



SINGAPORE

FINANCIAL SECTOR ASSESSMENT PROGRAM

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

July 2019

This Detailed Assessment Of Observance on 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 June 24, 2019.

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DETAILED ASSESSMENT OF OBSERVANCE

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 held in Singapore during October 29 to November 14, 2018. It was led by Mr. Ulric Eriksson von Allmen. Further information on the FSAP program can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

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Glossary

AC	Audit Committee
ACH	Automated Clearing House
AGC	Attorney-General's Chambers
APEX	Asia Pacific Exchange Pte Ltd
APEX Clear	Asia Pacific Clear Pte Ltd
ASP	Application Service Provider
ASX	Australia Stock Exchange
BCP	Business Continuity Plan
BCS	Banking Computer Services Pte Ltd
BCSIS	BCS Information Systems Pte Ltd
BD	Banking Department
CC	Chairman's Committee
CCP	Central Counterparty
CCSO	Chief Cyber Security Officer
CDP	Central Depository (Pte) Limited
CII	Critical Information Infrastructure
CIIC	Management Critical Information Infrastructure Committee
CIIO	Critical Information Infrastructure Owners
CLS	Continuous Linked Settlement
CM	Chairman's Meeting
CMT	Crisis Management Team
CPMI	Committee on Payments and Market Infrastructures
CPSS	Committee on Payment and Settlement Systems
CSA	Cyber Security Agency of Singapore
CSD	Central Securities Depository
CSP	Critical Service Provider
DLT	Distributed Ledger Technology
DDRS	DTCC Data Repository (Singapore) Pte Ltd
DPS	Designated Payment System
DR	Disaster Recovery
DVP	Delivery Versus Payment
EMEAP	Executives' Meeting of East Asia-Pacific Central Banks
EXCO	Executive Committee
FAST	Fast And Secure Transfers
FD	Finance Department

FTIG	Fintech and Innovation Group
FMI	Financial Market Infrastructure
FNA	Payment and Settlement Systems (Finality and Netting) Act
FSAP	Financial Sector Assessment Program
GMRA	Global Master Repurchase Agreement
IAASB	International Auditing and Assurance Standards Board
IAD	Internal Audit Department
IBG	Interbank GIRO System
ICE Futures	ICE Futures Singapore Pte Ltd
ICSG	ICE Clear Singapore Pte Ltd
ILF	Intraday Liquidity Facility
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
ISAE	International Standard on Assurance Engagements
ITD	Information Technology Department
KC	Key Consideration
MAS	Monetary Authority of Singapore
MCRBA	Money-Changing and Remittance Businesses Act
MD	Managing Director
MEPS	MAS Electronic Payment System
MEPS+	New MAS Electronic Payment and Book-Entry System
MEPS+ IFT	MEPS+ Interbank Funds Transfers Sub-System
MEPS+ SGS	MEPS+ Singapore Government Securities Sub-System
MFSC	Management Financial Supervision Committee
MIC	Management Markets and Investment Committee
NETS EFTPOS	NETS Electronic Fund Transfers at Point of Sale
OC	Oversight Committee
OCM	Offline Contingency Module
PFMI	Principles for Financial Market Infrastructures
PSB	Payment Services Bill
PS(O)A	Payment Systems (Oversight) Act
RBA	Reserve Bank of Australia
RC	Risk Committee
RiMD	Risk Management Department
RTGS	Real Time Gross Settlement
SACH	Singapore Automated Clearing House
SC	Staff Committee

SGD	Singapore Dollar
SGDCCS	Singapore Dollar Cheque Clearing System
SGX-DC	Singapore Exchange Derivatives Clearing Limited
SGX-DT	Singapore Exchange Derivatives Trading Limited
SGX-ST	Singapore Exchange Securities Trading Limited
SIPS	Systemically Important Payment System
SOC	Security Operations Center
SSS	Securities Settlement System
STP	Straight Through Processing
SWIFT	Society for Worldwide Interbank Financial Telecommunication
SWIPS	System-Wide Important Payment System
TCB	Traditional Correspondent Banking
TR	Trade Repository
TRPD	Technology Risk and Payments Department
USDCCS	US Dollar Cheque Clearing System
USFR	United States Federal Reserve

EXECUTIVE SUMMARY

Singapore's financial market infrastructures (FMIs) have continued to operate safely and efficiently since they were assessed in the FSAP of 2013. The Monetary Authority of Singapore (MAS) has taken important steps to address the recommendations made for capital market FMIs. Remedial actions were implemented or are in progress for the two central counterparties. The privately-operated securities settlement system has moved its SGD money settlements for equities and debt securities to settle at the MAS in December 2018. Two additional central counterparties and one trade repository have also entered the FMI landscape. MAS has signed a supervisory cooperation on crisis management arrangements with the U.S. authorities.

The payment system was further protected with legal and regulatory reforms. The Payment and Settlement Systems (Finality and Netting) Act was amended in 2018 to enhance insolvency protection, designation criteria, and administrative powers of the MAS. A Payment Services Bill to address new activities and risks, following major changes in the payments landscape, was proposed in 2017 and is expected to be introduced to Parliament in late-2018. Foreign exchange settlement risks in the financial landscape were addressed following international supervisory guidance issued in 2013, with MAS supervisory expectations requiring banks to include the management of such risks in their counterparty risk management framework.

MAS has led efforts to develop international guidance on the cyber resilience for FMIs and moved swiftly to strengthen Singapore's governance and resiliency of the payment system. MAS co-chaired the Committee on Payments and Market Infrastructures (CPMI)/International Organization of Securities Commissions (IOSCO) Working Group on Cyber Resilience, which prepared the international guidance. MAS has appointed a member in its Board-level Risk Committee who has specialist expertise and experience in technology and cyber risk management, and also a Chief Cyber Security Officer to its senior management team to advise on strengthening the cyber resiliency of the MAS and the financial sector. A Cyber Resiliency Framework for MAS-operated Critical Information Infrastructures (CIIs) has been established and includes the MAS Electronic Payment and Book-Entry System (MEPS+). Efforts are ongoing to manage potential operational risks that could stem from cyber risks, and they include expanding surveillance coverage, reinforcing protection capabilities, reducing time to recover, and developing cyber competencies. MAS established a Cyber Security Advisory Panel, including international cyber security thought leaders.

MAS' pioneering role in cyber resiliency is also demonstrated in its practices, which are higher than minimum requirements and help strengthen the safety of FMIs. Given that Singapore is a modern financial center with a systemically important financial system, MAS is right in aiming for higher standards than the minimum set out in the Committee on Payment and Settlement Systems (CPSS)/IOSCO Principles for Financial Market Infrastructures (PFMI). And it is particularly important to do so considering the evolving financial landscape, new technologies, and potential risks since the issuance of the international standards in 2012. MAS' potential to aim for higher standards in

many other areas of the PFMI are also evident in the assessment results for the MEPS+ inter-bank funds transfer sub-system and MAS responsibilities.

The assessment of MEPS+ finds that most of the principles are observed, but also identifies opportunities for further improvement relative to international best practices. MEPS+ observes 17 principles and broadly observes one principle, which is on operational risk. Six principles were not applicable. To achieve full observance for operational risk, enhancements to the cyber resiliency of the central bank and MEPS+ would need to be substantially implemented. While MEPS+ has observed most of the minimum standards of the PFMI, the mission has identified opportunities for improvement in view of rapid technological changes, evolving risks, and comparisons with international best practices that the authorities' may want to consider:

- **Governance (Principle 2).** As the Chief Cyber Security Officer is a new and important role which is held concurrently by the Executive Director of the Technology Risk and Payments Department (TRPD), which is the overseer and supervisor of MEPS+, the clarification of the role and reporting line should ensure the independence of the TRPD. The objective would be to prevent perceived or potential conflicts of interest between the oversight and operational responsibilities for MEPS+. The TRPD head is a member of the Management Financial Supervision Committee, which is the governing oversight body of MEPS+. The Chief Cyber Security Officer, whose appointment is currently held by the TRPD head, is also a member of the Management Critical Information Infrastructure Committee, which is responsible for the operations of MEPS+. As the Chief Cyber Security Officer role, responsibilities, and resource implications continues to evolve, MAS may consider if a full-time position is warranted.
- **Comprehensive risk management framework (Principle 3).** In the near to medium term, FMIs might adopt distributed ledger technology to handle different asset classes such as for cash, securities and foreign exchange. MAS should analyze and identify the potential risks for MEPS+ guided by the CPMI analytical framework for distributed ledger technology in payment, clearing and settlement. This framework considers risk implications such as legal basis, governance, settlement finality, financial risk, and operational risk.
- **Operational risk (Principle 17).** With the worldwide heightening of cyber risks, MAS should: (i) enhance enterprise-level cyber resiliency with mandatory information security awareness training and course completion for all MAS staff on a regular basis; (ii) apply ratings in the annual self-attestations submitted by MEPS+ critical service providers to support the continuation of critical services for MEPS+ and ensure that the external audit is completed against acceptable national or international standards; and (iii) monitor the compliance of MEPS+ participants with the mandatory controls of the Society for Worldwide Interbank Financial Telecommunication (SWIFT) Customer Security Program, and ensure that self-attestations are audited.
- **Disclosure of rules, key procedures and market data (Principle 23).** To further enhance transparency and thus foster public understanding and confidence in the payment system, MAS should consider public disclosure of additional information on material developments and

quantitative indicators such as MEPS+ system availability, average daily liquidity, and throughput time in the MEPS+ disclosure framework. This is particularly important with operational incidences associated with MEPS+, FMI interdependencies, and MEPS+ critical service providers.

The assessment of MAS responsibilities finds that most responsibilities are also observed.

Responsibility B on powers and resources is assessed as having broad observance because of resource constraints relative to the broad scope of responsibilities and in light of the evolving payments landscape. Potential opportunities for improvement relative to international best practices are as follows.

- **Regulatory, supervisory, and oversight powers and resources (Responsibility B).** In view of its broad mandate and increased responsibilities, MAS should increase resources for the payment systems oversight and supervision unit of the TRPD. The unit is responsible for the oversight and supervision of MEPS+, five privately-operated designated payment systems, and credit bureaus. The unit also participates in the cooperative oversight of a cross-border payment system and SWIFT. The unit has a limited number of staff working on payment systems oversight and supervision. Sufficient resources would support the detailed annual assessment of MEPS+ and other payment systems, which could evolve in systemic importance.
- **Disclosure of policies with respect to FMIs (Responsibility C).** To further enhance transparency in its oversight and supervisory responsibilities, MAS should consider: (i) enhancing the independent review of MEPS+ with an annual assessment report with ratings prepared by the TRPD, endorsed by the Management Financial Supervision Committee, and publicly disclosed; and (ii) publishing an annual report on FMI and payments for Singapore, including the policies, assessment results, and risk analysis for the MEPS+.
- **Application of the PFMI (Responsibility D).** To clarify the application of the PFMI, MAS should consider: (i) revising the Monograph on Supervision of Financial Market Infrastructures to describe the standards used for designated system-wide important payment systems and the associated risks assessed relative to the PFMI; and (ii) assessing on an annual basis the need to apply the PFMI to system-wide important payment systems with respect to horizon-scanning and changes in their risk profiles (such as value limit increases, cross-border features).

INTRODUCTION

1. This report contains the assessment of Singapore’s systemically important payment system and authorities’ responsibilities against international standards. The assessment was undertaken in the context of the IMF’s FSAP mission to Singapore from October 29 to November 14, 2018.¹ The assessor would like to thank the MAS for the excellent cooperation and hospitality.

2. The objective of the assessment was to identify potential risks that may affect financial stability. While safe and efficient payment and securities settlement systems 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 stocks, such as liquidity dislocations and credit losses, or a major channel through which these shocks are transmitted across domestic and international financial markets.

3. The scope of the assessment includes the MEPS+ and its authority, the MAS.² MAS-operated FMIs includes the MEPS+, which functions as an interbank funds transfer system, and a central securities depository and a securities settlement system for government securities and MAS Bills. The assessment focuses on the inter-bank funds transfer functions of MEPS+. MEPS+ is assessed using 18 of the 24 principles that are generally applicable for payment systems under the PFMI. MAS regulatory, supervisory and oversight responsibilities are assessed against Responsibilities A to E of the PFMI.

4. Singapore’s FMIs have been subject to external assessments and peer reviews. Detailed assessments were completed for central counterparties in the FSAP of 2013. The systemically important payment system and securities settlement systems were assessed in the FSAP of 2002-03. Singapore takes part in monitoring the implementation of the PFMI by CPMI/IOSCO, which includes self-assessments and peer reviews.³ Singapore has participated in the Financial Stability Board peer review in 2017, which recommended the extension of resolution planning to FMIs that could be systemic in failure.

5. The methodology for the assessments is based on the PFMI Disclosure Framework and Assessment Methodology.⁴ Important sources of information included the self-assessment report

¹ The assessor was Tanai Khiaonarong.

² The assessment follows the definition and analytical approach established in the PFMI, which considers FMIs as multilateral systems inclusive of their participants and operator.

³ Monitoring is organized into three levels. Level 1 includes self-assessments that report on whether a jurisdiction has completed the process of adopting the legislation and other policies that will enable it to implement the PFMI. Level 2 includes peer reviews that assess the extent to which the content of the jurisdiction's implementation measures is complete and consistent with the PFMI. Level 3 includes peer reviews that examine consistency in the outcomes of implementation of the PFMI. See: https://www.bis.org/cpmi/info_mios.htm

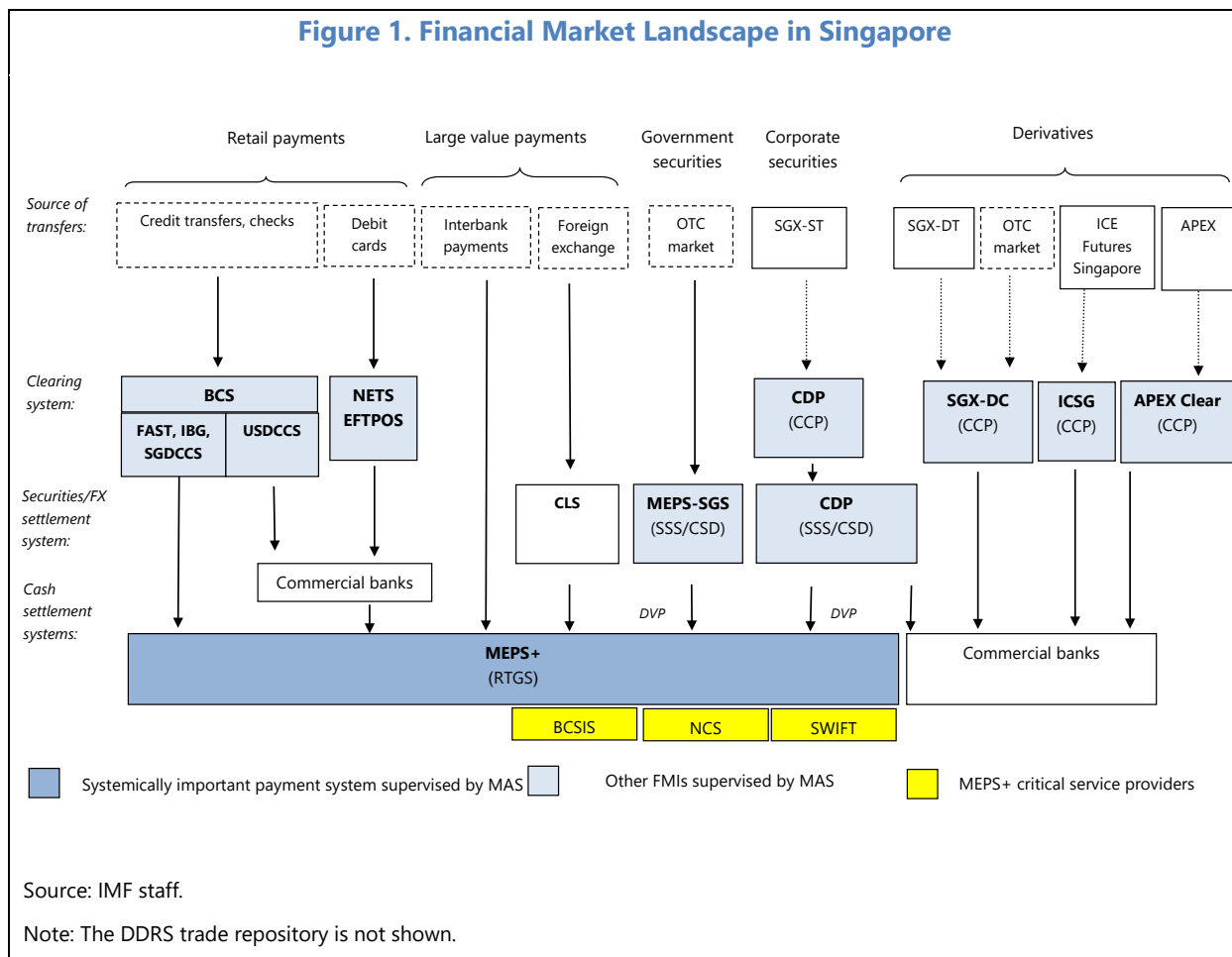
⁴ The methodology could be used by external assessors to draw comparisons at the international level to identify best practices. In addition, the questions under the key considerations for each principle in the PFMI are not intended to serve as a checklist or to be exhaustive. Assessors, at their discretion, could pose additional or different questions as needed, in particular to address the different levels of complexity of the FMI.

and disclosure framework of MEPS+ completed by the operators of MEPS+, self-assessment report of MAS responsibilities prepared by the overseers and supervisors of MEPS+, responses to the Questionnaire on FMIs in Singapore, and relevant laws and regulations. The assessor had thorough discussions with MAS staff and private sector representatives.

OVERVIEW OF PAYMENT, CLEARING AND SETTLEMENT LANDSCAPE

A. Description of Landscape

6. FMI form a key role in facilitating the clearing, settlement and recording of monetary and other financial transactions and fostering financial stability in Singapore. There are multiple infrastructures that handle transactions for payments, securities, and derivatives contracts in Singapore (Figure 1). A brief description by type of infrastructure follows.



Payment Systems⁵

- **MEPS+ Interbank Funds Transfer (MEPS+ IFT).** MAS-operated real-time gross settlement system for large-value SGD interbank funds transfers and scripless Singapore Government Securities (SGS) and MAS Bills. MEPS+ is also used for settlement of obligations arising from financial market transactions, such as foreign exchange trades and the cash-leg of securities trades by members of other FMIs. MEPS+ IFT also settles the participants' net obligations arising from the clearing of SGD checks, Inter-Bank GIRO transactions and FAST transactions in the Singapore Automated Clearing House (SACH). SACH prepares the net settlement files and sends them to MEPS+ IFT for settlement via a leased line linkage between SACH and MEPS+ IFT, at stipulated times within the MEPS+ operating hours.
- **Fast and Secure Transfers (FAST).** Retail payment system that provides electronic funds transfer service for customers of the participating banks to make SGD funds transfer 24 x 7 almost instantly. The system is operated by the Banking Computer Services Pte Ltd (BCS), and settlement takes place on MEPS+.
- **Singapore Dollar Cheque Clearing System (SGDCCS).** Retail payment system that clears SGD-denominated checks drawn on banks in Singapore. The system is operated by the BCS, and settlement takes place on MEPS+.
- **US Dollar Cheque Clearing System (USDCCS).** Retail payment system that clears US dollar-denominated checks drawn on banks in Singapore. The system is operated by the BCS, and settlement takes place at an appointed settlement bank.
- **Interbank GIRO System (IBG).** Retail payment system catering mainly for low-value payments. It allows customers of participating banks to transfer funds via credit transfers and direct debits to and from the accounts of customers of any other participating banks. The system is operated by the BCS, and settlement takes place on MEPS+.
- **NETS Electronic Fund Transfers at Point of Sale (NETS EFTPOS).** Debit card system operated by the Network for Electronic Transfers (Singapore) Pte Ltd. Settlement takes place at an appointed settlement bank.
- **Continuous Linked Settlement (CLS).** Cross-border payment system that settles foreign exchange transactions for the major currencies, including the SGD, on a payment-vs-payment (PVP) basis. Settlement takes place on the books of CLS. Funding of individual currencies take place in the real time gross settlement (RTGS) system of each jurisdiction.

⁵ MEPS+, FAST, SGDCCS, USDCCS, IBG system, and NETS EFTPOS are designated payment systems under the PS(O)A. FAST, SGDCCS, USDCCS, and IBG are collectively called the Automated Clearing House (ACH) systems. CLS is under the oversight of the Federal Reserve Bank of New York.

Central Securities Depositories and Securities Settlement Systems

- **MEPS+ Singapore Government Securities (MEPS+ SGS).** MAS-operated Central Securities Depository (CSD) and Securities Settlement System (SSS) for the custody and settlement of scripless SGS and MAS Bills.
- **Central Depository (Pte) Limited (CDP-SSS/CSD).** CSD and SSS for equities and corporate debt securities. CDP has moved SGD money settlements completely into MEPS+ in December 2018.

Central Counterparties (CCPs)

- **Central Depository (Pte) Limited (CDP-CCP).** CCP for all stocks, bonds, and other corporate securities traded on the Singapore Exchange Securities Trading (SGX-ST).
- **Singapore Exchange Derivatives Clearing Limited (SGX-DC).** CCP that clears exchange traded and over the counter derivatives.
- **ICE Clear Singapore Pte Limited (ICSG).** CCP for derivatives traded on the ICE Futures Singapore Pte Ltd.
- **Asia Pacific Clear Pte Limited (APEX Clear).** CCP for derivatives traded on the Asia Pacific Exchange.

Trade Repository

- **DTCC Data Repository (Singapore) Pte Limited (DDRS).** Trade repository that enables market participants' reporting of over the counter derivative transactions (i.e., credit default swaps, interest rate swaps). DDRS is the Singapore subsidiary of the Depository Trust and Clearing Company in the U.S.

B. Description of MEPS+

7. MEPS+ is a systemically important payment system and has a key role in fostering financial stability in Singapore. The first RTGS system (MEPS) was launched in July 1998. The system was later enhanced and relaunched as MEPS+ and it went live in December 2006. As of December 2017, MEPS+ has 63 participants, comprising MAS, 59 commercial banks and 3 FMIs (including CLS, CDP, and SGX-DC). MEPS+ participants access MEPS+ through SWIFT terminals and interfaces, where they submit payment instructions, manage queued transactions and perform online enquiries.

8. MEPS+ operates as two sub-systems settling funds and securities—MEPS+ IFT and MEPS+ SGS. MEPS+ IFT is for the settlement of large value SGD interbank funds transfers and MEPS+ SGS is for the custody and settlement of scripless SGS and MAS Bills transactions. MEPS+ utilizes the SWIFT network, SWIFT services and message type messaging standards as its messaging

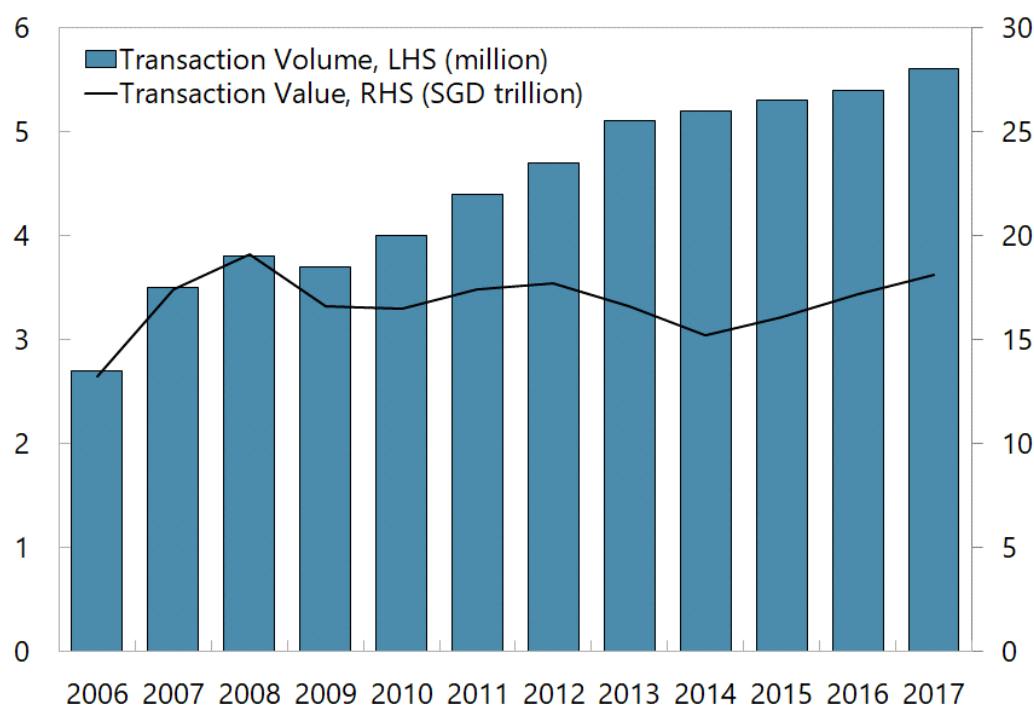
backbone. MEPS+ operates on weekdays (excluding public holidays) from 9:00 a.m. to 7:00 p.m. Prior to the start of MEPS+ operating hours, funds maintained by MEPS+ participants in their current accounts with MAS are transferred to their RTGS accounts, where they may be used for the settlement of MEPS+ transactions. When an intraday minimum cash balance requirement applies to a participant, only funds in excess of its intraday minimum cash balance requirement are transferred to the RTGS account from which funds are available for settlement of intraday MEPS+ payments.

