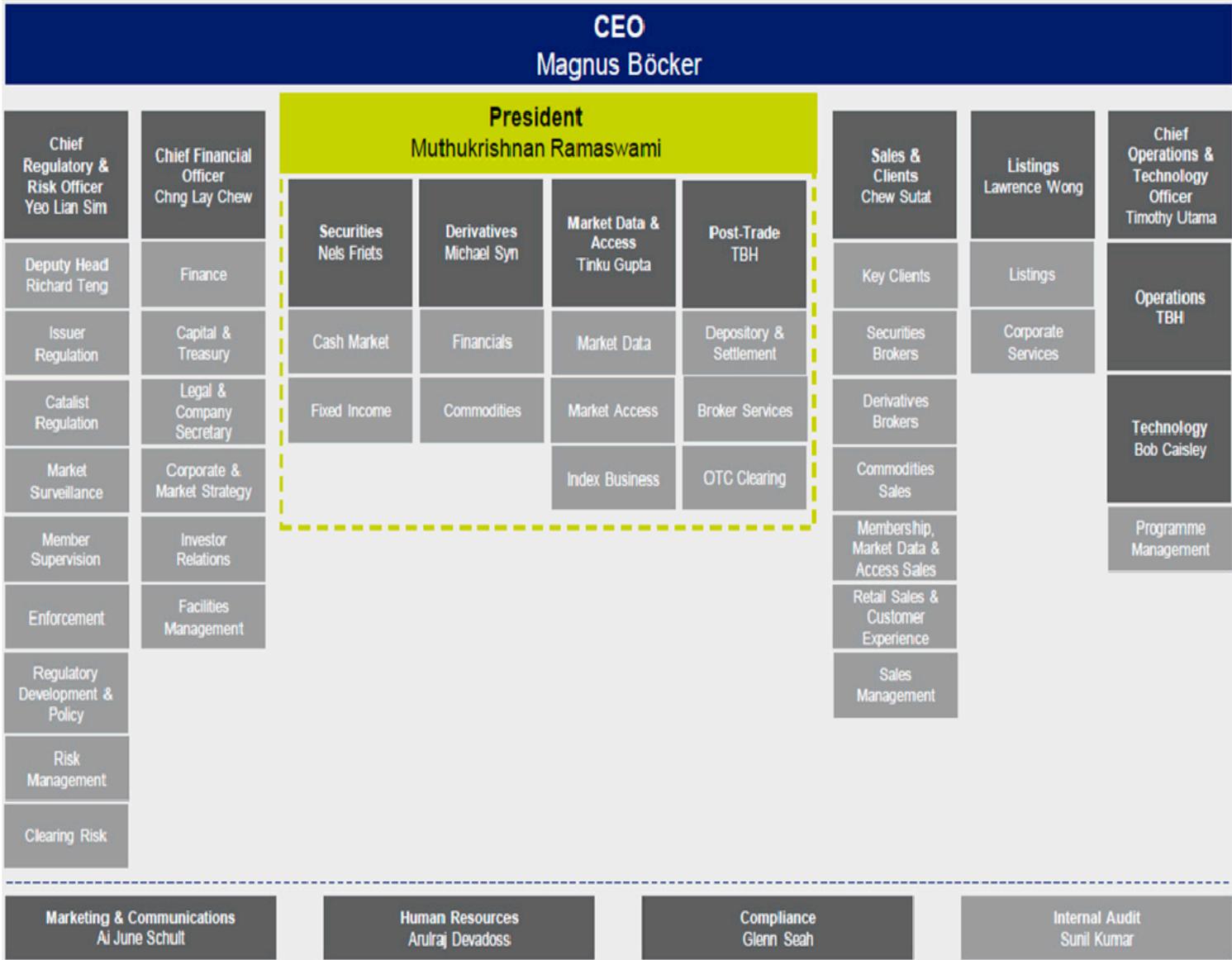
**76. MAS welcomes the assessments on Singapore's implementation of the PFMI, as part of the IMF's FSAP.** The assessments provided MAS with the opportunity to review Singapore's regulatory and supervisory framework in respect of FMIs, and allowed for identification of areas for further improvement.