9. Queuing and gridlock resolution mechanisms ensure that sufficient funds and securities are available for settlement.

- **Funds.** Same day payment instructions are settled instantaneously and irrevocably subject to a paying participant holding sufficient balances in its RTGS account. Participants that fail to settle due to insufficient funds are queued. When funds are available, queued instructions are settled according to their assigned priority levels on a first-in-first-out basis. A gridlock detection and resolution mechanism operate every half hour to allow payments to be settled simultaneously on a multilateral gross basis, provided that the resulting positions of all accounts are positive. Queued payments which cannot be settled at the end of a business day are cancelled by MEPS+ and affected participants are informed of such cancelled payments through the appropriate SWIFT messages.
- **Securities.** If the seller of SGS or MAS Bills has insufficient SGS or MAS Bills for delivery, the transaction is queued in MEPS+ SGS until sufficient SGS or MAS Bills are available. Once the seller has sufficient SGS or MAS Bills, MEPS+ SGS will earmark the SGS or MAS Bills for transfer to the buyer and generate a payment instruction to MEPS+ IFT on behalf of the buyer. If the buyer has insufficient funds in its RTGS account to pay for the SGS or MAS Bills purchase, the payment will be queued in MEPS+ IFT. When the funds become available, the amount will be debited from the buyer's RTGS account and credited to the seller's RTGS account, and transfer of SGS or MAS Bills to the buyer will be simultaneously effected on a delivery-vs-payment (DVP) (Model 1) basis.

10. MEPS+ handled about 5 million transactions valued at SGD 18 trillion in 2017. This translates to an average of about 22,000 transactions valued at about SGD 72 billion daily. During the 12-year period from 2006 to 2017, transactions values peaked at SGD 19 trillion in 2008 (Figure 2). The concentration ratio in terms of value and volume were around 60 percent and 57 percent, respectively.

Figure 2. MEPS+ Transaction Volume and Value, 2006-17



Source: MAS

C. Regulatory, Supervisory, and Oversight Framework

11. The legal underpinnings for MEPS+ rest on four main laws, supplemented by agreements. Main legislation includes: (i) MAS Act, Section 29A (Cap. 186); (ii) Payment Systems (Oversight) Act Cap (222A) (PS(O)A); (iii) Payment and Settlement Systems (Finality and Netting) Act (FNA); and (iv) Electronic Transactions Act (Cap. 88). The five main agreements are: (i) the MEPS+ Service Agreement; (ii) Terms and Conditions Governing the Operation of the Current Account of the Specified Institution; (iii) Terms and Conditions Governing the Operation of the Accounts for SGS and MAS Bills; (iv) Terms and Conditions Governing the MAS Intraday Liquidity Facility (ILF); and (v) PSA/International Securities Market Association (ISMA) Global Master Repurchase Agreement (GMRA). The rights and obligations of MAS (as the operator for MEPS+) and the MEPS+ participants are set out in the MEPS+ Service Agreement that MAS entered into with each of the MEPS+ participants.

12. FMs in Singapore are subject to the regulation, supervision, and oversight by MAS. MAS is empowered by the PS(O)A and the Securities and Futures Act (SFA), which establish the regulatory framework for FMs, in line with the PFMI. MAS has primary responsibility for the supervision of payment systems, CSDs, SSSs, CCPs and Trade Repositories (TRs) in Singapore. MAS oversees CLS on a cooperative basis as a member of the CLS Oversight Committee (OC), alongside

other central banks whose currencies are included in CLS. The CLS OC is chaired by the United States Federal Reserve (USFR). The Monograph on Supervision of Financial Market Infrastructures in Singapore was revised in October 2018 (following issuance in January 2013 and revision in January 2015). The Standards for MAS-operated FMIs were issued in January 2015 and revised in November 2017. The MAS Framework for Impact and Risk Assessment of Financial Institutions, which are applied to system-wide important payment systems, was issued in April 2007 and revised in September 2015.

13. MAS supervises payment systems in Singapore, focusing on the safety and efficiency of payment systems. The supervision covers operators, settlement institutions and participants of payment systems. MAS adopts a risk-based approach in its oversight role, subjecting payment systems that are more important to financial stability and the financial system to closer supervision, while monitoring all other payment systems for on-going developments.

14. The PS(O)A empowers MAS to designate payment systems for closer supervision. The PS(O)A gives MAS two sets of powers. First, MAS could collect payment system-related information from operators, settlement institutions or participants of any payment system in Singapore. MAS is thus enabled to obtain comprehensive and reliable information about payment systems to monitor their development and make informed policy and supervisory decisions. Second, MAS could subject designated payment systems (DPSs) to closer supervision. Regulatory powers over DPSs include the power to impose access regimes, impose restrictions and conditions, establish standards, make regulations, approve and remove chief executive officers and directors, approve the control of substantial shareholding in an operator, issue directions, inspect operations, and assume control of the operations of a DPS under emergency situations. In its supervision of DPSs, MAS undertakes a combination of off-site reviews and assessments, as well as on-site inspections.

15. The designation of payment systems is categorized as follows:

- **Systemically important payment system (SIPS).** These are systems whose disruption could trigger or transmit further disruption to participants or cause systemic disruption to the financial system of Singapore. MEPS+ is the only SIPS in Singapore. All SIPS are subject to the PFMI.
- **System-wide important payment system (SWIPS).** These are systems whose disruption could affect public confidence in payment systems or the financial system of Singapore. Although a disruption or failure in these systems may have system-wide implications and may affect many users, there is negligible risk of systemic impact to financial stability. The FAST, SGDCCS, USDCCS, IBG system and NETS EFTPOS are SWIPS and have been designated under the PS(O)A. MAS does not subject SWIPS to the PFMI. Instead, SWIPS are subject to an internal risk assessment framework for designated payment systems.

16. The Cyber Security Agency of Singapore (CSA) is the national agency overseeing cybersecurity strategy, operations, education, outreach, ecosystem development and Cybersecurity Act. The Cybersecurity Act establishes a legal framework for the oversight of

essential services in Singapore. MAS as a sector regulator, works with the CSA to strengthen the cyber resilience of the CIIs in the banking and finance sector.

D. Major Changes and Reforms

17. The Payment and Settlement Systems (Finality and Netting) Act was amended in 2018 to enhance insolvency protection, provide clarity on designation criteria, and strengthen administrative powers. The changes account for the proliferation of faster payment systems with different settlement models and longer business hours. Insolvency protection was extended to three areas: (i) protection of transfer orders, netting and settlement in a designated system by one business day beyond the day which a participant becomes insolvent; (ii) protection to designated systems which utilize collateral; and (iii) protection from liability for an operator, settlement institution, collateral holder of a designated system or an officer or employee of such an entity for any act or omission which was done with reasonable care and in good faith. Greater clarity on designation criteria was part of the amendments. Designation focuses on critical systems, where operational disruptions could impact other participants, the financial system, or public confidence. MAS intends to designate the FAST and NETS EFTPOS debit card system. MAS administrative powers were also strengthened to obtain information and issue directions to rectify outstanding issues. The participant, operator, settlement institution and collateral holder of a designated system will have an obligation to notify MAS in the event of a potential insolvency.

18. A Payment Services Bill (PSB) to address new activities and risks, following major changes in the payments landscape was proposed in 2018. In November 2017, MAS published a public consultation paper, which sets out a new regulatory framework for payment services. MAS currently regulates several types of payment services under the PS(O)A and the Money-Changing and Remittance Businesses Act (MCRBA). The considerable changes in the payment services landscape in the past few years presented new risks from activities that are beyond the current scope of the PS(O)A and MCRBA. New payment business models have also blurred the lines between activities regulated under these two laws. Therefore, the proposed PSB seeks to address the following: (i) streamline payment services under a single legislation by combining the PS(O)A and the MCRBA; (ii) enhance the scope of regulated activities to consider developments in payment services; and (iii) calibrate regulations according to the risks the activities pose by adopting a modular regulatory regime. The PSB is expected to be introduced in Parliament in late-2018.

19. MAS has led efforts to develop international guidance on cyber resilience for FMI and has taken relevant steps for MEPS+.⁶ MAS has established the Cyber Resiliency Framework for MAS-operated CIIs. The framework covers the various cyber resiliency domains such as protection, detection, response and recovery. A dedicated Technical Risk and Assurance Unit is being set-up. MEPS+ enhancements have been made to ensure the necessary data is available for the resumption of settlement operations in the event of a cyber-attack. Efforts have also been initiated to manage

⁶ MAS representatives served as a co-chair and drafting member for the Working Group in Cyber Resilience, which developed the CPMI/IOSCO Guidance on Cyber Resilience for FMI of June 2016.

operational risks, including expanding surveillance coverage, reinforcing protection capabilities, reducing time to recover, and developing cyber competencies. MAS had also enhanced the tracking and monitoring of the input and output sequence numbers of the SWIFT messages in MEPS+ to enable more timely detection of possible fraudulent messages.

20. MAS has collaborated with the industry in testing distributed ledger technology (DLT) for the clearing and settlement of payments and securities since 2016. Project Ubin is aimed at understanding the technology and its benefits in making financial transactions and processes more transparent, resilient, and economical. The first phase of the project, completed in March 2017, tested the use of digital central bank issued tokens for domestic interbank payments. Privacy, deterministic finality of transactions, and mechanisms for liquidity savings such as netting were considered. The second phase of the project focused on developing liquidity saving mechanisms, which are a key feature of RTGS systems. The DVP phase of the project demonstrated delivery versus payment capabilities to allow financial institutions to carry out the simultaneous exchange and final settlement of tokenized digital currencies and securities assets residing on different blockchain platforms. MAS also worked with the Bank of Canada and the Bank of England to assess alternative models that could enhance cross-border payments and settlements. Future phases of the project will include developing payment versus payment models to link up Project Ubin in Singapore with Project Jasper in Canada.

21. Banks in Singapore have participated in the survey on foreign exchange settlement risk practices in response to international supervisory guidance issued in 2013.⁷ The last survey was completed in July 2001, prior to the onboarding of the SGD to CLS. The Basel Committee on Banking Supervision (BCBS) Supervisory Guidance for Managing Risks associated with the Settlement of Foreign Exchange Transactions has been incorporated into the supervisory framework of MAS (MAS Credit Risk Management Guidelines and MAS Notice 637). MAS' supervisory expectations for banks include their management of foreign exchange settlement risk as part of their counterparty risk management framework. Recommendations are communicated to banks where practices are not aligned with supervisory expectations. Given that some banks are MEPS+ participants, the supervisory expectations have helped manage potential foreign exchange settlement risks, which encourages the use of payment-versus-payment arrangements (such as CLS), where practicable.

⁷ The main settlement methods for foreign exchange transactions was through CLS and traditional correspondent banking (TCB), and to a lesser extent, bilateral netting and on-us settlement. Some local banks deal largely in regional currencies (Chinese Yuan, Malaysian Ringgit), which are not CLS-eligible. In addition, there is a large corporate customer base that settles in TCB.

SUMMARY ASSESSMENT OF MEPS+

A. Observance of the Principles

22. The assessment of MEPS+ finds that most of the principles are observed, but also identifies areas for potential improvement relative to international best practices. MEPS+ observes 17 principles and broadly observes one principle, which is on operational risk (Table 1). Six principles were assessed as being not applicable. To achieve full observance for operational risk, enhancements to the cyber resiliency of the central bank and MEPS+ would need to be substantially implemented. While MEPS+ has observed most of the minimum standards of the PFMI, the mission has identified opportunities for improvement in view of rapid technological changes, evolving risks, and comparisons with international best practices that the authorities' may want to consider.

General Organization (Principles 1–3)

23. The legal basis is sound with further enhancements made for insolvency protection, designation criteria, and administrative powers for MAS. The MAS Act (Section 29A) provides MAS with the legal authority to establish and operate MEPS+. MEPS+ is designated under the FNA, which provides settlement finality and protection from the application of the “zero-hour” rule in the event of a participant default. The MEPS+ Service Agreement with MAS forms the contractual basis and includes the MEPS+ Operating Rules, which are binding on the participant, and between the participant and MAS and all other participants in MEPS+. MEPS+ Operating Rules (Rule 17.1) provides finality and irrevocability for transactions.

24. Governance arrangements are clear and transparent and should continue to ensure the independence of the oversight and supervisory functions for MEPS+. Supervisory and operational functions for MEPS+ are separated into different organizational units and have distinct reporting lines to different management to prevent potential conflicts of interests. MAS has appointed a member to its Board-level Risk Committee (Chief Defense Scientist at the Singapore Ministry of Defense) who has specialist expertise and experience in technology and cyber risk management, and also a Chief Cyber Security Officer (CCSO) to its senior management team to help strengthen the cyber resiliency of the MAS and the financial sector. The CCSO is a member of the Management Critical Information Infrastructure Committee (CIIC), which is chaired by the Deputy Managing Director (Corporate Development) who supports the Managing Director of MAS in overseeing the design, implementation, operations and risks associated with running MEPS+. As the CCSO is a new and important role which is held concurrently by the Executive Director of TRPD, which is the overseer and supervisor of MEPS+, MAS should review the role clarity and reporting line of the CCSO to ensure the independence of the TRPD. This should aim to prevent perceived or potential conflicts of interest between the oversight and operational responsibilities for MEPS+. The TRPD head is a member of the Management Financial Supervision Committee (MFSC), which is the governing oversight body of MEPS+. The CCSO is also a member of the CIIC, which is responsible for the operations of MEPS+. As the CCSO role, responsibilities, and resource implications continues to evolve, MAS may consider if a full-time position is warranted.

25. MEPS+ has a sound risk management framework where operational, credit, liquidity and legal risks have been identified, but should include potential DLT-related risks. The MAS Board has established the MEPS+ risk management framework to manage operational risk since it was assessed as the most material risk in MEPS+. The framework sets out the roles and responsibilities of departments, operational targets and risk tolerance limits on system reliability, resilience and security. As the potential for DLT adoption by FMIs to handle different asset classes such as for cash, securities and foreign exchange could materialize in the near to medium term,⁸ the mission recommends a review and analysis of other relevant potential risks for MEPS+. This should be guided by the CPMI analytical framework for DLT in payment, clearing and settlement, which considers risk implications such as legal basis, governance, settlement finality, financial risk and operational risk.⁹

Credit Risk, Collateral, and Liquidity Risk (Principles 4–5 and 7)

26. MAS does not face credit risk as the operator of MEPS+. As the central bank, MAS mitigates its exposure to credit risk by requiring participants to provide collateral against borrowing from MEPS+ participants. MAS offers the ILF which allows MEPS+ participants to borrow SGD on an intraday and collateralized basis to facilitate the settlement of SGD payments and help prevent system gridlocks owing to timing mismatches. The ILF is available only to participants who have executed the PSA/ISMA GMRA with MAS. MAS accepts SGS and MAS Bills as collateral in exchange for SGD cash via the ILF.

27. Collateral with low risks are accepted to manage credit exposures from participants and are subject to valuation and conservative haircuts. Eligible collateral under the ILF is limited to SGS and MAS Bills. These constitute the highest quality liquid assets available domestically. The list of eligible collateral is reviewed annually. Collateral is marked to market daily. Collateral valuation is performed based on an established framework and management approval is sought for exceptions. Haircuts are determined based on the approved haircut framework, which analyses the value-at-risk of debt securities in each class. To ensure that the haircuts are sufficiently able to withstand stressed market conditions, the price movements of the securities under stressed scenarios are taken into consideration in the calibration of the haircuts. Haircuts are subject to annual reviews or as and when the need arises. Periods of stressed market conditions are incorporated in the calibration of the haircuts.

⁸ For illustrative purposes, Project Ubin experimentations directly involved MAS. DLT developments in the wider FMI landscape, and their links to MEPS+, could also be potential scenarios. Some material developments at the international level are as follows: (i) CLS has developed a foreign exchange product with netting features based on DLT to cover trades outside its settlement; (ii) SGX was reported to invest in the London-based foreign exchange start-up, called Cobalt, which uses DLT for streamlining post-trade settlements; and (iii) ASX has plans to replace its securities settlement system with DLT in Australia.

⁹ See CPMI (2017) DLT in Payment, Clearing and Settlement—An Analytical Framework, February. For comparative purposes, the Bank of Canada has applied sub-sets of the PFMI to evaluate the financial stability risks of Project Jasper, which focused on credit and liquidity risks, settlement risks, and operational risk. The evaluation has been published in the Bank of Canada Financial System Review. The Federal Reserve Board (2016) has also examined risk management issues in DLT in payments, clearing, and settlement as part of its analytical work.

28. MAS does not face liquidity risk as the operator of MEPS+. MAS does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. To support the liquidity needs of MEPS+ participants and assist them in managing their liquidity risks, MAS offers ILF to MEPS+ participants, which allows them to borrow SGD, interest-free, on an intraday and collateralized basis, to settle their SGD payments. MEPS+ has automatic gridlock detection and resolution features. MEPS+ features monitoring tools for intraday liquidity management of MEPS+ participants, such as daily maximum liquidity usage, available intraday liquidity at the start of the business day, total payments, and time-specific obligations. MAS conducts annual stress tests on banks by reviewing the impact on banks' settlement and knock-on impact on other participants, under different scenarios. These scenarios include the failure of a key participant, and multiple key participants from a country or region. Results of these stress tests are shared with management and other relevant departments.

Settlement (Principles 8–9)

29. Settlement finality is clear and certain in MEPS+. The FNA provides for the finality and irrevocability of transactions carried out on MEPS+ and it applies where the rules of a designated system provide that the transactions are final and irrevocable. MEPS+ processes payment and securities transfer instructions for settlement on a real-time basis. Settlement in MEPS+ takes place continuously throughout the day whenever a payment is accepted by the system and participants have sufficient funds and SGS and MAS Bills in their MEPS+ accounts. Unsettled payments and securities transfers at the end of day are automatically cancelled.

30. Payments in MEPS+ settle in SGD only on a real-time gross settlement basis in central bank money. MAS does not act as the central counterparty or guarantee the settlement of transactions by MEPS+ participants.

Exchange-of-Value Settlement Systems (Principle 12)

31. Principal risks arising from the settlement of securities transactions are eliminated through delivery versus payment capabilities in MEPS+. For the RTGS of SGS trades and MAS Bills, MEPS+ has implemented DVP processing. Each leg of the DVP trade is accorded finality under the FNA upon settlement. The linked obligations are settled on a gross basis. MEPS+ has implemented DVP Model 1 for processing securities transfer instructions from participants, and payment of SGD corporate bonds traded by participants in the CDP. The FNA provides the legal certainty that all transactions settled by MEPS+ are final and irrevocable notwithstanding the insolvency of a participant.

Default Management (Principle 13)

32. MEPS+ has clearly defined rules and procedures to manage a default by a participant and it has an annual contingency drill and testing of its default procedures. The MEPS+ Service Agreement sets out the definition of default, and the procedures for handling a default of a participant. MAS conducts an annual contingency drill on key aspects of the participant-default

procedures. The drill and associated tests cover, among others, the failure of the largest net debit bank in meeting its check/Inter-Bank GIRO obligations and the failure of a participant bank. These tests also include the recasting of the check/Interbank GIRO obligations.

General Business and Operational Risk Management (Principles 15–17)

33. MAS manages the general business risks of operating MEPS+ based on the enterprise-wide budgeting and accounting processes. This allows it to monitor, manage and control its operating expenses, including those arising from MEPS+ operations.

34. As the operator of MEPS+, MAS does not use commercial custodian services for its own or participants' assets (cash, SGS and MAS Bills).

35. MAS monitors and manages MEPS+ operational risks based on international and national standards as well as MAS-issued guidelines and notices on financial institutions. MEPS+ participants view the system as reliable, resilient and fit-for-purpose.¹⁰ MEPS+ was not affected by the trading disruptions reported for the SGX in 2014 and 2016.¹¹ The systems, policies, procedures and controls to monitor and manage the operational risks are documented in the MEPS+ Operational and Risk Management Framework, various Information Technology Department (ITD) manuals and the annual MEPS+ risk assessments. MAS, as the MEPS+ operator, reviews its MEPS+ outsourcing arrangements annually and continually ensures that there is proper management control and oversight as well as assessments of the risk and impact of the outsourcing arrangements. As part of the annual review, MAS requires its critical service providers (CSPs) to submit self-attestations that cover a specific set of requirements such as its financial strength, operational controls and processes, and physical and information security. To achieve full observance for operational risk, enhancements to the cyber resiliency of the central bank and MEPS+ would need to be substantially implemented. With the heightening of cyber risks at the international level, MAS could consider: (i) enhancing enterprise-level cyber resiliency with mandatory information security awareness training and course completion for all MAS staff on a regular basis; (ii) applying ratings in the annual self-attestations submitted by MEPS+ CSPs to support the continuation of critical services for MEPS+ and ensuring that external audit is completed against acceptable national or international standards; and (iii) monitoring the compliance of MEPS+ participants with the mandatory controls of the SWIFT Customer Security Program, and ensuring self-attestations are audited.

¹⁰ This feedback is based on meetings with the Association of Banks in Singapore and major MEPS+ participants.

¹¹ The CDP uses MEPS+ to submit SGD interbank funds transfers for money settlements. MEPS+ functionality is not reliant on SGX systems. SGX trading disruptions were caused by a power outage on November 5, 2014, a software defect on December 3, 2014, and a hardware failure on July 14, 2016. The settlement of trades was not affected for the three incidents. Authorities have taken immediate and longer-term remedial actions.

Access (Principles 18–19)

36. MEPS+ access and participation requirements include publicly disclosed risk-based criteria, which permit fair and open access. Access to MEPS+ is open to all banks and regulated entities of systemic importance such as the CDP and SGX-DC that meet MAS' prudential standards. Requirements for participation in MEPS+ take into consideration that the applicant is appropriately licensed and approved by MAS or adequately supervised by a competent authority in the country where the applicant is established or licensed. In assessing an entity's application, MAS will review the entity's creditworthiness, and risks posed to system and other participants amongst other strict admission criteria. Participants also have to demonstrate their continuous capacity to effectively operate the technical equipment of the electronic payment system.

37. MAS monitors and manages the material risks to the FMI arising from tiered participation arrangements in MEPS+. Direct participants are required to submit an annual return to MAS on the total volume and value of the MEPS+ transactions that they perform on behalf of indirect participants. MAS analyzes these annual statistics to identify, monitor and manage the risks arising from any material dependencies between direct and indirect participants. Indirect participants whose average daily value of MEPS+ payments through their direct participants exceed SGD 500 million may be required to participate in MEPS+ directly.

Efficiency (Principles 21–22)

38. MEPS+ efficiency and effectiveness are measured by the extent to which the operational standards and targets are met. Qualitative and quantitative operational standards and targets are defined and are documented in the MEPS+ Operational and Risk Management Framework. Performance against the operational standards and targets are reported monthly to the CIIC. MEPS+ adopts a full cost recovery policy. As a matter of practice, fees are set at a level to achieve within 90 percent to 110 percent of the three-year average actual cost recoverability ratio. MEPS+ operational, development and capital costs that meet the recognition criteria as fixed assets in accordance with accounting standards are capitalized and depreciated over a period of three to five years. Fixed assets are reported in MAS financial statements. MEPS+ fee schedules are reviewed annually by ITD, which seeks approval from the CIIC and MAS' Executive Committee (EXCO).

39. MEPS+ uses internationally accepted communication procedures and standards. The SWIFT network and SWIFT messaging standards are used for all funds settlement and securities transfer instructions, which are also used by the participants. MAS is in the process of consultations with the banking industry on the adoption of ISO 20022.

Transparency (Principle 23)

40. MEPS+ operating rules and procedures are documented in the MEPS+ Service Agreement and the Operations and Contingency Manual, which are made public. The last disclosure for MEPS+ was published in June 2018 and includes statistics on transaction volume and value. MEPS+ participants are also disclosed on the MAS website. The disclosure is updated every

two years. To further enhance transparency and thus foster public understanding and confidence in the payment system, MAS should consider public disclosure of additional information on material developments and quantitative indicators such as MEPS+ system availability, average daily liquidity, and throughput time in the MEPS+ disclosure framework. This is particularly important with operational incidences associated with MEPS+, FMI interdependencies, and MEPS+ CSPs.

Table 1. Ratings Summary of MEPS+

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

B. Recommendations for MEPS+

List of Prioritized Recommendations				
Principle	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Timeframe ¹
2	Chief Cyber Security Officer oversight and operational involvement	Clarify the role and reporting line for the Chief Cyber Security Officer with a view to ensure the separation of MEPS+ oversight and operational responsibilities.	MAS	Immediate
3	Potential implications for safety from DLT	Analyze and identify the potential implications for safety for MEPS+ against the CPMI analytical framework for distributed ledger technology in payment, clearing and settlement.	MAS	Near-Term
17	Cyber resiliency awareness and competencies	Enhance enterprise-level cyber resiliency with mandatory information security awareness training and course completion for all MAS staff on a regular basis.	MAS	Immediate
17	Critical service providers assessments and audits	Apply ratings in the annual self-attestations submitted by MEPS+ critical service providers to support the continuation of critical services for MEPS+ and ensure that external audit	MAS	Immediate

List of Prioritized Recommendations				
Principle	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Timeframe ¹
		is completed against acceptable national or international standards.		
17	Endpoint security of MEPS+ participants	Monitor the compliance of MEPS+ participants with the mandatory controls of the SWIFT Customer Security Program, and ensure self-attestations are audited.	MAS	Immediate
23	Disclosure of material changes and quantitative indicators	Disclose additional information on material developments and quantitative indicators on system availability, average daily liquidity, and throughput time in the MEPS+ disclosure framework.	MAS	Near-Term

¹"Immediate" is within one year; "near-term" is 1–3 years; "medium-term" is 3–5 years.

SUMMARY ASSESSMENT OF AUTHORITIES' RESPONSIBILITIES

A. Observance of the Responsibilities

41. The assessment of MAS responsibilities suggests that most responsibilities are observed (Table 2). Responsibility B on powers and resources is assessed as having broad observance because of resource constraints relative to the broad scope of responsibilities in light of the evolving payments landscape. Potential opportunities for improvement relative to international best practices are as follows.

Regulation, Supervision, and Oversight of FMIs (Responsibility A)

42. MEPS+ is subject to appropriate and effective regulation, supervision, and oversight by the MAS. Section 7(1) of the PS(O)A empowers MAS to designate and subject a payment system to closer supervision and various regulatory requirements. Criteria for DPSs are clearly defined and disclosed in the PS(O)A and the Monograph on Supervision of FMIs in Singapore. All relevant PFMI principles applicable to MEPS+ are stated in the Standards for MAS-Operated FMIs. Within MAS, the TRPD is responsible for the supervision of payment systems in Singapore.

Regulatory, Supervisory, and Oversight Powers and Resources (Responsibility B)

43. MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country. MAS' regulatory powers over DPSs include the power to impose access regimes, impose restrictions and conditions, establish standards, make regulations, approve and remove chief executive officers and directors, approve the control of substantial shareholding in an operator, issue directions, inspect operations, and assume control of the operations of a DPS under emergency situations. The PS(O)A also mandates external audits of a DPS and imposes the obligation on a DPS to notify MAS of significant changes in its operations. Section 6 of the PS(O)A empowers MAS to collect information from all payment systems in Singapore. Section 22 of the MAS Act provides immunity to MAS officers discharging their responsibilities.

44. There appears to be insufficient resources for discharging oversight and supervisory responsibilities for MEPS+ relative to the current and future scope of responsibilities of the TRPD. As at July 2018, there were 5 staff in the payment systems oversight and supervision unit of the TRPD involved in the supervision of DPS.¹² Specialist staff from technology risk and business continuity management teams also supports the supervision of payment systems, such as during inspections. Following organizational changes that included the set-up of the MAS Fintech and Innovation Group (FTIG) in 2015, some experienced staff and payments policy work from the TRPD moved to the FTIG. For example, public consultations on the FNA amendment and proposed PSB were led by the FTIG. Part of the responsibilities of the payment systems oversight and supervision unit of the TRPD also involves participation in international forums such as the CLS OC, SWIFT Oversight Forum, CPMI, and the CPMI/IOSCO Steering Group. Given its broad mandate and responsibilities, MAS should increase resources for the payment systems oversight and supervision unit of the TRPD. The unit is responsible for the oversight and supervision of MEPS+, DPSs (FAST, SGDCCS, USDCCS, IBG, NETS EFTPOS), CLS, credit bureaus, and SWIFT. The unit has a limited number of staff working on payment systems oversight and supervision. Increasing resources would support the detailed annual assessment of MEPS+ and other DPSs, which could evolve in systemic importance (particularly for FAST).¹³

Disclosure of Policies with Respect to FMIs (Responsibility C)

45. MAS' approach to supervision of FMIs is described in the publicly available Monograph on the Supervision of FMIs in Singapore. The Monograph highlights MAS' supervisory objectives of ensuring the safety and efficiency of FMIs and provides an overview of the

¹² The Payments and Infrastructure Division of TRPD has 20 staff and is responsible for the oversight and supervision of MEPS+, DPSs, CLS, credit bureaus, payment institutions and SWIFT. For comparative purposes, 18 MAS staff are responsible for the oversight and supervision of capital market FMIs.

¹³ For comparative purposes, the Bank of England has 65 full time staff in its FMI Directorate, and is considering further increases. Another CPMI/IOSCO jurisdiction has around 50 staff working on the oversight and supervision of FMIs. This includes around 20 staff working on FMI regulation, oversight, and policy development at the central bank, and 30 staff working on capital market FMIs at the securities regulator.

regulatory framework for FMIs as set out by the PS(O)A. The standards against which MEPS+ is supervised is also clearly set out in the Standards for MAS-Operated FMIs document.

46. To further enhance transparency in its oversight and supervisory responsibilities, MAS should consider the following: (i) enhance the independent review of MEPS+ with an annual assessment report with ratings prepared by the TRPD, endorsed by the MFSC, and publicly disclosed;¹⁴ and (ii) enhance the transparency of MAS FMI responsibilities, including MEPS+, by publishing an annual report on FMI and payments for Singapore, which could include analysis of associated risks for MEPS+.¹⁵

Application of the Principles for FMIs (Responsibility D)

47. MAS adopts the PFMI in its supervision of SIPS. Currently, MEPS+ is the only SIPS in Singapore. In addition, 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. For MEPS+, all relevant principles are fully adopted by MAS and included in the standards document. MAS conducts annual assessments to understand the risk profile of each operator of SWIPS, as well as to highlight areas of concern and remedial actions. Ratings are given for each assessment. The possibility of SWIPS becoming a SIPS is discussed during such annual assessments.

48. To clarify the application of the PFMI, authorities should consider: (i) revising the Monograph on Supervision of Financial Market Infrastructures to describe the standards used for designated SWIPS and the associated risks which are assessed relative to the PFMI; and (ii) assessing on an annual basis the need to apply the PFMI to SWIPS with respect to horizon-scanning and changes in their risk profiles (such as value limit increase, cross-border features).

Cooperation with Other Authorities (Responsibility E)

49. CLS is the only SIPS which is subject to cooperative oversight and has participation from MAS. The USFR chairs the CLS OC, in which MAS participates alongside other central banks whose currencies are included in the CLS. The USFR organizes and administers the CLS OC, which operates in accordance with the Protocol for Cooperative Oversight of CLS. MAS contributes to the cooperative oversight of CLS by reviewing, providing views, and raising questions on CLS oversight matters, such as its operations and risk management practices.

50. MAS, as a sector lead, works with the CSA to strengthen the cyber resilience of the CIIs in the banking and finance sector. The Cybersecurity Act allows the Minister to appoint officers from the sector regulator as Assistant Commissioner to assist the Commissioner to oversee and

¹⁴ For comparative purposes, the Reserve Bank of Australia's Payments Policy Department independently prepares and discloses an annual assessment report on the RITS, which is endorsed by the RBA Payment Systems Board.

¹⁵ For comparative purposes, Norges Bank publishes an annual Financial Infrastructure Report, which describes supervision and oversight activities and includes FMI assessments results with ratings. The Bank of Canada's FMI Oversight Activities Annual Report, describes the approach to oversight, authorities' expectations, and risk management priorities. The National Bank of Belgium's FMI and Payment Service Report provides a more comprehensive reporting approach.

enforce cybersecurity requirements on the CII Owners (CIIOs), to proactively protect the CIIs and respond to cybersecurity threats and incidents in Singapore. CSA manages incident reporting through MAS as CSA's sector lead / regulator, in fulfilment of Cybersecurity Act by the CIIOs.

Table 2. Ratings Summary of MAS Responsibilities

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

B. Recommendations for Authorities

List of Prioritized Recommendations				
Responsibility	Issues of Concern and Other Gaps or Shortcomings	Recommended Action	Relevant Parties	Timeframe ¹
B	Insufficient resources for the payment systems oversight and supervision unit	Increase resources for the payment systems and oversight unit of the TRPD, which is responsible for the oversight and supervision of MEPS+, designated payment systems, CLS, credit bureaus, and major MEPS+ participants.	MAS	Near-Term
C	MEPS+ independent assessment and disclosure	Enhance the independent review of MEPS+ with an annual assessment report with ratings prepared by the TRPD, endorsed by the MFSC, and publicly disclosed.	MAS	Near-Term
C	Transparency of MAS FMI oversight responsibilities, including MEPS+	Enhance the transparency of MAS FMI responsibilities, including MEPS+, by publishing an annual report on FMI and payments for Singapore, which could include analysis of associated risks for MEPS+.	MAS	Near-Term
D	Application of the PFMI to designated payment systems	Revise the Monograph on Supervision of FMIs to describe the standards used for designated system-wide important payment systems and the associated risks which are assessed relative to the PFMI.	MAS	Near-Term
D	Designated payment systems subject to the PFMI	Assess on an annual basis the need to apply the PFMI to system-wide important payment systems, based on horizon-scanning and changes in their risk profiles (value limit increase, cross-border features) and systemic importance.	MAS	Near-Term

¹"Immediate" is within one year; "near-term" is 1–3 years; "medium-term" is 3–5 years.

DETAILED ASSESSMENT OF MEPS+

Principle 1. Legal Basis	
An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions.	
Key Consideration 1	Material aspects and relevant jurisdictions
The legal basis should provide a high degree of certainty for each material aspect of an FMI's activities in all relevant jurisdictions.	<p>MEPS+ activities requiring legal certainty include:</p> <ul style="list-style-type: none"> (i) finality in settlement for the transfer of funds, settlement of payment obligations and the transfer and settlement of book-entry securities and instruments between or among participants; and (ii) enforceability of sale and repurchase (repo transactions) transactions, including in the event of a default or the insolvency of a participant. <p>Each material aspect is subject to the laws of Singapore. No other jurisdiction's laws apply.</p>
	Legal basis for each material aspect
	<p>The legal basis for the issuance of dematerialised SGS and MAS Bills is provided in the Government Securities Act and the MAS Act, and the transfer of these securities by book-entry are found in the FNA, the Government Securities Act and the MAS Act.</p> <p>MEPS+ is a designated system under the FNA. The FNA provides settlement finality and protection from the application of the "zero-hour" rule in the event of a participant default. The FNA establishes that no court in Singapore shall recognize or give effect to an order of the courts in a foreign jurisdiction to reverse or unwind transactions that have been settled in MEPS+ if doing so would be prohibited under the FNA for a court in Singapore.</p> <p>The FNA also provides that any transaction under the rules of a designated system is final and irrevocable and shall not be reversed, repaid or set aside and no order shall be made by any court for the rectification or stay of such transfer, netting or settlement.</p>
	The MEPS+ Operating Rules, appended to the MEPS+ Service Agreement, set out the rules for funds transfer, settlement of payment obligations and transfer and settlement of scripless SGS

	<p>and MAS Bills in MEPS+. It also provides for the finality and irrevocability of transactions and settlements.</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>Before MAS grants access to MEPS+, participants are required to enter into the MEPS+ Service Agreement with MAS, which forms the contractual basis for the payment and settlement activities in MEPS+. The MEPS+ Operating Rules are read as part of the MEPS+ Service Agreement and is binding on the participant, and between the participant and MAS and all other participants in MEPS+. The participant is required to comply strictly with the MEPS+ Operating Rules as long as the MEPS+ Service Agreement continues to be in force.</p> <p>The MEPS+ Service Agreement is readily available and publicly disclosed on the MAS website. Participants also have access to the Operations and Contingency Manual for MEPS+ Participants and Non-Participants and the MEPS+ User Manuals that provide details on the capabilities of the system and operational processes. In addition, MAS conducts a consultation process where feedback in response to proposed changes to the MEPS+ Service Agreement may be provided to MAS. Any concerns highlighted in the feedback received, including supervisory concerns, are addressed before any proposed changes to the MEPS+ Service Agreement are effected. This consultation process provides a channel to receive feedback on the proposed changes and for participants to understand the revisions to the MEPS+ Service Agreement. The TRPD in MAS is also consulted so that any supervisory concerns may be raised and addressed.</p> <p>The Legal Department in MAS reviews the MEPS+ Service Agreement to ensure it is consistent with the relevant laws in Singapore. Where necessary, MAS will seek external legal advice on specific issues concerning MEPS+.</p> <p>The MEPS+ Service Agreement, and the subsequent updates and amendments to it, is approved by the Management CIIC before coming into effect. CIIC is the MAS management forum chaired by the Deputy Managing Director (Corporate Development) who supports the MAS Managing Director (MD) in overseeing the design, implementation, operations and risks associated with running MEPS+.</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 legal basis of MAS' payment and settlement activities are articulated through legislation and contractual agreements, which are publicly accessible.</p> <p>Section 29A of the MAS Act provides MAS with the legal authority to establish and to operate MEPS+. The FNA provides settlement finality and protection from the application of the zero-hour rule in the event of a participant's default. These and other relevant legislation are publicly available.</p> <p>Before access to MEPS+ is granted, participants are required to enter into the MEPS+ Service Agreement with MAS. The agreement forms the contractual basis for payment and settlement activities in MEPS+.</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>Enforceability of rules, procedures, and contracts</p> <p>See response to Principle 1, KC 1.</p> <p>Degree of certainty for rules and procedures</p> <p>See response to Principle 1, KC 1 in respect of the MEPS+ Operating Rules and MEPS+ Service Agreement.</p> <p>In respect of transactions settled in MEPS+, the FNA and the MEPS+ Operating Rules provide for the finality and irrevocability of such transactions. The FNA (Section 7) provides for the finality and irrevocability of transactions settled in MEPS+ and applies where the rules of a designated system provide that the transactions are final and irrevocable. Such transactions shall not be reversed, repaid or set aside and no order shall be made by any court for the rectification or stay of such transactions. MEPS+ Operating Rules (Rule 17.1) provides that the following transactions are final and irrevocable:</p> <ul style="list-style-type: none"> (i) the transfer of funds into and out of an account of a participant of MEPS+; (ii) the settlement of any payment obligation in MEPS+; and (iii) the settlement and transfer of book-entry SGS and MAS Bills. <p>The proceedings of MEPS+ take precedence over the laws of insolvency, and the settlement of such transfer orders are dealt</p>

	<p>with under the default arrangements set out in the MEPS+ Service Agreement and the MEPS+ Operating Rules.</p> <p>However, as set out in the FNA (Section 12), the finality and irrevocability of transactions of a designated system does not extend to any transfer order given by a participant which is entered into a designated system after the expiry of one business day after: (i) a court made an order for bankruptcy, judicial management or winding up in respect of the participant; or (ii) a resolution for the voluntary winding up of the participant was passed.</p>
	<p>There has been no court in any relevant jurisdiction that has held any of MEPS+ relevant activities or arrangements under its rules and procedures to be unenforceable.</p>
<p>Key Consideration 5</p> <p>An FMI conducting business in multiple jurisdictions should identify and mitigate the risks arising from any potential conflict of laws across jurisdictions.</p>	<p>MEPS+ operates in Singapore only. To-date, the MEPS+ Service Agreement and the Operations and Contingency Manual for MEPS+ Participants and Non-Participants have not been the subject of any conflict of laws across jurisdictions.</p>
<p>Key Conclusions for Principle 1</p>	<p>The legal basis is sound with further enhancements having been made for insolvency protection, designation criteria, and MAS administrative powers. The MAS Act (Section 29A) provides MAS with the legal authority to establish and operate MEPS+. MEPS+ is designated under the FNA, which provides settlement finality and protection from the application of the zero-hour rule in the event of a participant default. The MEPS+ Service Agreement with MAS forms the contractual basis and includes the MEPS+ Operating Rules, which are binding on the participant, and between the participant and MAS and all other participants in MEPS+. MEPS+ Operating Rules (Rule 17.1) provides finality and irrevocability for transactions, including: (i) the transfer of funds into and out of an account of a participant of MEPS+; (ii) the settlement of any payment obligation in MEPS+; and (iii) the settlement and transfer of book-entry SGS and MAS Bills.</p>
<p>Assessment of Principle 1</p>	<p>Observed</p>
<p>Recommendations and comments</p>	

Principle 2. Governance	
<p>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.</p>	
<p>Key Consideration 1</p> <p>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.</p>	<p>MAS has identified operational standards and targets, and tracks and reports the achievements to the CIIC monthly to assess the performance of MEPS+.</p> <hr/> <p>To assess the performance of MEPS+ against these objectives, MAS performs an annual risk assessment of MEPS+.</p>
<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>Governance arrangements</p> <p>MAS plays multiple roles with respect to MEPS+, including: (i) the payment system operator; (ii) the central bank monitoring banking system liquidity; and (iii) the payment system regulator. The MAS Board’s oversight responsibilities of MEPS+ is exercised through the Chairman’s Committee (CM), while the MAS Board is assisted by the Risk Committee (RC) in the management of key risks in MEPS+.</p> <p>MAS has established an internal arrangement where the supervisory and operational functions are separate, with distinct reporting lines to different management fora.</p> <div style="text-align: center; border: 1px solid black; padding: 10px; margin-top: 10px;"> <pre> graph TD Board[MAS Board of Directors] AC[Audit Committee] CM[Chairman's Meeting] RC[Risk Committee] MIPM[Monetary and Investment Policy Meeting] EC[Executive Committee] MFC[Management Financial Supervision Committee] MCII[Management Critical Information Infrastructure Committee] MMIC[Management Markets and Investment Committee] IAD[Internal Audit Department - Audit] TRPD[Technology Risk and Payments Department - Regulator] ITD[IT Department (Supported by Finance Department) - System Operations] RMD[Risk Management Department - Risk Management] MDM[Monetary & Domestic Markets Management Department - Liquidity Provider] IAD --> AC TRPD --> MFC TRPD --> MCII TRPD --> MMIC ITD --> CM ITD --> EC RMD --> RC MDM --> MIPM MFC --> EC MCII --> EC MMIC --> EC EC --> AC EC --> CM EC --> RC EC --> MIPM </pre> </div>

	<p>The Information Technology Department (ITD) and Finance Department (FD) in MAS are responsible for the day-to-day operations of MEPS+. They report to the CIIC, which oversees the design, implementation, operations and risks associated with running MEPS+. The primary responsibility for the risk management of MEPS+ rests with ITD, supported by FD.</p> <p>A dedicated unit residing within the Risk Management Department (RiMD) conducts independent risk management of MEPS+. To enhance independence of the risk management function, RiMD is not a member of CIIC but sits in its meetings as an observer. RiMD has direct reporting lines to the Executive Committee (EXCO) and Risk Committee (RC).</p> <p>MEPS+ is also subject to regular internal and external audits. The Internal Audit Department will conduct audit on MEPS+ and report their findings to the MD, and the Audit Committee.</p> <p>The TRPD is responsible for the supervision of MEPS+ to ensure safety and efficiency through a combination of supervisory tools, and its adherence to the PFMI. TRPD carries out periodic inspections on MEPS+. To avoid possible or perceived conflicts of interest, TRPD is not involved in MEPS+ operations and does not participate in decisions concerning MEPS+. Nonetheless, TRPD can sit in the CIIC meetings to be updated on MEPS+ matters.</p>
	<p>The obligation of the MEPS+ operator is stated in the MEPS+ Service Agreement. If there are amendments to the MEPS+ Service Agreement, participants will be consulted, and their comments will be taken into consideration before the agreement is revised. In addition, TRPD is consulted so that supervisory concerns are addressed before the proposed changes to the MEPS+ Service Agreement are affected.</p> <p>MAS disseminates information relating to MEPS+ operations to participants through two main channels, including the MAS website and direct communications. Up-to-date statistics on transaction volumes and values as well as important documents such as the MEPS+ Service Agreement, the Operations and Contingency Manual for MEPS+ Participants and Non-Participants and the MEPS+ User Manuals are readily publicly available. Participants are notified of the schedule of MEPS+ activities and any changes to the MEPS+ Service Agreement via email.</p>

	<p>Disclosure of governance arrangements</p> <p>The governance arrangements are set out in the MEPS+ PFMI Disclosure that is publicly available on the MAS 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 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>Roles and responsibilities of the board</p> <p>The MAS Board is appointed by the President of Singapore as required under section 7(3) and section 8(1) of the MAS Act. As set out in section 7(1) and 7(2) of the MAS Act, the MAS Board of Directors is responsible for the policy and general administration of the affairs and business of MAS and shall from time to time inform the Government of the regulatory, supervisory and monetary policies of MAS.</p> <p>Pursuant to section 13A of the MAS Act, MAS may appoint from among its directors or other persons who are not directors such number of committees to assist MAS in the exercise of its powers and carrying out of its functions and duties. These committees have clear terms of reference which set out the roles and responsibilities, and the composition of each committee. For instance, one of the roles of the CM is to approve major policies and strategies in relation to payment and settlement system(s) operated by MAS. RC serves as an independent body to provide oversight and guidance on the management of risks faced by MAS in the implementation of its functions (including the operations of MEPS+).</p> <p>The MAS Act sets out provisions on the appointment and disqualification of directors. Under section 8 of the MAS Act, directors should not act as delegates on the board of any commercial, financial, agricultural, industrial or other interests with which they may be connected. Section 10(1) of the MAS Act prohibits any member of the MAS Board of Directors from being a director or salaried official of any financial institution licensed or approved by MAS. Under section 13 of the MAS Act, a director who is, directly or indirectly, interested in a contract made, or proposed to be made, by MAS shall disclose the nature of his interest at the first meeting of the MAS Board or Board Committee at which he is present after the relevant facts have come to his knowledge. After the disclosure, the director shall not take part in any deliberation or decision of the MAS Board or Board Committee with respect to that contract and shall be</p>

	<p>disregarded for the purpose of constituting a quorum of the MAS Board or Board Committee for any such deliberation or decision.</p> <p>The MAS Board of Directors are required to abide by a Code of Conduct, which sets out specific requirements and procedures relating to the management of conflicts of interest. For example, where a member accepts gifts or entertainment in his capacity as a member of the MAS Board or MAS Board Committee, he should disclose it as soon as practicable to the Chairman. Where a member makes any investment or transaction that may pose a potential conflict of interest, he should disclose such an investment or transaction to the Chairman no later than two weeks after the transaction date. On an annual basis, the MAS Board of Directors are required to furnish a declaration of gifts and entertainment received in the past year, and an updated list of personal financial dealings that may present an actual or perceived conflict of interest.</p> <p>MAS has established five MAS Board Committees as follows:</p> <ul style="list-style-type: none"> (i) Chairman’s Meeting (CM); (ii) Monetary and Investment Policy Meeting (MIPM); (iii) Audit Committee (AC); (iv) Risk Committee (RC); and (v) Staff Committee (SC). <p>The roles, responsibilities and composition of the MAS Board Committees are available on the MAS website.</p> <p>Review of performance</p> <p>To review the performance of the MAS Board, MAS has instituted a survey for the MAS Board to assess itself in the areas of structure; processes; and resources. The survey, and corresponding review based on the survey results, is conducted biennially.</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>The MAS Board comprises members from both the public and private sectors. MAS has several core functions, including central banking, reserve management, integrated financial supervision, as well as the development of Singapore as a financial centre. It is also responsible for operating the RTGS system. Given MAS’ wide range of responsibilities, the MAS Board of Directors have relevant economic, policy, financial, legal and operational expertise. The composition of the MAS Board of Directors reflects this diversity of skills. In considering potential candidates for the</p>