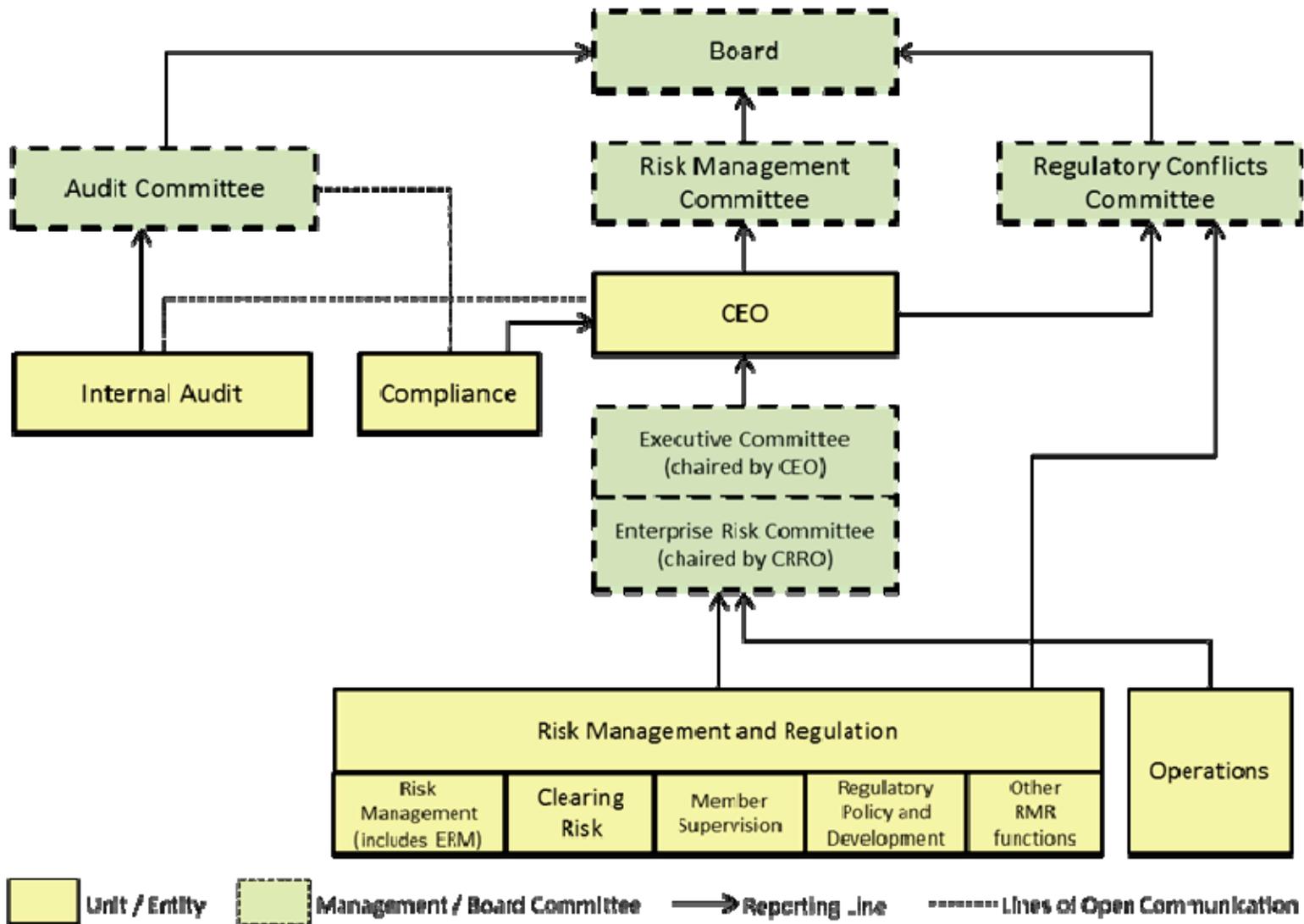
**77. MAS acknowledges the IMF's overall assessment that CDP and SGX-DC are sound and efficient CCPs that comply with the PFMI.** Since the introduction of the PFMI in April 2012, MAS has engaged CDP and SGX-DC in reviewing areas where the PFMI has imposed new or strengthened requirements; and where appropriate, to consider improvements to CDP's and SGX-DC's risk management policies and technology systems. MAS has also reviewed its legislative framework, instituted legislation changes and published policies to reflect and encompass the PFMI requirements. MAS will continue to work with these FMIs to ensure best practice implementation of the PFMI.

**78. MAS notes the assessors' finding that CDP's and SGX-DC's RRP's should be further developed (Principle 3).** The RRP's have been developed taking reference from the guidance provided under the FSB Key Attributes of Effective Resolution Regimes for Financial Institutions published in October 2011, which sets out the core elements that are necessary for an effective resolution of financial institutions including FMIs. MAS notes that the FSB and CPSS-IOSCO are currently consulting on the Assessment Methodology for the Key Attributes of Effective Resolution Regimes for Financial Institutions, and the recovery of FMIs respectively. MAS will monitor developments on the international front, and will continue to engage CDP and SGX-DC to further enhance various components of the RRP's.

**79. MAS would like to express its appreciation to the IMF and its PFMI FSAP assessors for the assessments.** MAS will thoroughly consider all the recommendations made by the assessors, so as to further reinforce the FMIs' operational policies and practices that are best suited to the context of Singapore's financial markets.

Appendix 1. Organization Chart of SGX





**CRRO:** Chief Risk and Regulatory Officer. The Chief Risk Officer is currently also the Chief Regulatory Officer  
**ERM:** Enterprise Risk Management