	<p>MAS Board, MAS looks out for individuals who possess experience and expertise relevant to MAS' functions; and who do not hold appointments presenting potential conflicts of interest with MAS, (i.e., holding key positions in MAS-regulated entities.)</p>
	<p>Board members are paid a nominal fee for their service on the MAS Board. The incentive of joining and staying on the MAS Board is more intrinsic in nature, such as the prestige of being a Board member of the MAS.</p>
	<p>Other than the Managing Director of MAS, the rest of the MAS Board comprises non-executive and independent board members.</p>
	<p>An independent board member is one who has independence from management (i.e., neither a serving employee nor an employee of MAS in the past three years.)</p>
<p>Key Consideration 5</p> <p>The roles and responsibilities of management should be 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>Roles and responsibilities of management</p> <p>Pursuant to section 9(6) of the MAS Act, the MD formed the CIIC to exercise MAS powers and duties in overseeing the CIIs operated by MAS, including MEPS+. The CIIC tasks include:</p> <ul style="list-style-type: none"> (i) overseeing the overall design and functionality of the CIIs, performance standards of the CIIs, policies and operating rules of the CIIs, and compliance of the CIIs with legislative requirements, government policies, industry standards, MAS' risk management and operational guidelines, risk management of the CIIs, implementation of major system changes to the CIIs, and contingency plans for the CIIs; (ii) recommending MAS management on CII strategic policies and key risk parameters; and (iii) providing regular assessments to MAS management on residual risks of the CIIs, including deviations of the CIIs from relevant policies and industry standards. <p>The roles and responsibilities of the CIIC are clearly set out in the Terms of Reference.</p> <p>Experience, skills, and integrity</p> <p>The CIIC has an appropriate mix and diversity of experience and skills. Its members include: (i) Deputy Managing Director</p>

	<p>(Corporate Development Group), serving as the Chairman; (ii) Assistant Managing Director (Corporate, HR and IT Services); (iii) Assistant Managing Director (Finance, Risk and Currency); and (iv) heads of various departments such as IT and Finance and the MAS Chief Cyber Security Officer. The Assistant Managing Directors could serve as the alternate chairperson. Division heads for payment systems, applications, infrastructure, and security that manage and oversee the day-to-day operations participate in the CIIC meetings given their extensive experience in the respective areas. Representatives from RiMD, BD and IAD attend the meeting as observers.</p> <p>MAS staff are expected to maintain high standards of integrity and conduct at all times. They are to avoid situations that may give rise to questions as to whether they have acted in the best interests of MAS. These requirements are set out in MAS Code of Conduct and Human Resource Operating Manuals.</p> <p>The appointment and removal of the MD, is set out in sections 9 and 10 of the MAS Act. Management staff can be removed based on the assessment from the Staff Committees.</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 responsibilities and accountability for risk decisions, and addresses decision making in crises and emergencies. Governance arrangements should ensure that the risk-management and internal control functions have sufficient authority, independence, resources, and access to the board.</p>	<p>Risk management framework</p> <p><i>Board Risk Governance</i></p> <p>Pursuant to section 13A of the MAS Act, the MAS Board has formed RC to assist the MAS Board in its risk management responsibilities. RC serves as an independent body to provide oversight and guidance on the management of risks faced by MAS. The responsibilities and duties are documented in the Terms of Reference for RC. In respect of oversight of the MAS-wide risk management framework, RC tasks include:</p> <ul style="list-style-type: none"> (i) advise the MAS Board on the framework, including its components, definitions, methodology and measures; (ii) advise the MAS Board on the key risks identified, risk mitigating measures and priorities, including the implementation time-frame to address such risks; (iii) advise the MAS Board on operational processes and accountability mechanisms within MAS; and (iv) provide the MAS Board with regular reports on MAS' risk profile, risk areas of concern, and recommendations to strengthen risk management within MAS.

	<p><i>MEPS+ Operational and Risk Management Framework</i></p> <p>The MAS Board has established an operational and risk management framework for MEPS+. As the main risk in MEPS+ is operational risks, the risk management framework identifies key processes and procedures to monitor and mitigate operational risks in MEPS+, including:</p> <ul style="list-style-type: none"> (i) design and review of the system to eliminate any single point of failure and to ensure sufficient capacity to handle the expected or sudden surge in transaction load; (ii) annual penetration test and system vulnerability assessment to identify potential threats and weaknesses; (iii) tight change management process to manage risks arising from changes to the system; (iv) real-time monitoring of the system's condition during MEPS+ operating hours and quarterly system health checks; and (v) annual contingency drills with participants and MEPS+ CSPs to maintain a high state of contingency preparedness across the system, processes and people. <p>An annual risk analysis and assessment is conducted, with the results presented to RC and management for endorsement and decision on whether additional risk mitigation measures are required.</p> <p>Under the MEPS+ risk management framework, line departments form the first layer of defence. As risk owners, line departments have the responsibility of managing the risks identified in their functional area. RiMD provides an additional layer of checks, including challenging assumptions and identifying longer-term implications. Where competing requirements or differences of views between departments arise in addressing the various risks, RiMD ensures that these issues and trade-offs are brought to the attention of the CIIC and EXCO for deliberation.</p> <p>The framework includes an incident management protocol to guide staff in managing an incident, including reporting and decision making by management. When an incident occurs, ITD will assess the nature and severity of the incident. Situation updates will be provided to the CIIC Chairman and relevant department heads. The CIIC Chairman will make the decision to activate the Disaster Recovery or Offline Contingency Module (OCM) if needed. If there is a possibility of a prolonged disruption</p>
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	<p>(i.e., multiple days), departments in consultation with their group heads will seek the MD's approval to convene a MAS Crisis Management Team meeting to develop a more effective and co-ordinated response. In such instances, the decision-making authority will lie with the Crisis Management Team comprising the MD, Deputy Managing Directors, and Assistant Managing Directors.</p>
	<p>The MEPS+ Operational and Risk Management Framework is jointly owned by ITD and RiMD and is reviewed annually as part of the annual MEPS+ risk assessment. Major changes to the framework require approval from the CIIC and RC.</p>
	<p>Authority and independence of risk management and audit functions</p> <p>See response to Principle 2, KC 2.</p> <p>A dedicated unit residing within RiMD oversees the risk management of MEPS+ and provides a second layer of checks to ensure that line departments are managing the risks identified in their functional area. RiMD also has an independent reporting line to RC. IAD forms the third line of defence and provides an independent assessment of internal controls for MEPS+. IAD also has a direct reporting line to AC.</p> <p>The audit and risk management functions are staffed by full-time dedicated personnel with appropriate skill-sets and resources to perform their roles and responsibilities.</p>
	<p>As the operator for MEPS+, the main risk is operational risk. Risk management models are not used for the management of this risk.</p> <p>To manage MAS' credit risk in the extension of intra-day liquidity as a central bank to MEPS+ participants, the Management Markets and Investment Committee (MIC) approves both the methodology used to determine the appropriate haircuts (i.e., haircuts framework) and the haircuts themselves. The approved methodology will also be tabled at RC for information.</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>Identification and consideration of stakeholder interests</p> <p>MAS actively consults participants and relevant stakeholders on proposed changes to the MEPS+ Service Agreement, operating rules and enhancements to MEPS+, unless the proposed changes have limited impact on the participants and stakeholders. Feedback from the participants and stakeholders will be presented to the CIIC for information and discussion, before decisions are made on changes. Once a decision is made on the changes, participants and stakeholders will be informed of the effective date of the proposed changes by way of circulars. Changes in MEPS+ Service Agreement and MEPS+ Operating Rules are published on the MAS website.</p> <p>MEPS+ participants' feedback on MEPS+ are elicited as part of the consultation process during changes to the MEPS+ Service Agreement. Feedback from the consultation are shared with the CIIC for information and discussion before decisions are made. Where decisions need to be referred to the MAS Board, relevant participants' feedback is presented.</p> <p>Disclosure</p> <p>Once a decision is made on the changes approved by the MAS Board, participants are informed of the effective date of the proposed changes via emails. Changes in the MEPS+ Service Agreement and operating rules are published on the MAS website.</p>
<p>Key conclusions for Principle 2</p>	<p>Governance arrangements are clear and transparent. Supervisory and operational functions for MEPS+ are separated into different organizational units and have distinct reporting lines to different management to prevent potential conflicts of interests.</p>
<p>Assessment of Principle 2</p>	<p>Observed</p>
<p>Recommendations and comments</p>	<p>Clarify the role and reporting line for the Chief Cyber Security Officer with a view to ensure the separation of MEPS+ oversight and operational responsibilities.</p>

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

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.

Risks that arise in or are borne by the FMI

The risks identified for MEPS+ are operational, credit, liquidity and legal risks. MAS has determined that operational risk is the key risk for MEPS+.

Risk management policies, procedures, and systems

The MAS Board has established the MEPS+ risk management framework to manage operational risk since it was assessed as the most material risk in MEPS+. The framework sets out the roles and responsibilities of departments, operational targets and risk tolerance limits on system reliability, resilience and security.

Line departments (FD, ITD) are responsible for managing operational risks in their respective areas of work. This includes identifying, measuring, and monitoring operational risks inherent in their activities; developing and implementing operational risk controls and other risk measures where appropriate; identifying, investigating, resolving and reporting operational risk incidents to the RiMD; and undertaking the annual risk assessment of MEPS+ and presenting the results to the CIIC for its endorsement and decision on whether additional risk mitigation measures need to be implemented. In general, the identified risk-owner is responsible for managing the operational risks associated with their area of work.

For credit and market risks, these are found in separate policies and limits (i.e., haircuts for collateral, exposure and concentration limits). RiMD would provide an additional layer of review to ensure that risks are properly identified and managed.

MAS uses several risk management tools to identify, measure, monitor and manage the range of risks that arises in MEPS+:

- (i) a payments dashboard, which presents key payments parameters at the system and individual participant level

	<p>(i.e., incoming and outgoing payments statistics, queued transaction volume);</p> <p>(ii) customized on-demand reports generated by MEPS+ system (i.e., intra-day liquidity facility utilization, queue statistics, gridlock detection and resolution reports);</p> <p>(iii) real-time system condition monitoring and alert system, to ensure that system problems are detected promptly. Annual stress tests and system performance tests are conducted to ensure MEPS+ can handle a surge in transaction volume; and</p> <p>(iv) penetration test, system vulnerability assessment and risk assessment are conducted annually to identify potential threats and weaknesses.</p>
	<p>MAS' credit and market risk exposure originate from ILF. MAS aggregates the total exposure by estimating the maximum amount equivalent to the total amount of free SGS and MAS Bills in the Trade Accounts for SGS and MAS Bills in MEPS+ after haircuts. Data is available from MEPS+ reports and MEPS+ Browse.</p>
	<p>Review of risk management policies, procedures, and systems</p> <p>Line departments and RiMD work closely to develop and maintain the risk management policies, procedures, and systems. Changes to the MEPS+ Operational and Risk Management Framework require approval from the CIIC and RC.</p>
	<p>MAS assesses the effectiveness of risk management policies, procedures and systems by tracking MEPS+'s performance against the operational standards and targets (see Principle 2, KC1). As part of the annual MEPS+ risk assessment, MAS benchmarks MEPS+'s policies, systems and processes against international standards as well as local regulations and requirements. MAS also assesses the effectiveness of MEPS+'s policies, systems and processes through the regular conduct of contingency drills and exercises and conducts gaps analysis against new risks and threats as they emerge such as the SWIFT hacking incidents or the WannaCry attacks.</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>The MEPS+ Browse service allows participants to access real-time on-line information on their account balances and securities holdings, and settlement status of their transactions. This service allows participants to monitor their own account positions and manage their liquidity more efficiently throughout the day using the MEPS+ queue management function. Participants can manage their liquidity requirements by setting bilateral limits, overall payment limits, or earmark funds for a specific counterparty or transaction. For participants who do not subscribe to the MEPS+ Browse service, a statement of their financial position is available upon request.</p> <p>At the end-of-day, end-of-day statements are sent to all participants for their reconciliation. Participants also receive a report on their adherence to the ABS Graduated Payment Schedule¹⁶. By adhering to this schedule, the likelihood of payment queues and gridlock in MEPS+ is reduced.</p> <p>The fee structure of MEPS+ is time-based and encourages early settlement of transactions by participants, thus reducing the operational risks which may result from concentration of payments towards the end of the MEPS+ operating hours.</p> <p>As a central bank, MAS provides interest free ILF to participants with eligible collateral (i.e., SGS and MAS Bills) to help fund their payment obligations. Automatic liquidity reversal takes place at 5:30 p.m. If participants are unable to return the funds borrowed under the ILF at the end of the day, the collateral will be held by MAS and participants may incur additional fees.</p> <p>Given the design of MEPS+, there is no credit risk among participants because transactions are settled on a real-time gross basis. Moreover, the FNA provides legal certainty that all transactions settled by MEPS+ are final and irrevocable.</p> <p>MEPS+ has an automatic gridlock detection and resolution mechanism, which runs every half hour to allow payments to be settled simultaneously on a multi-lateral basis, provided that the resulting positions of all accounts are positive. This feature reduces the liquidity needs and associated risks for participants.</p>
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¹⁶ The Association of Banks in Singapore issued the Graduated Payment Schedule which recommends that banks make at least 30 percent of the transaction value by 10:30 a.m., 60 percent by 2:30 p.m., and the remaining balance of all payments by 5:30 p.m.

	<p>Participants are also able to manage their liquidity requirements through the prioritization of payments, setting of bilateral limits, payment limits or setting aside funds for specific transactions.</p> <p>MAS, in its role as the financial sector regulator, has issued guidelines on IT security policies and Business Continuity Management to all financial institutions. In seeking to ensure that banks manage their operational risks appropriately, MAS supervisory departments conduct periodic on-site inspections to ascertain that banks comply with these guidelines in the MAS' Technology Risk Management Notice and Business Continuity Management Guidelines.</p> <p>In addition, MAS keeps all participants notified of operational incidents encountered by another participant to assist them to mitigate the risks among themselves.</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>Material risks</p> <p>MAS reviews the interdependencies and material risks that it bears from and poses to other entities during the annual risk assessment or when there are significant changes in the operating environment, system, procedures or findings from data analytics. The key test when considering the impact that MEPS+ has on other entities/systems would be to review the impact should MEPS+ services be unavailable, partially or otherwise. This could occur when the MEPS+ system encounters an issue. Similarly, to assess the impact on MEPS+ from other entities/systems, considerations are given to any disruption or impact to MEPS+ when these entities/systems encounter an issue or a disruption.</p> <p>These risks are reviewed annually or when there are significant changes in the operating environment, system, procedures or findings from data analytics.</p> <p>Risk management tools</p> <p>MEPS+ operating hours could be extended. Offline contingency measures and regular business continuity drills for MEPS+ participants (including other FMI entities) are also in place to mitigate the risks. For example, MAS participates in the annual offline contingency drills with CLS, and as well as in the semi-annual exercises where a CLS full outage test is carried out. There are also annual contingency exercises conducted with SWIFT.</p>

	MAS participates in contingency drills with the MEPS+ participants which are held annually. The observations and findings during these drills, which are reported to the CIIC, enable MAS to assess the effectiveness of the measures put in place to manage the operational risk arising from being linked to the other FMI entities.
<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>Scenarios that may prevent an FMI from providing critical operations and services</p> <p>Not applicable.</p>
	<p>Recovery and orderly wind-down plans</p> <p>Not applicable.</p>
<p>Key Conclusions for Principle 3</p>	MEPS+ has a sound risk management framework where operational, credit, liquidity and legal risks have been identified. The MAS Board has established the MEPS+ risk management framework to manage operational risk since it was assessed as the most material risk in MEPS+. The framework sets out the roles and responsibilities of departments, operational targets and risk tolerance limits on system reliability, resilience and security.
<p>Assessment of Principle 3</p>	Observed
<p>Recommendations and comments</p>	Analyze and identify the potential implications for safety for MEPS+ against the CPMI analytical framework for DLT in payment, clearing and settlement

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.

Key Consideration 1

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.

MAS offers the ILF which allows MEPS+ participants to borrow SGD on an intraday and collateralized basis to facilitate the settlement of SGD payments and help prevent system gridlocks owing to timing mismatches. The ILF is available only to participants who have executed the PSA/ISMA GMRA with MAS.

MAS is exposed to credit risk through the ILF. Credit risk is mitigated by requiring participants to provide collateral against their borrowing. MAS accepts SGS and MAS Bills as collateral in exchange for SGD cash via the ILF. The amount of liquidity extended to participants is the market value of the collateral provided subject to a haircut. The haircut applied is determined by a haircut framework and is suitably calibrated based on the time-to-maturity and risk characteristics of the collateral. The haircuts pertaining to the ILF are published on the MAS website and reviewed annually.

The haircuts pertaining to the ILF are reviewed annually, or as and when needed (i.e., significant changes in market volatility).

<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>See response to Principle 4, KC 1.</p> <p>The only source of credit risk is through the extension of credit to participants under the ILF. For credit risk to MAS arising from extension of credit under the ILF, the credit exposure is fully collateralized with SGS and MAS Bills received from the participant. There is an online platform that allows daily monitoring of participants who are tapping on this facility daily and the corresponding exposures.</p> <p>Only participants who have signed the GMRA with MAS can access the ILF. MEPS+ automatically verifies that the participant has executed the GMRA with MAS before processing ILF requests by participants. In addition, in the exchange of collateral for intraday liquidity, delivery versus payment (DVP) Model 1 settlement mechanism is utilized. Lastly, haircuts are incorporated to reduce MAS' credit risk exposure.</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>Coverage of exposures to each participant</p> <p>To manage exposures that arise from the extension of intraday credit to participants, the lending is automatically reversed at 5:30 p.m. in MEPS+. MAS is entitled to reverse the repo transaction at the end of the day and to secure funds covering the repurchase price either directly from the affected participant's MEPS+ account or by selling the SGS or MAS Bills that MAS had obtained in the opening leg of the repo transaction. If there is still a shortfall, MAS is entitled to seek the return of liquidated damages as per the Terms and Conditions Governing the MAS ILF.</p> <p>See response to Principle 4, KC 3.</p> <p>For DNS payment systems and DNS SSSs in which there is no settlement guarantee</p> <p>Not applicable.</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 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>Coverage of current and potential future exposures to each participant</p> <p>Not applicable.</p>
	<p>Risk profile and systemic importance in multiple jurisdictions</p> <p>Not applicable.</p>
	<p>Additional financial resources</p> <p>Not applicable.</p>
	<p>Supporting rationale and governance arrangements</p> <p>Not applicable.</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 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>Stress testing</p> <p>Not applicable.</p>
	<p>Review and validation</p> <p>Not applicable.</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>Not applicable.</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>Allocation of credit losses</p> <p>Losses from participant-default are not applicable as MEPS+ is a real time gross settlement system and transactions are settled using available funds and securities in the participants' MEPS+ accounts. Participants who encounter liquidity strains arising from failed payments due from the defaulting participant may tap on the ILF, as provided in the MEPS+ Service Agreement. If a defaulting participant taps on the ILF, MAS' loss is mitigated as it has obtained collateral, and such collateral is subject to haircuts. In the unlikely scenario that collateral provided is insufficient, the GMRA allows MAS to make claims against the participant for the shortfall.</p> <p>Replenishment of financial resources</p> <p>See response to Principle 4, KC 7.</p>

Key Conclusions for Principle 4	MAS offers the ILF which allows MEPS+ participants to borrow SGD on an intraday and collateralized basis to facilitate the settlement of SGD payments and help prevent system gridlocks owing to timing mismatches. MAS mitigates its exposure to credit risk by requiring participants to provide collateral against borrowing from MEPS+ participants. The ILF is available only to participants who have executed the PSA/ISMA GMRA with MAS. MAS accepts SGS and MAS Bills as collateral in exchange for SGD cash via the ILF. The amount of liquidity extended to participants is the market value of the collateral provided subject to a haircut. The haircut applied is determined by a haircut framework and is suitably calibrated based on the time-to-maturity and risk characteristics of the collateral. The haircuts pertaining to the ILF are published on the MAS website and reviewed annually.
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.	
<p>Key Consideration 1</p> <p>An FMI should generally limit the assets it (routinely) accepts as collateral to those with low credit, liquidity, and market risks.</p>	<p>MAS offers an ILF to participants using MEPS+ to facilitate the settlement of SGD transactions. Participants that have executed the GMRA with MAS can access the ILF. Through the ILF, MAS provides SGD liquidity to the participant in exchange for collateral from the participant.</p> <p>Eligible collateral under the ILF is limited to SGS and MAS Bills. These constitute the highest quality liquid assets available domestically. The list of eligible collateral is reviewed annually.</p> <p>MEPS+ automatically checks that the collateral meets the applicable acceptance criteria before DVP settlement is effected.</p> <p>To avoid wrong-way risk, only SGS and MAS Bills, the highest quality liquid assets in Singapore, can be pledged as eligible collateral under the ILF and debt securities issued by other entities are not accepted. MEPS+ automatically checks the eligibility of the collateral when participants request for ILF.</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>Valuation practices</p> <p>Collateral is marked to market daily. Collateral valuation is performed based on an established framework and management approval is sought for exceptions.</p>
	<p>Haircutting practices</p> <p>Haircuts are determined based on the approved haircut framework, which analyses the value-at-risk of debt securities in each class. To ensure that the haircuts are sufficiently able to withstand stressed market conditions, the price movements of the securities under stressed scenarios are taken into consideration in the calibration of the haircuts. Haircuts are subject to annual reviews or as and when the need arises.</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>See response to Principle 5, KC 2.</p> <p>Periods of stressed market conditions are incorporated in the calibration of the haircuts.</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>Not applicable. Collateral is limited to SGS and MAS Bills, and the list of eligible collateral is reviewed annually.</p>
<p>Key Consideration 5</p> <p>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>Not applicable. MAS does not accept cross-border collateral under the ILF.</p>

<p>Key Consideration 6</p> <p>An FMI should use a collateral management system that is well-designed and operationally flexible.</p>	<p>Collateral management system design</p> <p>MEPS+ also functions as the collateral management system for the ILF. It uses DVP settlement for ILF transactions. The securities in the MEPS+ account of the participant is automatically earmarked and instantaneously transferred to the MEPS+ account of MAS in exchange for the liquidity provided to the participant. MAS can monitor the collateral pledged under the ILF on a real-time basis.</p> <p>MAS' rights to these collateral securities are secured under the GMRA signed between MAS and the participant. MAS does not reuse or allow participants to reuse the collateral that MAS receives under the ILF.</p> <p>Operational flexibility</p> <p>MAS can monitor the collateral pledged under the ILF on a real-time basis.</p> <p>The system is largely automated and there is an in-house team that monitors and ensures smooth operations daily.</p>
<p>Key Conclusions for Principle 5</p>	<p>Collateral with low risks are accepted to manage credit exposures from participants and are subject to valuation and conservative haircuts. Eligible collateral under the ILF is limited to SGS and MAS Bills. These constitute the highest quality liquid assets available domestically. The list of eligible collateral is reviewed annually. Collateral is marked to market daily. Collateral valuation is performed based on an established framework and management approval is sought for exceptions. Haircuts are determined based on the approved haircut framework, which analyses the value-at-risk of debt securities in each class. To ensure that the haircuts are sufficiently able to withstand stressed market conditions, the price movements of the securities under stressed scenarios are taken into consideration in the calibration of the haircuts. Haircuts are subject to annual reviews or as and when the need arises. Periods of stressed market conditions are incorporated in the calibration of the haircuts.</p>
<p>Assessment of Principle 5</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	

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 Not applicable.
	Credit exposures Not applicable.
	Operational components Not applicable.
Key Consideration 2 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.	Sources of price data Not applicable.
	Estimation of prices Not applicable.
Key Consideration 3 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	Initial margin model Not applicable.

<p>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 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>Closeout and sample periods</p> <p>Not applicable.</p>
	<p>Procyclicality and specific wrong-way risk</p> <p>Not applicable.</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>Not applicable.</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>Portfolio margining</p> <p>Not applicable.</p>
	<p>Cross-margining</p> <p>Not applicable.</p>
	<p>Robustness of methodologies</p> <p>Not applicable.</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>Back testing and sensitivity analysis</p> <p>Not applicable.</p>
	<p>Margin model performance</p> <p>Not applicable.</p>

Key Consideration 7 A CCP should regularly review and validate its margin system.	Not applicable.
Key Conclusions for Principle 6	Not applicable.
Assessment of Principle 6	Not applicable.
Recommendations and Comments	Not applicable.

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>MAS does not face liquidity risk as the operator of MEPS+. MAS does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+.</p> <p>All transactions in MEPS+ are settled gross, in real time, and on DVP basis (for securities transfers). If a participant does not have sufficient balances or securities, its payments or securities transfers will be queued accordingly. Participants have real-time access to MEPS+ to enquire on the status of their transactions. They are also able to set fund allocations, bilateral and overall payment limits, but these limits will be automatically lifted by the system after 3:30 p.m.</p> <p>Participants can perform queue prioritization and cancellation on their outstanding transactions. An automatic gridlock detection and resolution mechanism runs every half hour to allow payments to be settled simultaneously on a multilateral gross basis, provided that the resulting positions of all MEPS+ RTGS accounts are positive. All these features aid participants in managing their liquidity needs. If by the end of day, the participants' accounts have insufficient balances, the queued transactions will be cancelled automatically by MEPS+. MEPS+ provides participants with a report on their adherence to the Graduated Payment Schedule at the end of day. By adhering to</p>
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	<p>the Graduated Payment Schedule, the likelihood of payment queues and gridlock in MEPS+ is reduced.</p> <p>To support the liquidity needs of the MEPS+ participants and assist them in managing their liquidity risks, MAS offers ILF to MEPS+ participants, which allows them to borrow SGD, interest-free, on an intraday and collateralized basis, to settle their SGD payments. Participants need to enter into the GMRA with MAS before it can tap on the ILF. Participants also need to ensure that they have eligible collateral (i.e., SGS or MAS Bills) before they can access the ILF. Aside from the ILF, MEPS+ participants can turn to the interbank market to obtain SGD to settle their payments.</p> <p>As the central bank, MAS has an unlimited amount of SGD liquidity and does not face liquidity risk.</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>MAS monitors MEPS+ payment patterns through the MEPS+ reports that cover daily vital statistics relating to the payment and queue status, monthly summaries of peak and average transaction volume, annual reports of transaction volume and other important metrics. In addition, MEPS+ is monitored on a near real-time basis using an automated utility which alerts MAS on payment anomalies such as when a participant has outstanding transactions that have been queued for a length of time exceeding the specified threshold.</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 default of the participant and its affiliates that would generate the largest aggregate</p>	<p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. Nonetheless, MAS conducts annual stress tests on banks by reviewing the impact on banks' settlement and knock-on impact on other participants, under different scenarios. These scenarios include the failure of a key participant, and multiple key participants from a country or region. Results of these stress tests are shared with management and other relevant departments.</p>

<p>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 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>Sufficient liquid resources</p> <p>Not applicable.</p> <p>Risk profile and systemic importance in multiple jurisdictions</p> <p>Not applicable.</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, 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>Size and composition of qualifying liquid resources</p> <p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. As such, the requirement to meet minimum liquid resources to cover payment obligations in extreme market conditions does not apply.</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</p>	<p>Availability and coverage of qualifying liquid resources</p> <p>See response to Principle 7, KC5, on size and composition of qualifying liquid resources.</p> <p>Size and composition of supplemental liquid resources</p> <p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. As such, the requirement to maintain liquid resources does not apply.</p>

<p>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 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>Availability of supplemental liquid resources</p> <p>See response to Principle 7, KC5, on size and composition of qualifying liquid resources.</p>
<p>Key Consideration 7</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>Use of liquidity providers</p> <p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. As such, the use of liquidity provider does not apply.</p> <p>Reliability of liquidity providers</p> <p>See response to Principle 7, KC 7, on use of liquidity providers.</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>Not applicable. MEPS+ is owned and operated by MAS.</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 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</p>	<p>Stress test program</p> <p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. Nonetheless, MAS conducts annual stress tests on banks by reviewing the impact on banks' settlement and knock-on impact on other participants, under different scenarios. These scenarios include the failure of a key participant, and multiple key participants from a country or region. Results of these stress tests are shared with management and other relevant departments.</p>
	<p>Stress test scenarios</p> <p>See response to Principle 7, KC 7, on stress test program.</p>
	<p>Review and validation</p> <p>See response to Principle 7, KC 7, on stress test program.</p>

<p>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>Key Consideration 10</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 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>Same day settlement</p> <p>MEPS+ is a designated system under the FNA. The FNA provides settlement finality and protection from the application of the "zero-hour" rule in the event of a participant's default¹⁷. However, under section 12 of the FNA, such protection does not extend to any transfer order given by a participant which is entered into a designated system after the expiry of one business day after: (i) court made an order for bankruptcy, judicial management or winding up in respect of the participant; or (ii) a resolution for the voluntary winding up of the participant was passed.</p> <p>Pursuant to section 14 of the FNA, no court in Singapore shall recognize or give effect to an order of a court exercising jurisdiction under the law of insolvency in a place outside Singapore, or an act of a person appointed in a foreign jurisdiction to perform a function under the law of insolvency there, in so far as the making of the order or doing of the act would be prohibited under the FNA for a court in Singapore. As such, should a participant default during the day, any transfer order relating to payments or securities transfers that have been entered into MEPS+ will be effected accordingly as long as there is sufficient liquidity or securities in the participant's MEPS+ accounts, and provided the transfer order made by the participant is entered into MEPS+ on or before the expiry of one business day after: (i) a court made an order for bankruptcy, judicial management or winding up in respect of the participant; or (ii) a resolution for the voluntary winding up of the participant was passed. After that point, transactions involving</p>

¹⁷ The FNA stipulates that no court in Singapore shall recognize or give effect to an order of the courts in a foreign jurisdiction to reverse or unwind transactions that have been settled in MEPS+.

	<p>any of the other participants will continue to settle in MEPS+ and are final and irrevocable, while transactions that involve the default participant will be rejected by MEPS+.</p>
	<p>Replenishment of liquidity resources</p> <p>Not applicable. MEPS+ is owned and operated by the central bank and it is not limited by its SGD liquidity.</p>
<p>Key Conclusions for Principle 7</p>	<p>MAS does not face liquidity risk as the operator of MEPS+. MAS does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. To support the liquidity needs of the MEPS+ participants and assist them in managing their liquidity risks, MAS offers ILF to MEPS+ participants, which allows them to borrow SGD, interest-free, on an intraday and collateralized basis, to settle their SGD payments. MEPS+ has automatic gridlock detection and resolution features. MEPS+ features monitoring tools for intraday liquidity management of MEPS+ participants, such as daily maximum liquidity usage, available intraday liquidity at the start of the business day, total payments, and time-specific obligations. Banks in Singapore generate and utilize daily reports on the monitoring indicators. Banks providing corresponding banking services track value of payments and intraday credit lines extended to customers. MEPS+ direct participants monitor intraday throughput by tracking the percentage of payments completed at different times of the day. MAS conducts annual stress tests on banks by reviewing the impact on banks' settlement and knock-on impact on other participants, under different scenarios. These scenarios include the failure of a key participant, and multiple key participants from a country or region. Results of these stress tests are shared with management and other relevant departments.</p>
<p>Assessment of Principle 7</p>	<p>Observed</p>
<p>Recommendations and comments</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

Section 7 of the FNA provides for the finality and irrevocability of transactions carried out on MEPS+ and applies where the rules of a designated system provide that the transactions are final and irrevocable. In this regard, Rule 17.1 of the MEPS+ Operating Rules lists the following transactions as being final and irrevocable:

- (i) the transfer of funds into and out of an account of a participant of MEPS+;
- (ii) the settlement of any payment obligation in MEPS+; and
- (iii) the settlement and transfer of book-entry SGS and MAS Bills.

This means that notwithstanding anything to the contrary in any written law or rule of law, these transactions shall not be reversed, repaid or set aside and no order shall be made by any court for the rectification or stay of such transfer or settlement.

Section 12 of the FNA makes it clear that section 7 of the FNA shall not apply to any transfer order given by a participant which is entered into a designated system after the expiry of one business day after: (i) a court made an order for bankruptcy, judicial management or winding up in respect of the participant; or (ii) a resolution for the voluntary winding up of the participant was passed.

See responses to Principle 1, KC1 and KC4.

Finality in the case of links

MEPS+ has implemented DVP processing. Rules 12.1 to 12.13 of the MEPS+ Operating Rules provide the legal basis for this DVP processing.

<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>Final settlement on the value date</p> <p>Settlement in MEPS+ takes place continuously throughout the day whenever a payment is accepted by the system and participants have sufficient funds and SGS and MAS Bills in their MEPS+ accounts. Unsettled payments and securities transfers at the end of day are automatically cancelled.</p> <p>Intraday or real-time final settlement</p> <p>MEPS+ processes payment and securities transfer instructions for settlement on a real-time basis. Participants who originate the payments or securities transfers would receive notifications once their transactions are settled in MEPS+. They can also perform online inquiries on the transaction status.</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>Section 7 of the FNA provides for the finality and irrevocability of transactions in MEPS+ and shall apply where the rules of a designated system provide that the transactions are final and irrevocable. Pursuant to Section 7 of the FNA, Rule 17.1 of the MEPS+ Operating Rules has listed the transactions to be deemed as final and irrevocable. As set out in Rule 4.3 of the MEPS+ Operating Rules, transactions pending settlement or execution may still be cancelled by participants who initiated the transactions.</p> <p>As set out in Rule 4.4 of the MEPS+ Operating Rules, for any transaction involving SGS and MAS Bills that is not matched, the participant that sent the instruction may unilaterally initiate its cancellation. For any transaction involving SGS and MAS Bills that is matched, both participants that are parties to the transaction are required to initiate and confirm the cancellation. For payment transactions pending settlement, participants can only cancel those transactions initiated by them.</p> <p>Queued as well as future-dated payment instructions in MEPS+ can only be cancelled by the participant that had initiated the payment instruction by sending in a SWIFT cancellation message to MEPS+.</p> <p>No exceptions are allowed to revocation deadlines.</p> <p>Rule 4 of the MEPS+ Operating Rules, which is appended to the MEPS+ Service Agreement, sets out the circumstances for cancellation of messages in MEPS+. The MEPS+ Service Agreement is publicly available on the MAS website.</p>

Key Conclusions for Principle 8	Settlement finality is clear and certain in MEPS+. The FNA provides for the finality and irrevocability of transactions carried out on MEPS+ and applies where the rules of a designated system provide that the transactions are final and irrevocable. MEPS+ processes payment and securities transfer instructions for settlement on a real-time basis. Settlement in MEPS+ takes place continuously throughout the day whenever a payment is accepted by the system and participants have sufficient funds and SGS and MAS Bills in their MEPS+ accounts. Unsettled payments and securities transfers at the end of day are automatically cancelled.
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	Payments in MEPS+ settle in SGD only, on a real-time gross settlement basis in central bank money.
An FMI should conduct its money settlements in central bank money, where practical and available, to avoid credit and liquidity risks.	
Key Consideration 2	Not applicable.
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.	
Key Consideration 3	Not applicable.
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	

<p>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>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><i>Credit risks</i></p> <p>MAS does not act as the central counterparty or guarantee the settlement of transactions by MEPS+ participants. As the operator of MEPS+, MAS is hence not exposed to credit risk.</p> <p>In providing ILF to participants, MAS has the potential to incur credit exposures to participants. However, this is managed by requiring participants to enter into repo transactions with MAS using their own unencumbered SGS or MAS Bills as collateral in exchange for the intraday liquidity.</p> <p>SGS and MAS Bills held as collateral constitute the highest quality collateral available domestically, and the liquidity granted are subjected to a haircut. Other safeguards include:</p> <ul style="list-style-type: none"> (i) MEPS+ automatically reversing the repo transaction at the end of the day if there are sufficient funds in the participant's RTGS account; (ii) MAS is entitled to instruct the MEPS+ operator, to reverse the repo transaction on the next earliest business day where there are sufficient funds in the participant's RTGS account should the reversal repo transaction be unable to settle on the previous day; (iii) MAS can return the collateral to the participant only after the repurchase price and liquidated damages (if any) have been duly returned to MAS; and (iv) MAS has the right to sell or dispose of the eligible collateral pledged to MAS for the transaction, and to apply the proceeds from the sale or disposal of the eligible collateral to offset the outstanding amounts that may be due to MAS, including any liquidated damages that may have accrued.

	<p><i>Liquidity risks</i></p> <p>MAS, as the operator of MEPS+, does not face liquidity risk because the operator does not act as the central counterparty or guarantee the settlement of transactions entered into MEPS+. All transactions in MEPS+ are settled in real time and DVP basis (for securities transfers) only if the participants have sufficient balances and securities. If a participant does not have sufficient liquidity or securities, its payments or securities transfers will be queued accordingly.</p> <p>MAS provides ILF to participants of MEPS+ to enable them to settle their payments and securities transfers on a timely basis. The ILF is interest-free, and participants have to enter into a GMRA with MAS before it can tap on the ILF. In addition, participants need to ensure that they have eligible collateral (i.e., SGS or MAS Bills) before they can access the ILF. MAS is not exposed to liquidity risk as it has unlimited amount of SGD liquidity.</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>	Not applicable.
<p>Key Conclusions for Principle 9</p>	Payments in MEPS+ settle in SGD only, on a real-time gross settlement basis in central bank money. MAS does not act as the central counterparty or guarantee the settlement of transactions by MEPS+ participants.
<p>Assessment of Principle 9</p>	Observed
<p>Recommendations and Comments</p>	

Principle 10. Physical Deliveries	
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.	
Key Consideration 1 An FMI's rules should clearly state its obligations with respect to the delivery of physical instruments or commodities.	Not applicable.
Key Consideration 2 An FMI should identify, monitor, and manage the risks and costs associated with the storage and delivery of physical instruments or commodities.	Not applicable.
Key Conclusions for Principle 10	Not applicable.
Assessment of Principle 10	Not applicable.
Recommendations and comments	Not applicable.

Principle 11: Central Securities Depositories	
A CSD should have appropriate rules and procedures to help ensure the integrity of securities issues and minimize and manage the risks associated with the safekeeping and transfer of securities. A CSD should maintain securities in an immobilized or dematerialized form for their transfer by book entry.	
Key Consideration 1 A CSD should have appropriate rules, procedures, and controls, including robust accounting practices, to safeguard the rights of securities issuers and holders, prevent the unauthorized creation or deletion of securities, and conduct periodic and at least daily reconciliation of securities issues it maintains.	Safeguarding the rights of securities issuers and holders Not applicable.
	Prevention of the unauthorized creation or deletion of securities Not applicable.
	Periodic reconciliation of securities issues Not applicable.

<p>Key Consideration 2</p> <p>A CSD should prohibit overdrafts and debit balances in securities accounts.</p>	<p>Not applicable.</p>
<p>Key consideration 3</p> <p>A CSD should maintain securities in an immobilized or dematerialized form for their transfer by book entry. Where appropriate, a CSD should provide incentives to immobilize or dematerialize securities.</p>	<p>Not applicable.</p>
<p>Key Consideration 4</p> <p>A CSD should protect assets against custody risk through appropriate rules and procedures consistent with its legal framework.</p>	<p>Not applicable.</p>
<p>Key Consideration 5</p> <p>A CSD should employ a robust system that ensures segregation between the CSD's own assets and the securities of its participants and segregation among the securities of participants. Where supported by the legal framework, the CSD should also support operationally the segregation of securities belonging to a participant's customers on the participant's books and facilitate the transfer of customer holdings.</p>	<p>Not applicable.</p>

Key Consideration 6 A CSD should identify, measure, monitor, and manage its risks from other activities that it may perform; additional tools may be necessary in order to address these risks.	Not applicable.
Key Conclusions for Principle 11	Not applicable.
Assessment of Principle 11	Not applicable.
Recommendations and Comments	Not applicable.

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.	<p>The FNA provides the legal certainty that all transactions settled by MEPS+ are final and irrevocable notwithstanding the insolvency of a participant.</p> <p>For the real-time gross settlement of SGS trades and MAS Bills, MEPS+ has implemented DVP processing. Clauses 12.1 to 12.13 of the MEPS+ Operating Rules provide the legal basis for DVP processing. Each leg of the DVP trade is accorded finality under the FNA upon settlement.</p> <p>The linked obligations are settled on a gross basis.</p> <p>MEPS+ has implemented DVP Model 1 for processing securities transfer instructions from participants, and payment of SGD corporate bonds traded by participants in the CDP.</p> <p>For securities transfer instructions from participants, MEPS+ will earmark the securities in the MEPS+ account of the seller after the trade has been matched, and then generate a payment order on behalf of the buyer based on the details in the matched trade. The payment order will be stored in MEPS+ until the settlement day. On settlement day, MEPS+ will automatically execute the payment order by debiting the MEPS+ account of the buyer (subject to sufficient funds in its MEPS+ account) and instantaneously transfer the earmarked securities to the MEPS+ account of the buyer. Rule 12 of the MEPS+ Operating Rules sets</p>
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	<p>out the provisions for DVP processing. Each leg of the DVP trade is also accorded finality under the FNA upon settlement.</p> <p>For payments of SGD corporate bonds, MEPS+ will debit the MEPS+ account of the buyer subject to sufficient funds in its MEPS+ account, and instantaneously transmit a SWIFT message to CDP who will simultaneously transfer the earmarked SGD corporate bonds to the buyer's account within CDP's Debt Securities Clearing and Settlement System.</p>
Key Conclusions for Principle 12	<p>Principal risks arising from the settlement of securities transactions is eliminated through delivery versus payment capabilities in MEPS+. For the real-time gross settlement of SGS trades and MAS Bills, MEPS+ has implemented DVP processing. Each leg of the DVP trade is accorded finality under the FNA upon settlement. The linked obligations are settled on a gross basis. MEPS+ has implemented DVP Model 1 for processing securities transfer instructions from participants, and payment of SGD corporate bonds traded by participants in the CDP. The FNA provides the legal certainty that all transactions settled by MEPS+ are final and irrevocable notwithstanding the insolvency of a participant.</p>
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	Participant default rules and procedures
<p>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</p>	<p>The criteria for default and the method for identifying and handling a default are defined in Clause 9.1 of the MEPS+ Service Agreement and Rules 11.8 to 11.12 of the MEPS+ Operating Rules. Clause 9.1 covers the various default scenarios by MEPS+ participants. Rule 11.8 to 11.12 addresses participants' failure to meet its cheque and IBG clearing obligations.</p>

<p>and that address the replenishment of resources following a default.</p>	<p>In addition, Clause 5 of the Terms and Conditions Governing the MAS ILF addresses the situation of a participant's failure to repay its ILF by 5:30 p.m., which is the cut-off time for reversal of ILF.</p>
	<p>The MEPS+ Service Agreement sets out the definition of default, and the procedures for handling a default of a participant. A participant has to notify MAS if it is being or has been wound up or has a receiver or receiver or manager appointed. MAS may then immediately suspend the provision of MEPS+ services to the affected participant or terminate the MEPS+ Service Agreement. Based on the Operations and Contingency Manual for MEPS+ Participants and Non-Participants, MAS will notify all participants of the suspension or termination via SWIFT and email, and all pending, queued, forward-dated transactions of the suspended/terminated participant at the point of suspension or termination will be cancelled or rejected with the exception of certain transactions as specified in the MEPS+ Service Agreement. These transactions include interbank funds transfers between the affected participant and MAS, and the redemption of matured SGS and MAS Bills held in the affected participant's accounts for SGS and MAS Bills. All new transactions submitted by the suspended/terminated participant will be rejected by MEPS+.</p>
	<p>Use of financial resources</p> <p>MAS is not affected by liquidity pressures arising from the default of a participant. Furthermore, there are no losses from participant-default as MEPS+ is a RTGS system and there is no loss sharing arrangement. Participants encountering liquidity strains arising from failed payments due from the defaulting participant may access the ILF, as provided in the MEPS+ Service Agreement and Terms and Conditions Governing the MAS ILF. Collateral provided to borrow SGD cash through the ILF is subject to haircuts to manage possible losses or exposures to MAS in the event the defaulting participant is unable to return the SGD cash by the end of the cut-off time for liquidity reversal. In the unlikely scenario that the collateral provided is insufficient, the GMRA allows MAS to make claims against the participant for the shortfall.</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>The relevant MAS supervisory departments will manage the insolvent participant bank, and MAS' Crisis Management Team (comprising MAS Management) will be activated to manage the issues arising from the default to minimise impact on the financial sector.</p> <p>For communication procedures, all stakeholders are notified via emails, and where necessary, through telephone calls.</p> <p>The internal procedures are endorsed by the CIIC and reviewed annually or as and when necessary.</p>
<p>Key Consideration 3</p> <p>An FMI should publicly disclose key aspects of its default rules and procedures.</p>	<p>Key aspects of the rules and procedures on participant-default are set out in the MEPS+ Service Agreement which is available on the MAS website.</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 ensure that they are practical and effective.</p>	<p>MAS conducts an annual contingency drill on key aspects of the participant-default procedures. The drill includes MEPS+ participants and other stakeholders (e.g., BCS) and includes the testing and review of default procedures. The drill and associated tests cover, among others, the failure of the largest net debit bank in meeting its check/Inter-Bank GIRO obligations and the failure of a participant bank. These tests also include the recasting of the check/Interbank GIRO obligations.</p>
<p>Key Conclusions for Principle 13</p>	<p>MEPS+ has clearly defined rules and procedures to manage a participant default and has an annual contingency drill and testing of the default procedures. The MEPS+ Service Agreement sets out the definition of default, and the procedures for handling a default of a participant. MAS conducts an annual contingency drill on key aspects of the participant-default procedures. The drill and associated tests cover, among others, the failure of the largest net debit bank in meeting its check/Inter-Bank GIRO obligations and the failure of a participant bank. These tests also include the recasting of the check/Interbank GIRO obligations.</p>
<p>Assessment of Principle 13</p>	<p>Observed</p>
<p>Recommendations and Comments</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.	
<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 the participant and a fellow customer, the CCP should take steps to ensure that such protection is effective.</p>	<p>Customer protection from participant default</p> <p>Not applicable.</p>
	<p>Customer protection from participant and fellow customer default</p> <p>Not applicable.</p>
	<p>Legal basis</p> <p>Not applicable.</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>	Not applicable.
<p>Key Consideration 3</p> <p>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>	Not applicable.

<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>	Not applicable.
<p>Key Conclusions for Principle 14</p>	Not applicable.
<p>Assessment of Principle 14</p>	Not applicable.
<p>Recommendations and Comments</p>	Not applicable.

<p>Principle 15. General Business Risk</p> <p>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>	
<p>Key Consideration 1</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>MAS manages the general business risks of operating MEPS+ based on the enterprise-wide budgeting and accounting processes, which allow it to monitor, manage and control its operating expenses, including those arising from MEPS+ operations.</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>Not applicable.</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 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>Recovery or orderly wind-down plan</p> <p>Not applicable.</p> <p>Resources</p> <p>Not applicable.</p>
<p>Key Consideration 4</p> <p>Assets held to cover general business risk should be of high</p>	<p>Not applicable.</p>

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.	
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.	Not applicable.
Key Conclusions for Principle 15	MAS manages the general business risks of operating MEPS+ based on the enterprise-wide budgeting and accounting processes, which allow it to monitor, manage and control its operating expenses, including those arising from MEPS+ operations.
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.	Not applicable. As the operator of MEPS+, MAS does not use commercial custodian services for its own or participants' assets (cash, SGS and MAS Bills).
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<p>Key Consideration 2</p> <p>An FMI should have prompt access to its assets and the assets provided by participants, when required.</p>	<p>Not applicable. MEPS+ operates in Singapore only and is subject to Singapore's laws and legislation.</p>
<p>Key Consideration 3</p> <p>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>Not applicable. As the operator of MEPS+, MAS does not use commercial custodian services for its own or participants' assets (cash, SGS and MAS Bills).</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>Investment strategy</p> <p>Not applicable. As the operator of MEPS+, MAS does not invest in assets.</p>
	<p>Risk characteristics of investments</p> <p>Not applicable. As the operator of MEPS+, MAS does not invest in assets.</p>
<p>Key Conclusions for Principle 16</p>	<p>As the operator of MEPS+, MAS does not use commercial custodian services for its own or participants' assets (cash, SGS and MAS Bills).</p>
<p>Assessment of Principle 16</p>	<p>Observed</p>
<p>Recommendations and Comments</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.

<p>Key Consideration 1</p> <p>An FMI should establish a robust operational risk-management framework with appropriate systems, policies, procedures, and controls to identify, monitor, and manage operational risks.</p>	<p>Identification of operational risk</p> <p>Operational risks are included as part of the risk assessment of MEPS+ conducted annually. The database of past MAS operational risk events maintained by RiMD is used to identify potential sources of operational risks. External operational risk events (including those encountered by MEPS+ participants) are also taken into consideration in the assessment of MEPS+ operational risks.</p> <p>The sources of MEPS+ operational risks are insider, external linkage, transaction load, CSPs, infrastructural resiliency, cyber threat, application defects and operational disruptions, which could be described as follows:</p> <ul style="list-style-type: none"> (i) Insider risk relates to malicious insider within MAS, MEPS+ participants or SWIFT; (ii) External linkage risk relates to failure in the linkage between MEPS+ production and its DR site, and between MEPS+ and SWIFT; (iii) Transaction load risk relates to surge in transaction load; (iv) CSP risk relates to non-performance of the MEPS+ CSPs, careless or malicious CSPs, or unexpected termination of the CSP arrangement; (v) Infrastructural resiliency risk relates to failure in MEPS+ hardware or loss of essential services; (vi) Cyber threat risk relates to threats resulting from cyber-attacks on the various software and hardware components of the system or the network; (vii) Application defects risk relates to coding errors or malicious codes embedded within MEPS+ during code development by MEPS+ application service provider (ASP); and (viii) Operational disruption risk relates to external factors such as hardware deterioration, fire, etc. <p>No known single point of failure in MEPS+ has been identified.</p>
	<p>Management of operational risk</p> <p>MAS monitors and manages its operational risks, including those from operating MEPS+, based on the international and Singapore Government's standards as well as MAS-issued guidelines and notices on financial institutions. The systems,</p>

	<p>policies, procedures and controls (such as security-by-design, regular review of access rights, near real-time alerts of privileged accesses and proper change management controls and system development life cycle) to monitor and manage the operational risks are documented in the MEPS+ Operational and Risk Management Framework, various ITD manuals and the annual MEPS+ risk assessments. MEPS+ operational procedures and controls are documented in respective departments' standard operating procedures.</p> <p>Policies, processes and controls</p> <p>Under the MEPS+ Operational and Risk Management Framework, ITD and FD oversee and carry out the day-to-day operations of MEPS+. The primary responsibility for the risk management of MEPS+ rests with ITD, supported by FD. They are required to perform an annual risk analysis and assessment of MEPS+. The results are reported to the RC and management for their endorsement and decision on whether additional risk mitigating measures are needed.</p> <p>A dedicated unit residing within RiMD conducts independent risk assessment of MEPS+. This unit complements the day-to-day risk management of MEPS+ carried out by the operator (i.e., ITD with the support of FD), by providing an additional layer of checks. This unit reviews the adequacy and effectiveness of risk controls on a regular basis and has direct access to various reports and logs generated by the system. Its role includes challenging assumptions and identifying longer-term implications of initiatives implemented by the operator.</p> <p>In addition, MEPS+ is subjected to an annual internal audit and audits by the Auditor-General's Office. Findings from the audits are reported to MAS' MD and the AC.</p> <p>MAS adopts the PFMI and the CPMI/IOSCO Guidelines on Cyber Resilience for Financial Market Infrastructures and SWIFT's Customer Security Programme. MAS benchmarks its operational risk management standards with other central banks that operate similar RTGS systems. MAS also subjects MEPS+ to the same standards as prescribed in Singapore Government policies and for technology risk management, outsourcing and business continuity management that are applicable to financial</p>
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	<p>institutions operating in Singapore. Over the past few years, MAS has stepped up its cybersecurity efforts with initiatives as follows:</p> <ul style="list-style-type: none"> (i) automated regular reconciliation of participants' account balances and holding positions against settled transactions; (ii) storage of critical MEPS+ data at a third site that can be used to continue processing and settling interbank funds and securities transfers; (iii) enhanced oversight of MEPS+ ASP's practices and regular reviews of MEPS+ ASP's code testing, review, compilation and deployment controls and processes; (iv) near real-time monitoring of MEPS+ transaction flows; (v) automation of the contingency solution; (vi) enhanced monitoring of user and application logins; and (vii) requirement for participants to conduct a review of its self-assessments against the MEPS+ security guidelines requirements. <p>Additionally, MAS is in the process of strengthening its cybersecurity resilience across the areas of expanding surveillance coverage, reinforcing protection capabilities, reducing recovery time and developing cyber competencies.</p> <p>Personnel involved in MEPS+ operations are subject to the requisite security screening. They also attend in-house training as well as training courses provided by SWIFT. To mitigate high staff turnover and key-person risk for MEPS+ operations, MEPS+ operational processes are documented in respective departments' standard operating procedures.</p> <p>To prevent fraudulent payments effected on behalf of participants (during technical disruption encountered by individual participants), these payments are required to be authorized by at least one senior officer (depending on the payment value) before they can be effected. Access rights to MEPS+ are reviewed monthly by MAS Departments to ensure that they are granted on a need-to basis.</p> <p>The MEPS+ Operational and Risk Management Framework and the various ITD manuals set out the approach for managing changes to the MEPS+ system to ensure that they are carried out in a controlled manner to minimize operational disruptions after</p>
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	<p>implementation. Each change goes through the following processes before they can be deployed:</p> <ul style="list-style-type: none"> (i) Application change process where the requirements for the changes to MEPS+ system are gathered, and risks and impact to the system are assessed before the changes are prioritized and approved by the CIIC. Once the MEPS+ ASP has developed the changes, the changes will undergo testing by independent test consultants, MAS departments and all MEPS+ participants. The types of tests conducted include functional and non-functional tests, as well as regression tests. Sign-offs are obtained from all testers upon completion of testing. The MEPS+ source codes will also be reviewed by an independent security consultant for viruses, malicious codes and code quality before the new codes can be deployed to production. MAS also appoints independent security consultants to review and advise MAS on MEPS+ application vulnerabilities and threats. Penetration testing and system vulnerability assessment on MEPS+ are conducted at least annually. (ii) System change process where risk assessment will be conducted for the changes to be deployed. A cutover checklist which identifies critical checkpoints and contingency plans will be prepared. The project team will further ensure that MEPS+ operational guides are updated and ready before the implementation date. (iii) Evaluation and approval process where all changes to MEPS+ will be submitted to Head, ITD for approval. For changes that are assessed to be of high risk (i.e., urgent code fix), these will be submitted to the Chairman of the CIIC for approval. (iv) Post-implementation process where relevant MAS departments will verify the changes on the first business day after the deployment in production. <p>MAS has enhanced the oversight of the MEPS+ ASP's practices and conducts regular reviews of the MEPS+ ASP's code testing, review, compilation and deployment controls and processes.</p> <p>MAS conducts near real-time monitoring of MEPS+ system's condition and the transaction flows during MEPS+ operating hours. MEPS+ automatically conducts regular reconciliation of participants' account balances and holding positions against the</p>
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	<p>settled transactions. MAS has also enhanced monitoring of privileged users and application logins. System health checks are conducted on a quarterly basis.</p> <p>Annual contingency drills with participants and MEPS+ CSPs are conducted to maintain a high state of contingency preparedness across system, processes and people.</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>Roles, responsibilities and framework</p> <p>MAS departments responsible for managing the various sources of risk faced by MEPS+ have been identified in the MEPS+ Operational and Risk Management Framework which has been endorsed by the EXCO, RC and the MAS Board.</p> <p>The MEPS+ Operational and Risk Management Framework was endorsed by the MAS Board in November 2014. The framework is reviewed annually as part of the annual risk assessment. Major changes to the framework require approval from CIIC and RC.</p> <p>Review, audit and testing</p> <p>RiMD regularly reviews MEPS+ risks (including operational risks) and the risk controls designed to address MEPS+ risks. Near misses and operational risk events are analysed to see whether additional controls are necessary. Periodic meetings with operational units are also held to discuss operation and risk issues. RiMD, FD and ITD also review existing risk controls and identify new controls as part of the annual MEPS+ risk assessment.</p> <p>MEPS+ is also subject to annual internal audit and audits by the Auditor-General's Office. Findings from the audits will be reported to the MD and the AC.</p> <p>In addition, contingency exercises are conducted with participants and MEPS+ CSPs annually to maintain a high state of contingency preparedness across system, processes and people.</p> <p>The Auditor-General's Office may, as part of its audit of MAS' financial statements, audit MEPS+ to determine whether controls are in place to preserve the integrity of MEPS+ transactions.</p>

<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>MEPS+ operational standards are documented in the MEPS+ Operational and Risk Management Framework.</p> <p>These objectives provide guidance to departments to review their processes and controls as well as the MEPS+ system design to ensure that MEPS+ would have a high degree of operational reliability.</p> <p>Contingency plans are drawn up and tested regularly to ensure that when a disruption occurs, these standards can be met. MAS has also established an incident and problem management framework to manage operational incidents to ensure that MEPS+ operations are restored as quickly as possible, and root causes are identified, and the problem resolved according to stipulated timelines. In addition, MAS executes service level agreements with the MEPS+ CSPs to ensure that the services underpinning MEPS+ operations meet the same reliability and contingency requirements. The service levels are closely monitored through regular meetings.</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>Currently, MEPS+ has sufficient capacity to process up to three times the average daily settlement volume in MEPS+ or two times of the peak settlement volume, whichever is higher. This capacity is tested annually through volume testing conducted by independent test consultants as part of each major upgrade of MEPS+ to ensure that the system can cope with the projected volumes. The test results are reported to the CIIC.</p> <p>MEPS+ capacity is monitored closely by ITD. This is reviewed at least quarterly with the MEPS+ CSPs as part of their maintenance and support of MEPS+. Should the operational capacity of MEPS+ be neared or exceeded, there will be a system alert and ITD will take the remediation steps to increase the capacity.</p>
<p>Key Consideration 5</p> <p>An FMI should have comprehensive physical and information security policies that address all potential vulnerabilities and threats.</p>	<p>Physical security</p> <p>MAS has implemented the following key controls to address plausible sources of physical vulnerabilities and threats:</p> <ul style="list-style-type: none"> (i) Only authorized staff has access to the data center. Visitors to the data centre must be escorted at all times, and the data centre is monitored using closed circuit television cameras. A process has been implemented to have card access matrix and rights assignment reviewed regularly.

	<p>(ii) Proper condition monitoring and preventive maintenance schedule are carried out to ensure a high state of readiness for backup power supply, fire suppression system, smoke and fire detectors in the data centre.</p> <p>MAS employs a multi-layered physical security protection from all entry points into and within the MAS building comprising the range of preventive and detective measures such as security searches, card-controlled accesses and explicit approvals and closed circuit television security systems.</p> <p>Information security</p> <p>As set out in the MEPS+ application change process, for each major MEPS+ upgrade, MAS appoints independent security consultants to review and advise MAS on MEPS+ application vulnerabilities and threats. Penetration testing and system vulnerability assessment on MEPS+ are also conducted at least annually. The security consultants' assessment results and recommendations are reported and discussed at the CIIC.</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 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 information technology (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>Objectives of business continuity plan (BCP)</p> <p>MEPS+'s BCP covers the scenarios of major disruptions caused by failure in critical MEPS+ components, wide-scale disruption affecting either one of the MEPS+ data centers or both of the data centers, and failure in MEPS+ application software. Comprehensive checklists are in place to guide the execution of the BCP plan and to ensure that MEPS+ is able to resume its services to meet its recovery time objective of two hours. MAS has also conducted live MEPS+ operations at the alternate data center to verify the operational readiness of the MAS staff, CSPs, and participants as well as the operating systems at the alternate data center.</p> <p>Various contingency drills are conducted annually with participants and MEPS+ CSPs to maintain a high state of preparedness across the system, processes and people to cope with various disruptions in MEPS+ operations. The scope of each drill is reviewed as part of the planning and scheduling of the drills and approved by the CIIC. The results of the contingency exercises are reviewed and discussed at the CIIC. Participants' feedback is collated and reviewed after each contingency drill. These are taken into consideration in the planning for subsequent MEPS+ contingency drills.</p>

	<p>Design of business continuity plan</p> <p>MEPS+ has high availability infrastructure with redundancy for critical components and proactive operations management at the main and alternate data centres. To mitigate the risk of data loss when MAS activates the alternate site, data in the main site is mirrored live to the alternate site during MEPS+ operating hours. Critical MEPS+ data is also stored at a third site and can be used to continue processing and settling interbank payments and securities transfers. A full backup of data is performed daily and stored offsite after the MEPS+ system closes.</p> <p>In addition, in the event of extreme circumstances such as failure of both main and alternate sites, MAS can activate the OCM which allow MAS to continue processing and settling interbank payments and securities transfers.</p> <p>Various contingency plans are in place to ensure that the status of all transactions can be identified in a timely manner, at the time of disruption. MAS has also conducted live MEPS+ operations at the alternate data centre to verify the operational readiness of MAS staff, CSPs and participants as well as the operating systems at the alternate data centre. In the event of an application failure, MAS has put in place the OCM. Banks will be able to send payments instructions to MAS for processing via a secured communications channel. Industry-wide drills are conducted on a regular basis to ensure that participants and MAS staff remain proficient with the offline contingency procedures.</p> <p>To mitigate the risk of data loss, data in the production environment is mirrored live to the DR environment. Hence, there is no loss of transaction information and status when MAS swings operations to the alternate site. To ensure a high level of preparedness, DR tests are conducted once every six months. MAS had also conducted live operations from the alternate site. In addition, MAS perform full backup of data daily after the system closes and are stored on physical medium (i.e., tapes stored offsite to further mitigate the risk of data loss.)</p> <p>As part of MAS' crisis management procedures, ITD will communicate with MEPS+ participants via email, phone or SWIFT during a MEPS+ contingency. Crisis management and</p>
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	<p>communications procedures are also established for FMIs which are linked to MEPS+ such as CLS and CDP.</p> <p>Internally, MAS has a crisis management structure which would be activated in the event of a crisis. The Crisis Management Team provides strategic direction in dealing with the crisis, including directing the communications with stakeholders.</p> <p>Secondary site</p> <p>MEPS+ BCP incorporates the use of an alternate site when there is a major operational disruption at the main site. MEPS+ data is mirrored from main to alternate site on a real time basis. This ensures sufficient system capabilities and functionalities when the alternate site is activated.</p> <p>MEPS+ alternate site is located away from the main site.</p> <p>In the event of a disruption to MEPS+ operations during critical payment windows (i.e., last CLS pay in /pay out schedule or towards the end of MEPS+ operating hours), MAS may extend the MEPS+ operating hours or activate the OCM to enable time-critical transactions to be effected. OCM is a stand-alone application software which allows MAS to continue processing and settling interbank payment transactions and securities transfers in the event of a disruption to MEPS+.</p> <p>Review and testing</p> <p>MEPS+ contingency drills are scheduled annually. The scope of the drills is reviewed annually as part of the planning and scheduling of the drills. The results of the contingency drills and feedback from the participants are reported at CIIC.</p> <p>MEPS+ contingency drills are conducted regularly. Participants' feedback is collated and reviewed after each contingency drill. The feedback including the scope of the drills are taken into consideration in the planning for subsequent MEPS+ contingency drills. MEPS+ also participates in the contingency drills conducted by SWIFT and CLS.</p>
<p>Key Consideration 7</p> <p>An FMI should identify, monitor, and manage the risks that key</p>	<p>Risks to the FMI's own operations</p> <p><i>Risks from participants</i></p>

<p>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>Robustness of MEPS+ operations is dependent on the security of its participants. MAS has established security guidelines and contingency requirements for participants relating to:</p> <ul style="list-style-type: none"> (i) Regular reviews of access rights to SWIFTNet Browse (to access MEPS+ online inquiries and liquidity management functions); (ii) Notification to MAS of any security-related incidents that disrupt the flow of payments in MEPS+; (iii) Implementation of backup and disaster recovery facilities to resume the processing of payments and securities settlements within two hours of any even that hinders its ability to send or receive payments or securities settlements instructions to or from MEPS+; and (iv) Monitoring of message and instructions submitted to MEPS+ for settlement. <p>Participants are required to perform annual self-assessment against these security guidelines and engage an independent party to review its self-assessment on a biennial basis.</p> <p>In addition, MAS provides participants with an optional manual contingency module to continue to submit their messages and instructions to MEPS+ in the event of an outage in participants' connectivity with SWIFT's messaging services or SWIFT network. The key MEPS+ participants are users of this manual contingency module and take part in the annual contingency drill with MAS to rehearse the use of this module.</p> <p>MAS, in supervising banks, also seeks to ensure that MEPS+ participants have sound processes in place.</p> <p><i>Risks from other FMIs</i></p> <p>CLS' and CDP's participation in MEPS+ are of critical importance to MEPS+ operations. Any failure or disruption event in CLS or CDP may impact MEPS+ service operations as MEPS+ operating hours may need to be extended to allow for settlement of these FMIs' transactions in MEPS+. There are agreed upon contingency procedures with CLS and CDP. MAS conducts regular contingency drills with these FMIs to ensure that these contingency procedures are well understood.</p> <p><i>Risks from service and utility providers (i.e., telecommunication and network partners)</i></p>
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	<p>MAS maintains redundancy in telecommunications and network partners for MEPS+ connection to SWIFT, to manage the operational risks arising from a disruption in telecommunications or networks. In addition, MAS subscribes to PremiumPlus service support from SWIFT, where SWIFT monitors MEPS+ connection to SWIFT and alert MAS should there be any anomaly. In the event of an outage in SWIFT's services, MAS can activate the OCM to enable time-critical transactions to be effected. The OCM is a stand-alone application software which allows MAS to continue processing and settling interbank payment and securities transfers.</p> <p>MEPS+ CSPs include:</p> <ul style="list-style-type: none"> (i) BCS Information Systems (MEPS+ ASP); (ii) NCS (disaster recovery site service provider); and (iii) SWIFT (messaging service provider). <p>MAS maintains a service level agreement with the CSPs to ensure that MEPS+ operations meet the same reliability and contingency requirements. Their service levels are closely monitored. In addition, regular meetings are held with the CSPs to discuss operational, technical, maintenance and project issues. These meetings also provide the opportunity for MAS to provide feedback to the CSPs on the professionalism of their services and support.</p>
	<p>Risks posed to other FMIs</p> <p>From the annual risk assessment of MEPS+, disruption in MEPS+ services may affect the settlement of the following transactions from CLS and CDP respectively:</p> <ul style="list-style-type: none"> (i) SGD leg of CLS' members' foreign exchange transactions; and (ii) securities market trades by CDP's members. <p>These risks are taken into consideration in the design of MEPS+ contingency measures. Feedback from these FMIs would be obtained before the MEPS+ contingency arrangements are operationalized.</p> <p>MAS has established contingency arrangements with CDP and CLS, which are tested annually. The respective manuals which</p>

	documents these arrangements are reviewed and updated regularly with inputs from the FMIs.
Key Conclusions for Principle 17	MAS monitors and manages its operational risks, including those from operating MEPS+, based on the international and Singapore Government's standards as well as MAS-issued guidelines and notices on financial institutions. The systems, policies, procedures and controls (such as security-by-design, regular review of access rights, near real-time alerts of privileged accesses and proper change management controls and system development life cycle) to monitor and manage the operational risks are documented in the MEPS+ Operational and Risk Management Framework, various ITD manuals and the annual MEPS+ risk assessments. MAS, as the MEPS+ operator, reviews its MEPS+ outsourcing arrangements annually and continually ensures that there is proper management control and oversight as well as assessments of the risk and impact of the outsourcing arrangements. As part of the annual review, MAS requires its CSPs to submit self-attestations that cover a specific set of requirements such as its financial strength, operational controls and processes, and physical and information security. MAS conducts on-site inspections of its CSPs on their controls and processes. MEPS+ direct and indirect participants are involved in one-day industry-wide exercises, which also includes a cyber-attack scenario. To achieve full observance for operational risk, enhancements to the cyber resiliency of the central bank and MEPS+ would need to be substantially implemented.
Assessment of Principle 17	Broadly Observed
Recommendations and Comments	Enhance enterprise-level cyber resiliency with mandatory information security awareness training and course completion for all MAS staff on a continuous basis. Apply ratings in the annual self-attestations submitted by the CSPs to support the continuation of critical services for MEPS+ and ensure that external audit is completed against acceptable national or international standards. Monitor the compliance of MEPS+ participants with the mandatory controls of the SWIFT Customer Security Program, and ensure self-attestations are audited.

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

Access to MEPS+ is open to all banks and regulated entities of systemic importance such as the CDP and SGX-DC that meet MAS' prudential standards. In assessing an entity's application, MAS will review the entity's creditworthiness, and risks posed to system and other participants amongst other strict admission criteria. In cases where MAS does not directly supervise the entity such as for CLS, access may be permitted subject to the participant being credibly supervised by an international oversight committee or a competent authority in its home country.

Existing participants must continue to exhibit a good track record with respect to the fulfilment of financial obligations such as the payment of fees and charges.

Participants also have to demonstrate their continuous capacity to effectively operate the technical equipment of the electronic payment system. This includes SWIFT membership and the necessary hardware, software, systems and capability to send and receive messages from others in the SWIFT network. An adequate and appropriate level of fault tolerance in the form of disaster recovery facilities is required of participants to meet the access criterion.

Once a bank has obtained its banking licence, it would be able to participate in MEPS+ provided other access criteria (i.e., SWIFT membership and adequate provision for disaster recovery) are met.

For non-bank participants, access criteria for MEPS+ participation is based on considerations, including: supervision by an international oversight committee or competent authority (if participant is not subject to MAS regulation), SWIFT membership, and adequate provision for disaster recovery.

Access to trade repositories

Not applicable.

<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 endeavor to set requirements that have the least-restrictive impact on access that circumstances permit.</p>	<p>Justification and rationale of participation criteria</p> <p>Requirements for participation in MEPS+ take into consideration that the applicant is appropriately licensed and approved by MAS or adequately supervised by a competent authority in the country where the applicant is established or licensed.</p> <p>Least restrictive access</p> <p>MEPS+ access criteria are set out in the MEPS+ Service Agreement, which is available on the MAS website and is reviewed regularly.</p> <p>Disclosure of criteria</p> <p>Access criteria is covered in the MEPS+ Service Agreement, which is publicly available on the MAS website.</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>Monitoring compliance</p> <p>MAS monitors participants' compliance with the access criteria on an on-going basis. The MEPS+ Service Agreement sets out the conditions under which MAS can suspend or terminate a participant's access to MEPS+.</p> <p>MEPS+ is a channel for banks to effect SGD payments to one another. As the system settles payments on a RTGS basis subject to the paying participant having sufficient funds in its MEPS+ account, there is no risk to MAS in providing access to participants whose risk profile has deteriorated. For participants who access ILF, haircuts are incorporated to reduce MAS' credit risk exposure in the event of the borrowers' default. For fees due from MEPS+ participants, these are automatically debited from participants' MEPS+ accounts before the funds in the accounts are made available to the participants for interbank payments during the day. ITD works with the relevant supervisory departments to impose additional controls, if needed.</p> <p>Suspension and orderly exit</p> <p>MEPS+ access for any participant breaching or no longer meeting MEPS+ access criteria are terminated, and the affected participant will be notified accordingly. The rest of the participants are notified accordingly of the termination.</p>

	The key aspects of the procedures are reflected in the Operations and Contingency Manual for MEPS+ Participants and Non-participants.
Key Conclusions for Principle 18	MEPS+ access and participation requirements include publicly disclosed risk-based criteria, which permit fair and open access. Access to MEPS+ is open to all banks and regulated entities of systemic importance such as the CDP and SGX-DC that meet MAS' prudential standards. Requirements for participation in MEPS+ take into consideration that the applicant is appropriately licensed and approved by MAS or adequately supervised by a competent authority in the country where the applicant is established or licensed. In assessing an entity's application, MAS will review the entity's creditworthiness, and risks posed to system and other participants amongst other strict admission criteria. Participants also have to demonstrate their continuous capacity to effectively operate the technical equipment of the electronic payment system. This includes SWIFT membership and the necessary hardware, software, systems and capability to send and receive messages from others in the SWIFT network. An adequate and appropriate level of fault tolerance in the form of disaster recovery facilities is required of participants to meet the access criterion.
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	Tiered participation arrangements
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.	<p>MEPS+ has two categories of participants: direct and indirect.</p> <p>Direct participants are those that have executed the MEPS+ Service Agreement and are able to settle payments, SGS and MAS Bills transactions directly on their MEPS+ accounts.</p> <p>Indirect participants are financial institutions in Singapore that do not have an RTGS account in MEPS+ and submit their MEPS+ payments, SGS and MAS Bills transactions through direct participants. Tiered payments refer to payments that are sent or</p>

	<p>received by a direct participant on behalf of an indirect participant.</p> <p>Basic information about indirect participation is obtained from the information furnished by the indirect participant when they open a current account with MAS. The information (such as the name of the indirect participant and its SWIFT BIC code) is updated as and when there are changes.</p> <p>Direct participants are required to submit an annual return to MAS on the total volume and value of the MEPS+ transactions that they perform on behalf of indirect participants. MAS analyses these annual statistics to identify, monitor and manage the risks arising from any material dependencies between direct and indirect participants.</p> <p>Risks to the FMI</p> <p>MAS analyzes the MEPS+ transactions submitted by indirect participants annually. For 2017, the risks posed by indirect participation arrangements to MEPS+ was assessed to be low based on the following risk indicators for tiered payments:</p> <ul style="list-style-type: none"> (i) Indirect participants' average daily MEPS+ payment transaction value comprised only 2 percent of the average daily MEPS+ payment transaction value; and (ii) Only one direct participant with 11 percent of its daily MEPS+ payment transaction value originates from its indirect participants.
<p>Key Consideration 2</p> <p>An FMI should identify material dependencies between direct and indirect participants that might affect the FMI.</p>	<p>Direct participants are required to submit annual statistics on the volume and value of MEPS+ transactions they perform on behalf of their customers (indirect participants). MAS analyses the annual statistics to identify material dependencies between direct and indirect participants that might affect MEPS+.</p> <p>Indirect participants whose average daily value of MEPS+ payments through their direct participants exceed SGD 500 million may be required to participate in MEPS+ directly.</p>
<p>Key Consideration 3</p> <p>An FMI should identify indirect participants responsible for a significant proportion of transactions processed by the FMI and indirect participants whose</p>	<p>The methodology described in the response to Principle 19, KC2, enables MAS to identify the following:</p> <ul style="list-style-type: none"> (i) the proportion of activity that each direct participant conducts on behalf of indirect participants in relation to the direct participants' capacity;

<p>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>	<ul style="list-style-type: none"> (ii) direct participants that act on behalf of a material number of indirect participants; (iii) indirect participants responsible for a significant proportion of turnover in the system; and (iv) 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>Key Consideration 4</p> <p>An FMI should regularly review risks arising from tiered participation arrangements and should take mitigating action when appropriate.</p>	<p>The following measures to mitigate the risks from indirect participation arrangements are reviewed annually:</p> <ul style="list-style-type: none"> (i) Indirect participants (average daily value of MEPS+ payments exceeding SGD 500 million) may be required to participate directly in MEPS+; and (ii) key direct participants who are appointed as agent banks are required to put in place robust contingency arrangements to minimize disruptions to their customer-indirect -participants' payments in the event of system/operational failure affecting the direct participant. <p>Results from the analysis of statistics submitted by direct participants are reviewed and discussed at the CIIC for its decision on whether mitigation actions are required, such as:</p> <ul style="list-style-type: none"> (i) encouraging indirect participants with large MEPS+ transaction values or whose transaction values are large relative to the capacity of their direct participants to participate directly in MEPS+; and (ii) requiring key direct participants to put in place robust contingency arrangements to minimize disruptions to indirect participants in the event of an operational disruption affecting the direct participants.
<p>Key Conclusions for Principle 19</p>	<p>MAS monitors and manages the material risks to the FMI arising from tiered participation arrangements in MEPS+. Direct participants are required to submit an annual return to MAS on the total volume and value of the MEPS+ transactions that they perform on behalf of indirect participants. MAS analyses these annual statistics to identify, monitor and manage the risks arising from any material dependencies between direct and indirect participants. Indirect participants whose average daily value of</p>

	MEPS+ payments through their direct participants exceed SGD 500 million may be required to participate in MEPS+ directly.
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.	
<p>Key Consideration 1</p> <p>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>	Not applicable.
<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>	Not applicable.
<p>Key Consideration 3</p> <p>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>	Not applicable.

<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>	<p>Not applicable.</p>
<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>	<p>Not applicable.</p>
<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>	<p>Not applicable.</p>
<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 more CCPs, each CCP should identify, assess, and manage the risks of the collective link arrangement.</p>	<p>Not applicable.</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>	Not applicable.
<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>	Not applicable.
<p>Key Conclusions for Principle 20</p>	Not applicable.
<p>Assessment of Principle 20</p>	Not applicable.
<p>Recommendations and Comments</p>	Not applicable.

Principle 21. Efficiency and Effectiveness

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

<p>Key Consideration 1</p> <p>An FMI should be designed to meet the needs of its participants and the markets it serves, in particular, with regards to the choice of a clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.</p>	<p>The design, rules and procedures for MEPS+ are customized to meet the needs of its participants. Major changes to the MEPS+ system, operational procedures and rules are made after consultation with the key participants.</p>
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<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>Qualitative and quantitative operational standards and targets are defined. Achievements against these operational standards and targets are tracked and reported monthly to the CIIC.</p> <p>MEPS+ met its operational targets in 2017. ITD uses data from the MEPS+ data warehouse to assess MEPS+ performance against its operational targets.</p>
<p>Key Consideration 3</p> <p>An FMI should have established mechanisms for the regular review of its efficiency and effectiveness.</p>	<p>MEPS+ efficiency and effectiveness are measured by the extent in which the operational standards and targets are met. These indicators are documented in the MEPS+ Operational and Risk Management Framework. Performance against the operational standards/targets are reported monthly to the CIIC and annually to the RC.</p>
<p>Key Conclusions for Principle 21</p>	<p>MEPS+ efficiency and effectiveness are measured by the extent in which the operational standards and targets are met. Qualitative and quantitative operational standards and targets are defined. These indicators are documented in the MEPS+ Operational and Risk Management Framework. Performance against the operational standards/targets are reported monthly to the CIIC and annually to the RC. MEPS+ adopts full cost recovery policy. As a matter of practice, fees are set at a level to achieve within 90 percent to 110 percent of the three-year average actual cost recoverability ratio. MEPS+ operational, development and capital costs that meet the recognition criteria as fixed assets in accordance with accounting standards are capitalized and depreciated over a period of three to five years. Fixed assets are reported in MAS financial statements. MEPS+ fee schedules are reviewed annually by ITD, which seeks approval from the CIIC and MAS' EXCO.</p>
<p>Assessment of Principle 21</p>	<p>Observed</p>
<p>Recommendations and Comments</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.	
Key Consideration 1 An FMI should use, or at a minimum accommodate, internationally accepted communication procedures and standards.	Communication procedures MEPS+ uses the SWIFT network and SWIFT messaging standards for all funds settlement and securities transfer instructions, which are also used by the participants. Use of common network and message standards help to facilitate straight-through-processing, resulting in higher efficiency and smoother flow of payments. MEPS+ does not have any cross-border operations.
	Communication standards See response to Principle 22, KC1.
Key Conclusions for Principle 22	MEPS+ uses internationally accepted communication procedures and standards. The SWIFT network and SWIFT messaging standards are used for all funds settlement and securities transfer instructions, which are also used by the participants. Use of common network and message standards help to facilitate straight-through-processing, resulting in higher efficiency and smoother flow of payments.
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	Rules and procedures MEPS+ operating rules and procedures are documented in the MEPS+ Service Agreement and the Operations and Contingency Manual for MEPS+ Participants and Non-Participants. These documents are published on the MAS website.

<p>procedures should also be publicly disclosed.</p>	<p>To ensure that MEPS+ rules and procedures are clear and comprehensive, MAS actively consults key MEPS+ participants when there are major changes to the MEPS+ procedures, processes and rules.</p> <p>Disclosure</p> <p>MAS' discretionary powers are defined in the MEPS+ Service Agreement and the MEPS+ Operating Rules to enable MAS to take appropriate action for key events like participant default, suspension of participant's access to MEPS+ services and amendments to MEPS+ system timings.</p> <p>Disclosure is via the MEPS+ PFMI Disclosure that is published on the MAS website.</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>MEPS+ system design and operations are documented in the functional specifications and user manuals. The user manuals are provided to all participants for each annual MEPS+ upgrade while the functional specifications are provided to all MAS user departments.</p> <p>MAS' discretion (as MEPS+ system operator) is defined unambiguously in the MEPS+ Service Agreement with the participants. MAS has powers to: (i) terminate defaulting participants (Clause 9.1 of the MEPS+ Service Agreement); (ii) modify or withdraw online information, query and control services as it sees fit (Clause 7.3 of the MEPS+ Operating Rules); (iii) suspend or terminate services (Clause 8.1 of the MEPS+ Operating Rules); (iv) adjust figures at its sole discretion posted to the Current, RTGS, SGS-Reserve, SGS-Trade, and SGS-Customer accounts if notice is sent by participants of errors (Clause 18 of the MEPS+ Operating Rules); and (v) change, with latitude, the various system cut-off windows as dictated by exigencies.</p> <p>Participants are given the option of applying to the MEPS+ system operator in writing to be exempted from certain provisions in the MEPS+ Operating Rules according to Clause 24 of the Operating Rules.</p> <p>All MEPS+ participants are signatories of the MEPS+ Service Agreement, which contains the operating rules that spell out the general duties of the participants and explains the different financial risks that participants may face.</p>

	<p>Rules relating to liquidity risks are circulated as Clause 14 of the MEPS+ Operating Rules, where the ILF is described.</p> <p>Rules relating to credit risks, the question of insolvency, and systemic risks are dealt with explicitly in Clauses 12, 16, 17 and 18 of the MEPS+ Operating Rules</p> <p>Rules relating to operational risks are covered in Clauses 19, 20 and 21 of the MEPS+ Operating Rules where manual backup and recovery facilities are described.</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>MEPS+ system design and operations are documented in the functional specifications and user manuals. User manuals are provided to all participants for each annual MEPS+ upgrade while the functional specifications are provided to all MAS user departments. MAS also conducts annual contingency exercises and industry tests to facilitate participants' understanding of the MEPS+ rules and operational procedures.</p> <p>Participants are required to submit self-assessments on their tests during these contingency exercises and industry tests to ITD, who will review and follow up with the participants who did not demonstrate familiarity or understanding of the MEPS+ processes.</p> <p>Participants are required to undergo additional tests to familiarize themselves of MEPS+ rules and procedures.</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>MEPS+ pricing and the incentive structure for early settlement of messages are documented in the MEPS+ Service Agreement that is posted on the MAS website.</p> <p>Participants are notified via email and given at least one month's notice of any changes in fees and services. The public is notified of changes in fees and services through the timely publication of the amendments to the MEPS+ Service Agreement on the MAS website.</p> <p>MEPS+ pricing is documented in the MEPS+ Service Agreement and the descriptions allow for comparison across similar FMIs.</p> <p>Technology and communication procedures of MEPS+ are confidential information and are not disclosed.</p>
<p>Key Consideration 5</p> <p>An FMI should complete regularly and disclose publicly responses to the CPSS-IOSCO Disclosure</p>	<p>The last disclosure was published in June 2018. The disclosure is updated every two years.</p> <p>MEPS+ statistics (transaction volume and value) are disclosed to the public and updated annually on the MAS website.</p>

framework for FMIs. An FMI also should, at a minimum, disclose basic data on transaction volumes and values.	MEPS+ participants are also disclosed on the MAS website.
Key Conclusions for Principle 23	MEPS+ operating rules and procedures are documented in the MEPS+ Service Agreement and the Operations and Contingency Manual for MEPS+ Participants and Non-Participants. These documents are published on the MAS website. MEPS+ system design and operations are documented in the functional specifications and user manuals. User manuals are provided to all participants for each annual MEPS+ upgrade while the functional specifications are provided to all MAS user departments. MAS also conducts annual contingency exercises and industry tests to facilitate participants' understanding of the MEPS+ rules and operational procedures. Participants are required to submit self-assessments on their tests during these contingency exercises and industry tests to demonstrate their familiarity or understanding of the MEPS+ processes. The last disclosure for MEPS+ was published in June 2018 and includes statistics on transaction volume and value. MEPS+ participants are also disclosed on the MAS website. The disclosure is updated every two years.
Assessment of Principle 23	Observed
Recommendations and Comments	To further enhance transparency and thus foster public understanding and confidence in the payment system, MAS should consider public disclosure of additional information on material developments and quantitative indicators such as MEPS+ system availability, average daily liquidity, and throughput time in the MEPS+ disclosure framework. This is particularly important with operational incidences associated with MEPS+, FMI interdependencies, and MEPS+ CSPs.

Principle 24. Disclosure of Market Data by Trade Repositories

A TR should provide timely and accurate data to relevant authorities and the public in line with their respective needs.

Key Consideration 1

A TR should provide data in line with regulatory and industry expectations to relevant authorities and the

Not applicable.

public, respectively, that is comprehensive and at a level of detail sufficient to enhance market transparency and support other public policy objectives.	
<p>Key Consideration 2</p> <p>A TR should have effective processes and procedures to provide data to relevant authorities in a timely and appropriate manner to enable them to meet their respective regulatory mandates and legal responsibilities.</p>	Not applicable.
<p>Key Consideration 3</p> <p>A TR should have robust information systems that provide accurate current and historical data. Data should be provided in a timely manner and in a format that permits it to be easily analyzed.</p>	Not applicable.
Key Conclusions for Principle 24	Not applicable.
Assessment of Principle 24	Not applicable.
Recommendations and Comments	Not applicable.

DETAILED ASSESSMENT OF MAS RESPONSIBILITIES

Responsibility A: Regulation, Supervision, and Oversight of Financial Market Infrastructures FMIs should be subject to appropriate and effective regulation, supervision, and oversight by a central bank, market regulator, or other relevant authority.	
<p>Key Consideration 1</p> <p>Authorities should clearly define and publicly disclose the criteria used to identify FMIs that should be subject to regulation, supervision, and oversight.</p>	<p>The PS(O)A Section 7(1) empowers MAS to designate and subject a payment system, thereby known as a DPS, to closer supervision and various regulatory requirements, if:</p> <ul style="list-style-type: none"> (i) 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; (ii) a disruption in the operations of the payment system could affect public confidence in payment systems or the financial system of Singapore; or (iii) it is otherwise in the interests of the public to do so. <p>The factors used in identifying payment systems for regulation are set out in section 3.4 of the Monograph. These include: (i) number and value of transactions processed; (ii) number and type of participants; (iii) markets served; (iv) market share; (v) interconnectedness with other payment systems and other financial institutions; and (vi) available alternatives to using the payment system at short notice.</p> <p>The criteria for identifying payment systems for regulation and supervision are publicly disclosed in the PS(O)A and further elaborated in the Monograph.</p> <p>The PS(O)A is publicly accessible on the Singapore Attorney-General's Chambers (AGC) website. The Monograph is publicly accessible on the MAS website.</p>
<p>Key Consideration 2</p> <p>FMIs that have been identified using these criteria should be regulated, supervised, and overseen by a central</p>	<p>MAS has designated six payment systems in Singapore under the PS(O)A for the purpose of supervising their operations as follows: (i) MEPS+; (ii) FAST; (iii) SGDCCS; (iv) USDCCS; (v) IBG system; and (vi) NETS EFTPOS.</p> <p>Assessments using the criteria set forth in Responsibility A, KC 1 were made on the above DPSs and presented to the</p>

bank, market regulator, or other relevant authority.	relevant senior management decision-making forum for approval.
	<p>MAS is an integrated financial regulator cum central bank. MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country.</p> <p>The Cybersecurity Act establishes a legal framework for the oversight of essential services in Singapore. MAS as a sector regulator, works with the CSA to strengthen the cyber resilience of the CIIs in the banking and finance sector. The Cybersecurity Act allows the Minister to appoint officers from the sector regulator as Assistant Commissioner to assist the Commissioner to oversee and enforce cybersecurity requirements on the CIIOs, to proactively protect the CIIs and respond to cybersecurity threats and incidents in Singapore. CSA manages incident reporting through MAS as CSA's sector lead / regulator, in fulfilment of Cybersecurity Act by the CIIOs.</p> <p>Among the DPSs, MEPS+ is the only SIPS in Singapore, and accordingly it is the only payment system subject to the PFMI as explained in the Monograph. All relevant PFMI principles applicable to MEPS+ are stated in the "Standards for MAS-Operated Financial Market Infrastructures" (Standards) which is available on the MAS website. MEPS+ is the RTGS system in Singapore and is owned and operated by MAS. While MEPS+ is a DPS, MAS is exempted¹⁸ from the PS(O)A as an operator, settlement institution and participant of MEPS+ because the PS(O)A is designed for commercial DPSs. Notwithstanding this exemption, MAS holds itself to similar standards as those expected of an operator and settlement institution of a DPS under the PS(O)A and oversees MEPS+ through a formalized oversight arrangement designed to mitigate the risks of conflicts of interests.</p> <p>The main supervisory objective is to promote the safety of payment systems. In particular, MAS seeks to ensure that there are adequate risk reduction or risk management measures in the design and operations of payment systems.</p>

¹⁸ Refer to section 3 of the PS(O)A - <https://sso.agc.gov.sg/Act/PSOA2006>

At the same time, MAS recognizes the need to oversee payment systems with due consideration for efficiency to ensure that they are able to respond effectively to the changing payment needs of the users. Broadly, MAS' supervisory objectives can be summarised as follows:

Safety

As a primary objective, MAS seeks to ensure payment systems are designed and operated in a safe manner, so that they do not compromise financial stability. For example, MAS seeks to identify where risks may arise or be transmitted through payment systems and following the assessment of these risks, MAS will initiate changes to reduce unnecessary risks.

MAS also seeks to ensure payment systems are governed by a well-founded legal framework, thereby further enhancing the safety of payment systems. An example is the FNA. The FNA reduces systemic risk as it provides protection to DPSs against certain laws, such as the laws of insolvency, where these systems meet certain conditions as laid down by the legislation and MAS. Payments through these systems are deemed to be final and irrevocable.

Efficiency

While safety is the primary supervisory objective, MAS also seeks to ensure payment systems in Singapore operate in an efficient manner that keeps costs reasonable while maximizing economic benefits. Inefficient payment systems may distort financial flows and lead to increased risk within the broader financial system.

	<p>Within MAS, the TRPD is responsible for the supervision of payment systems in Singapore. On a regular basis, TRPD collects information from identified payment systems of interest through various means, such as surveys and direct information gathering. The data collected allows TRPD to maintain a comprehensive and reliable view of the payment systems landscape. Where relevant, a payment system(s) may be designated for closer supervision by MAS. TRPD reports to the MFSC¹⁹. TRPD is also represented on the CPMI/IOSCO Steering Group.</p> <p>In MAS' IT supervision framework, MAS uses a combination of on-site inspections and off-site reviews to assess the technology risks of DPS. Through the information gathered, MAS will assess the inherent risks and control factors to determine the technology risk of DPS.</p> <p>Operators of DPS also participate in cybersecurity exercises organised by MAS and CSA to test and validate incident response plan.</p>
<p>Key Conclusions for Responsibility A</p>	<p>MEPS+ is subject to appropriate and effective regulation, supervision, and oversight by the MAS. Section 7(1) of the PS(O)A empowers MAS to designate and subject a payment system, thereby known as a DPS, to closer supervision and various regulatory requirements. Criteria for DPSs are clearly defined and disclosed in the PS(O)A and the Monograph on Supervision of FMIs in Singapore. All relevant PFMI principles applicable to MEPS+ are stated in the Standards for MAS-Operated FMIs. Within MAS, the TRPD is responsible for the supervision of payment systems in Singapore.</p>
<p>Assessment of Responsibility A</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	

¹⁹ The role of the MFSC is to assist the MAS MD in the supervision and regulation of the financial services sector, including payment systems. The MFSC is chaired by the Deputy MD from the Financial Supervision Group and comprises Assistant MDs and heads of departments from the Banking and Insurance, Capital Markets, Policy, Risk and Surveillance and Data Analytics groups and the General Counsel.

Responsibility B. Regulatory, Supervisory, and Oversight Powers and Resources	
<p>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 FMI.</p>	
<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>Powers or other authority consistent with relevant responsibilities</p> <p>MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country. The PS(O)A provides MAS with supervisory powers to collect information on all payment systems, and to regulate DPSs.</p> <p>To identify payment systems which are considered important to the stability of the financial system and public confidence, section 6 of the PS(O)A empowers MAS to collect payment system-related information from the operators, settlement institutions or participants of any payment system in Singapore. This enables MAS to obtain comprehensive and reliable information on payment systems in order to monitor their development and support MAS' policy and supervisory decisions.</p> <p>MAS' regulatory powers over DPSs include the power to impose access regimes, impose restrictions and conditions, establish standards, make regulations, approve and remove chief executive officers and directors, approve the control of substantial shareholding in an operator, issue directions, inspect operations, and assume control of the operations of a DPS under emergency situations. The PS(O)A also mandates external audits of a DPS and imposes the obligation on a DPS to notify MAS of significant changes in its operations. Details can be found in Part V and VI of the PS(O)A.</p> <p>AS MEPS+ is owned and operated by MAS, MAS has established a formal internal arrangement for segregation of the supervisory and operational functions, with distinct reporting lines to different management fora. MFSC is the management forum responsible for the supervision of MEPS+ and has approved an internal oversight arrangement to ensure the safety and efficiency of MEPS+. These include adherence to PFMI, timely notification of significant incidents,</p>

	<p>quarterly reporting to TRPD, notification of significant changes in operations, and inspection of the system. Key oversight issues identified are surfaced to MFSC and escalated to the MAS MD, where relevant.</p> <p>Powers to obtain timely information</p> <p>Section 6 of the PS(O)A empowers MAS to collect information from all payment systems in Singapore. In addition, Part V of PS(O)A imposes obligations on the operators and settlement institutions of DPSs to:</p> <ul style="list-style-type: none"> (i) notify MAS of the acquisition of any corporation that does not carry on the business of operating a payment system; (ii) notify MAS of certain events listed in the Act, including: an intention to make a material change to the operating rules, settlement procedures or activities of the DPS; an event or irregularity that impedes or prevents access to, or impairs the usual operations of the DPS or its settlement operations; the operator or settlement institution becoming or likely to become insolvent or unable to meet its financial statutory, contractual or other obligations; and other events that the Authority may prescribe by regulations; and (iii) submit periodic reports. <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 DPS.</p> <p>For MEPS+, the Monograph sets out the internal arrangements to carry out MAS' oversight responsibilities. As explained in the Monograph, the oversight arrangements empower TRPD to request for timely information from the function responsible for the operations of MEPS+. Such information includes quarterly reports on key MEPS+ developments (such as strategies, testing and incidents) and statistics of MEPS+. TRPD is also notified in advance of changes in the MEPS+ Service Agreement and collects and analyses transaction information on MEPS+ to understand</p>
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	<p>payment trends and to identify payment flow anomalies and any risk that may arise in the system.</p>
	<p>A DPS is required to:</p> <ul style="list-style-type: none"> (i) notify MAS as soon as practicable upon carrying on of any business or acquiring a substantial shareholding in a corporation which is not related to operating a payment system [section 11 of the PS(O)A]; (ii) submit financial statements and other reports as MAS may require for the proper administration of the PS(O)A to MAS [regulation 6 of the Payment Systems (Oversight) Regulations 2006 (“PS(O)R”). Examples include annual submission of audited financial statements and audit reports; (iii) notify MAS as soon as practicable of any activation of its BCP 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 BCP and submit, at the request of MAS, a copy of the new plan to MAS [regulation 11 of PS(O)R]; (iv) notify MAS as soon as practicable after the occurrence of any significant event, such as intention to make a material change to the operating rules, settlement procedures or activities [section 12 of PS(O)A]; (v) notify MAS as soon as practicable of any civil or criminal legal proceeding instituted against, disciplinary action taken against, foreign regulatory requirements imposed on or any failure of the operation of the DPS [regulation 5 of PS(O)R]; (vi) submit additional information as MAS may require, such as quarterly and semi-annual transaction volume and value statements [section 6 of the PS(O)A]; and

	<p>(vii) report disruptions to its operations or systems, including any IT security incidents to MAS [section 12(1) of the PS(O)A and Notice on Technology Risk Management].</p> <p>For MEPS+, departments responsible for MEPS+ operations are required to:</p> <ul style="list-style-type: none"> (i) notify TRPD as soon as possible, but no later than 1 hour, of significant incidents (i.e., an event which impairs the usual operations of MEPS+ including any IT security incidents, activation of disaster recovery or BCP; (ii) notify TRPD in advance before the occurrence of any significant event, such as intention to make a material change to the operating rules, settlement procedures or activities; and (iii) submit MEPS+ quarterly reports to TRPD. The quarterly reports consist of updates on key payment statistics, activities (i.e., industry testing) and decisions made by management committees (i.e., updates to Board Risk Committee). <p>For MEPS+, TRPD has full access to all MEPS+ documents (such as MEPS+ Service Agreement and risk management framework), payment statistics, and transaction details. The review of such information helps TRPD to understand and assess MEPS+'s functions and activities, risks borne or created by MEPS+, impact of MEPS+ on participants and the broader economy, and adherence of MEPS+ to the PFMI. TRPD does not review the financial condition of MAS. TRPD obtains the above information through several ways, including:</p> <ul style="list-style-type: none"> (i) Obtaining important updates from the operations function by requiring timely notification of significant incidents and changes to operations, submission of quarterly reports, and having regular meetings with the operator; (ii) Attending, whenever useful, decision-making forums in which key MEPS+ operational policies and implementation issues are decided; (iii) Reviewing the Disclosure Framework and self-assessments done by the operations function against the
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	<p>PFMI. TRPD may request for supporting documents from the operations function during reviews; and</p> <p>(iv) Inspecting MEPS+ to assess adherence to the PFMI. TRPD may request for supporting documents from the operations function during inspections.</p>
	<p>Powers to induce change or enforce corrective action</p> <p>Part VI of the PS(O)A provides MAS with regulatory powers including the power to: (i) impose conditions; (ii) establish standards; or (iii) issue directions.</p> <p>In the event of any breach of the PS(O)A, MAS is empowered to compound²⁰ the offence, or prosecute the offender whereby fines or imprisonment terms on responsible persons may be imposed. These powers allow MAS to induce changes or enforce actions on FMIs where necessary to ensure they meet the expectation of MAS.</p> <p>For MEPS+ which is operated and supervised by MAS, for any non-observance of the PFMI or with the oversight standards, TRPD will communicate concerns to the operational and risk management functions responsible for MEPS+ and require them to address the concerns in a timely manner. Depending on the severity of the issues, senior management's attention and advice would also be sought. For example, the review of MEPS+ self-assessment against the PFMI is tabled to the Management CIIC, to whom TRPD can also raise concerns directly. Supervisory concerns are also highlighted at the MFSC and escalated to MAS' MD, where relevant. The chairs of CIIC²¹ and MFSC are chaired by different Deputy MDs with separate reporting lines to the MAS' MD. In the event of any significant MEPS+ incident, TRPD conducts an independent review of the root causes and recommends corrective actions</p>

²⁰ Composition is a procedure by which MAS gives a person who is reasonably suspected of committing an offence the chance to avoid conviction in court by paying a sum of money to MAS. On payment of the sum of money, MAS will not take any further criminal proceedings against the offender and the offender is taken not to have convicted of the offence.

²¹ The role of the CIIC is to assist the MAS MD in overseeing the operations of the CIIs operated by MAS, including MEPS+. The CIIC is chaired by the Deputy MD from the Corporate Development Group and comprises Assistant MDs and heads of departments from the Currency, Finance, Information Technology, and Monetary and Domestic Management departments. Representatives from the Banking Department, the Internal Audit Department, and the Risk Management Department attend the CIIC meetings as observers.

	to the operating departments to address the issues. Such reviews are presented to the MFSC and MAS MD.
<p>Key Consideration 2</p> <p>Authorities should have sufficient resources to fulfill their regulatory, supervisory, and oversight responsibilities.</p>	<p>Resources</p> <p>MAS is a self-financing statutory board. The main sources of funding are license fees and imputed income from services provided by MAS as an agency of Government, for example, the management of exchange rate and monetary policy, and the management of national reserves.</p> <p>Each MAS department is allocated an amount of funds each year based on its operational needs and strategic goals as discussed and agreed upon by MAS senior management and approved by the MAS Board. Should additional resources in excess of budget allocation be needed during the year, departments may put up a request for additional funds to MAS senior management. Funds allocated to TRPD are deployed towards supervisory, policy making, standard setting, regional and international engagement (such as CPMI and Executives' Meeting of East Asia-Pacific Central Banks (EMEAP)), and staff training activities.</p> <p>For manpower, MAS exercises independence in determining its manpower resourcing levels and remuneration policies. 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. MAS' budget for staff remuneration is increased annually considering any increase in headcount as well as wage increases needed to keep the organization's wages competitive. MAS may also engage the services of consultants and advisers and set the terms and conditions of such engagement as it thinks fit. As at July 2018, there were 5 staff in TRPD involved in the supervision of DPS. Specialist staff from technology risk and business continuity management teams also supports the supervision of payment systems, such as during inspections.</p> <p>For training, MAS staff receives on-going and relevant training at the MAS Academy (Academy) to raise their professional competence. The Academy was set up by MAS to centralize in-house professional and leadership training programs for all</p>

	<p>departments. The Academy organizes the MAS Diploma in Central Banking for entry-level officers to acquire broad-based financial sector knowledge and understanding of MAS' key functions and core values. It systematically rolls out various functional and general development training courses to equip MAS officers at various levels with the skills and knowledge identified as important for their respective roles.</p> <p>As a complement to the efforts of the Academy, functional skills and expertise are further deepened through focused developmental interventions as guided by the MAS functional competency framework (Professional Requisites and Outcomes Framework). In addition to participation in regional and international working groups, meetings and conferences, MAS sends supervisory staff for attachments at large international banks, international bodies and other financial sector regulators to broaden and deepen their skills. Supervisory staff also attend relevant courses conducted by international bodies and central banks, such as the European Central Bank, the South East Asian Central Banks Research and Training Center, and IMF Singapore Regional Training Institute. MAS officers also regularly engage experts from the private sector through formal class-room training or informal discussions to further hone their skills and expertise. These include study visits to other jurisdictions, meeting the private sector and foreign supervisors, on topical issues. To further build and deepen in-house expertise, MAS provides scholarships to officers to pursue postgraduate studies, up to PhD levels.</p> <p>MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country. To ensure adequate funding, departments in MAS plan their activities and resources as required in the new financial year budget on an annual basis.</p> <p>MAS also undertakes annual talent reviews and regular assessment on the expertise levels of staff. These facilitate early identification of gaps in expertise levels, and appropriate follow-up actions are taken.</p>
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	<p>Legal protections</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 in the course of work.</p>
<p>Key Conclusions for Responsibility B</p>	<p>MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country. MAS' regulatory powers over DPSs include the power to impose access regimes, impose restrictions and conditions, establish standards, make regulations, approve and remove chief executive officers and directors, approve the control of substantial shareholding in an operator, issue directions, inspect operations, and assume control of the operations of a DPS under emergency situations. The PS(O)A also mandates external audits of a DPS and imposes the obligation on a DPS to notify MAS of significant changes in its operations. Section 6 of the PS(O)A empowers MAS to collect information from all payment systems in Singapore. Section 22 of the MAS Act provides immunity to MAS officers discharging their responsibilities. As at July 2018, there were 5 staff in TRPD involved in the supervision of DPS. Specialist staff from technology risk and business continuity management teams also supports the supervision of payment systems, such as during inspections.</p>
<p>Assessment of Responsibility B</p>	<p>Broadly Observed</p>
<p>Recommendations and Comments</p>	<p>Given its broad mandate and responsibilities, MAS should increase resources for the payment systems oversight and supervision unit of the TRPD. The unit is responsible for the oversight and supervision of MEPS+, DPSs (FAST, SGDCCS, USDCCS, IBG, NETS EFTPOS), CLS, credit bureaus, and SWIFT. The unit has a limited number of staff working on payment systems oversight and supervision. Increasing resources would support the detailed annual assessment of MEPS+ and other DPSs, which could evolve in systemic importance (particularly for FAST).</p>

Responsibility C. Disclosure of Policies with Respect to Financial Market Infrastructures	
Central banks, market regulators, and other relevant authorities should clearly define and disclose their regulatory, supervisory, and oversight policies with respect to FMIs.	
<p>Key Consideration 1</p> <p>Authorities should clearly define their policies with respect to FMIs, which include the authorities' objectives, roles, and regulations.</p>	<p>MAS is the sole authority in Singapore responsible for the regulation, supervision and oversight of all the payment systems in the country.</p> <p>MAS' approach in its supervision of FMIs in Singapore is described in the publicly available Monograph, which 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. The standards against which MEPS+ is supervised is also clearly set out in the Standards document.</p> <p>The Cybersecurity Code of Practice has also been established, specifying the minimum protection policies that a CIO shall implement to ensure the cybersecurity of its CII. Any DPS identified to be designated as a CII must comply with the Cybersecurity Code of Practice, in addition to MAS' Technology Risk Management regulations and guidelines. For example, CIOs are required to report cyber incidents to MAS, after which MAS will report to the CSA.</p>
<p>Key Consideration 2</p> <p>Authorities should publicly disclose their relevant policies with respect to the regulation, supervision, and oversight of FMIs.</p>	<p>MAS' policies for FMIs, which include its supervisory objectives and the scope of its supervision, are published in the Monograph. In addition, MAS' policies and objectives are publicly disclosed on MAS' website in the Monograph as well as in the CPMI Red Book (Singapore Chapter) and the EMEAP Red Book (Singapore Chapter).</p>
<p>Key Conclusions for Responsibility C</p>	<p>MAS' approach in its supervision of FMIs in Singapore is described in the publicly available Monograph on the Supervision of FMIs in Singapore, which 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. The standards against which MEPS+ is supervised is also clearly set out in the Standards for MAS-Operated FMIs document.</p>
<p>Assessment of Responsibility C</p>	<p>Observed</p>
<p>Recommendations and Comments</p>	<p>Enhance the independent review of MEPS+ with an annual assessment report with ratings prepared by the TRPD,</p>

	endorsed by the MFSC, and publicly disclosed. Enhance the transparency of MAS FMI responsibilities, including MEPS+, by publishing an annual report on FMI and payments for Singapore, which could include analysis of associated risks for MEPS+.
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Responsibility D. Application of the Principles for Financial Market Infrastructures	
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.	MAS adopts the PFMI in its supervision of SIPS. Specifically, all SIPS in Singapore are required to comply with the PFMI. In addition, 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. For MEPS+, all relevant principles are fully adopted by MAS and included in the Standards document.
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>MAS applies the principles to all SIPS in Singapore. Currently, MEPS+ is the only SIPS in Singapore. MAS makes public the application of the PFMI to all SIPS in Singapore and such a disclosure is found in the Monograph which is publicly accessible at MAS' website.</p> <p>All relevant principles applicable to MEPS+ are also stated in the Standards document. For MEPS+, MAS has stated publicly in the Monograph that MEPS+ is required to comply with the PFMI. To facilitate compliance with the PFMI, TRPD actively engages the operations function during discussions and inspections on the implementation of PFMI.</p> <p>MAS conducts annual assessments to understand the risk profile of each operator of SWIPS, as well as to highlight areas of concern and remedial actions. Ratings are given for each assessment. The possibility of SWIPS becoming a SIPS is discussed during such annual assessments.</p>
Key Consideration 3 Authorities should apply these principles consistently within and across jurisdictions, including across	<p>MEPS+, owned and operated by MAS, is the only SIPS in Singapore and is required to adhere to the PFMI. All relevant PFMI requirements that apply to SIPS are fully adopted and included in the Standards document.</p> <p>For payment systems operating across jurisdictions, MAS would participate in the cross-border oversight arrangements</p>

<p>borders, and to each type of FMI covered by the principles.</p>	<p>(i.e., CLS OC) and ensure that the FMI meets the standards expected of MAS (i.e., compliance with PFMI).</p> <p>As there are no other private sector SIPS, the risk of inconsistent application of PFMI between private sector owned and MAS operated payment systems does not arise.</p> <p>To ensure effective oversight of the MAS operated and supervised MEPS+, a formal internal arrangement has been established to ensure segregation of the supervisory and operational functions, with distinct reporting lines to different management fora. The ITD in MAS is responsible for the operations of MEPS+. ITD reports to the CIIC which oversees the design, implementation, operations and risk associated with running MEPS+. An independent risk management unit resides in the RiMD to oversee the risk management of MEPS+ and has direct access to the EXCO and RC. ITD works closely with RiMD and other stakeholders to manage the risks in MEPS+ on an on-going basis. In addition, MEPS+ is audited by the IAD. Separately, TRPD is responsible for the supervision of MEPS+.</p> <p>MEPS+ is subject to internal oversight arrangements. ITD and RiMD perform self-assessments against the PFMI biennially, which TRPD reviews. Inspections on MEPS+ are also conducted with the same rigor as those conducted on other key financial institutions. The process is formalized and includes information gathering, walkthroughs, meetings with management, discussion of potential issues, and tracking of issues resolution. The results of reviews and inspections by TRPD are highlighted to the MFSC and escalated to MAS MD, where relevant.</p>
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Key Conclusions for Responsibility D	MAS adopts the PFMI in its supervision of SIPS. Currently, MEPS+ is the only SIPS in Singapore. In addition, 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. For MEPS+, all relevant principles are fully adopted by MAS and included in the Standards document. MAS conducts annual assessments to understand the risk profile of each operator of SWIPS, as well as to highlight areas of concern and remedial actions. Ratings are given for each assessment. The possibility of SWIPS becoming a SIPS is discussed during such annual assessments.
Assessment of Responsibility D	Observed
Recommendations and Comments	Revise the Monograph on Supervision of FMIs to describe the standards used for designated SWIPS and the associated risks which are assessed relative to the PFMI. Assess on an annual basis the need to apply the PFMI to SWIPS, based on horizon-scanning and changes in their risk profiles (such as value limit increase, cross-border features).

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</p> <p>Relevant authorities 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,</p>	<p>The only SIPS which is subject to cooperative oversight in which MAS participates in is the CLS. CLS is regulated and supervised by the USFR as an Edge corporation. The USFR also chairs the CLS OC, in which MAS participates alongside other central banks whose currencies are included in the CLS.</p> <p>The USFR organizes and administers the CLS OC, which operates in accordance with the Protocol for Cooperative Oversight of CLS (Protocol). The Protocol was adopted by the CLS OC 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. The oversight arrangement facilitates the fulfilment by members of the CLS OC of their respective mandates with respect to CLS.</p>
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<p>and the potential recovery, wind-down, or resolution of an FMI.</p>	<p>The USFR provides regular oversight updates to members of the CLS OC. These updates include key CLS developments and supervisory assessments. MAS contributes to the cooperative oversight of CLS by reviewing, providing views, and raising questions on CLS oversight matters, such as its operations and risk management practices. In addition, MAS engages CLS members regularly to gather feedback on relevant CLS issues, such as governance and pricing. Changes proposed by CLS that may materially impact the nature or level of risks presented require the “no objection” of all CLS OC members, including MAS.</p> <p>The CLS OC has an established crisis communication protocol which would be activated during a crisis situation. For example, the CLS OC chair may initiate a daily conference call if necessary to share information and to seek CLS OC’s views on issues relating to the crisis.</p> <p style="text-align: center;">The CSA is the national agency overseeing cybersecurity strategy, operations, education, outreach, and ecosystem development and Cybersecurity Act, etc. The Cybersecurity Act establishes a legal framework for the oversight of essential services in Singapore. MAS as a sector regulator, works with the CSA to strengthen the cyber resilience of the CII in the banking and finance sector.</p> <p>The Cybersecurity Act allows the Minister to appoint officers from the sector regulator as Assistant Commissioner to assist the Commissioner to oversee and enforce cybersecurity requirements on the CIIOs, to proactively protect the CII and respond to cybersecurity threats and incidents in Singapore. CSA manages incident reporting through MAS as CSA’s sector lead / regulator, in fulfilment of Cybersecurity Act by the CIIOs.</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</p>	<p>Not applicable.</p>

<p>other relevant authorities that may have an interest in the FMI's observance of the CPSS-IOSCO Principles for financial market infrastructures.</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>Forms of cooperation</p> <p>See response to Responsibility E, KC 1. The cooperative oversight of CLS is a formalized arrangement under the CLS OC and is considered appropriate as it states the responsibilities of each central bank.</p> <p>MAS as a sector regulator, works with the CSA to strengthen the cyber resilience of the CII in the banking and finance sector. The Cybersecurity Act allows the Minister to appoint officers from the sector regulator as Assistant Commissioner to assist the Commissioner to oversee and enforce cybersecurity requirements on the CIOs, to proactively protect the CII and respond to cybersecurity threats and incidents in Singapore. CSA manages incident reporting through MAS as CSA's sector lead / regulator, in fulfilment of Cybersecurity Act by the CIOs.</p> <p>Efficiency and effectiveness of cooperation</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. For the CLS OC, the CLS OC has reviewed and discussed the effectiveness and efficiency with respect to the number of members in CLS OC and balanced the need for central banks to discharge their respective oversight mandate to arrive at the current arrangement.</p>
<p>Key Consideration 4</p> <p>For an FMI where cooperative arrangements are appropriate, at least one authority should accept responsibility for establishing efficient and effective cooperation among all relevant authorities. In international cooperative</p>	<p>The lead overseer for CLS, USFR, is responsible for the efficient and effective cooperation among all relevant authorities. The duties of the USFR with respect to oversight of CLS are outlined in the Protocol, including:</p> <ul style="list-style-type: none"> (i) Organizing and administering the CLS OC and acting as the Chairperson and Secretariat of the CLS OC; and (ii) Coordinating the cooperation between participating central banks and USFR supervisors.

<p>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</p> <p>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 USFR is responsible for ensuring that the CLS is periodically assessed against the PFMI. The USFR consults on and shares assessments on CLS with other relevant authorities via the CLS OC. This may be in the form of email, teleconference or in-person meeting.</p>
<p>Key Consideration 6</p> <p>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 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>Through the CLS OC, the USFR provides regular updates to MAS, including any changes to payment and settlement arrangements and liquidity risk management procedures of CLS that may affect SGD. Areas which may affect the SGD or Singapore's financial center are reviewed by MAS. MAS may provide views or raise questions for clarifications as part of its review. MAS would consider the views of the USFR and other members of the CLS OC. Key issues, such as CLS' strategic initiatives and approval which CLS requires from the CLS OC (i.e., currency inclusion) are presented to TRPD department head for updates, discussion and decision. Changes proposed by CLS that may materially impact the nature or level of risks presented require the "no objection" of all CLS OC members, including MAS.</p>

<p>Key Consideration 7</p> <p>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>Under the Protocol, MAS is expected to consult the other participating central banks as timely as possible, as necessary, before implementing policies or taking any action that could materially affect CLS. For example, MAS provided advance notification to the CLS OC of improvements to the contingency measures of MEPS+.</p> <p>This is carried out through the CLS OC arrangement. MAS would review any material changes and consider the views of the CLS OC members. Where necessary, TRPD would seek the views and decision of the MFSC.</p>
<p>Key Consideration 8</p> <p>Relevant authorities should coordinate to ensure timely access to trade data recorded in a TR.</p>	<p>Not applicable.</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>No DPS has to date been assessed to be imprudently managed to the point that it would warrant such supervisory response.</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</p>	<p>The CLS cooperative oversight arrangement does not prejudice the statutory or legal powers of the MAS nor does it constrain in any way MAS' powers to fulfil its statutory or legislative mandate or its discretion to act in accordance with those powers.</p>

<p>way an authority's powers to fulfill its statutory or legislative mandate or its discretion to act in accordance with those powers.</p>	
<p>Key Conclusions for Responsibility E</p>	<p>The only SIPS which is subject to cooperative oversight in which MAS participates in is the CLS. CLS is regulated and supervised by the USFR as an Edge corporation. The USFR also chairs the CLS OC, in which MAS participates alongside other central banks whose currencies are included in the CLS. The USFR organizes and administers the CLS OC, which operates in accordance with the Protocol for Cooperative Oversight of CLS. MAS contributes to the cooperative oversight of CLS by reviewing, providing views, and raising questions on CLS oversight matters, such as its operations and risk management practices. MAS as a sector regulator, works with the CSA to strengthen the cyber resilience of the CIIs in the banking and finance sector. The Cybersecurity Act allows the Minister to appoint officers from the sector regulator as Assistant Commissioner to assist the Commissioner to oversee and enforce cybersecurity requirements on the CIIOs, to proactively protect the CIIs and respond to cybersecurity threats and incidents in Singapore. CSA manages incident reporting through MAS as CSA's sector lead / regulator, in fulfilment of Cybersecurity Act by the CIIOs.</p>
<p>Assessment of Responsibility E</p>	<p>Observed</p>
<p>Recommendations and comments</p>	

AUTHORITIES' RESPONSE

51. MAS welcomes the IMF's assessment of Singapore's systemically important payment system and authorities' responsibilities against the PFMI and wishes to express its appreciation to the IMF and its assessors for the constructive dialogue and assessment.

Governance (Principle 2)

52. MAS notes IMF's observation that the CCSO is a member of the CIIC, and the CCSO role is concurrently held by the Executive Director of TRPD which is the overseer and supervisor of MEPS+. At the time of appointment of CCSO in October 2017, Executive Director of TRPD was assessed to be the most qualified person for the CCSO role. MAS is of the view that there is no material conflict of interest as CCSO advises CIIC on adequacy and appropriateness of MEPS+'s cyber security arrangements and is not responsible for MEPS+ operations. Nonetheless, MAS will review the need for greater clarity of the CCSO role to more fully achieve the separation of operational and oversight responsibilities over MEPS+.

Comprehensive risk management framework (Principle 3)

53. MAS agrees with IMF's observation on the potential adoption of DLT by FMIs in the near to medium term, and its potential risks to MEPS+. MAS will review and analyze the potential implications of DLT on the safety of MEPS+ against the CPMI analytical framework for distributed ledger technology in payment, clearing and settlement before it makes the decision, to either adopt DLT for MEPS+ or interface DLT-based systems with MEPS+.

Operational Risk (Principle 17)

54. MAS notes IMF's observation on MAS' ongoing efforts to manage potential operational risks that could stem from cyber risks, and these efforts include expanding surveillance coverage, reinforcing protection capabilities, reducing time to recover, and developing cyber competencies. The assessors have also observed that there are a few areas for improvement in MAS' information and cyber security training to staff, oversight of MEPS+ critical service providers and monitoring of MEPS+ participants' end-point security.

55. On enhancing enterprise-level information security, MAS agrees that it is critical for all MAS staff to be cyber vigilant. MAS staff are apprised of latest developments in information security risks through regular advisories. All staff are also required to complete a mandatory information security e-learning module and pass the accompanying assessment test. This mandatory e-learning module will be continually updated to reflect the evolving information security threat and risk landscape. Additional initiatives will be explored to enhance enterprise-level cyber vigilance of all staff, including the conduct of more frequent phishing exercises.

56. On oversight of MEPS+ critical service providers, MAS agrees with IMF's recommendation to apply ratings in the annual self-attestations submitted by the MEPS+ critical service providers that support the continuation of critical services for MEPS+. All external audits will be completed against acceptable national or international standards.

57. On MEPS+ participants' end-point security, MAS agrees with IMF's recommendation to monitor the compliance of MEPS+ participants with the mandatory controls of the SWIFT Customer Security Program and ensure that the participants' self-attestations are audited.

Disclosure of rules, key procedures and market data (Principle 23)

58. MAS notes IMF's observation that MEPS+ has met the disclosure requirements in Principle 23. MAS also notes that the assessors had drawn comparisons to international best practices on the extent of disclosure. To further enhance transparency and foster public understanding and confidence in MEPS+, MAS will review IMF's recommendation on the disclosure of additional information on material developments and quantitative indicators on system availability, average daily liquidity, and throughput time in the MEPS+ PFMI Disclosure that is published on the MAS website.

Regulatory, Supervisory, and Oversight Powers and Resources (Responsibility B)

59. In light of the evolving payments landscape, MAS agrees that it is timely to review the resource requirements for the supervision of payment systems.

Disclosure of Policies with Respect to FMIs (Responsibility C)

60. Responsibility C does not require overseers of payment systems to publicly disclose the results of their independent assessment of the systems or publish a consolidated report on FMI. Nonetheless, MAS acknowledges that the publication of the overseer's assessment of MEPS+ will enhance accountability to the public given that MEPS+ is also operated by MAS. MAS will discuss the frequency of disclosure, the forum to endorse the report and the form in which such information would be best presented. On the publication of a consolidated report, MAS publicly discloses important developments on FMIs supervised by us on a regular basis through various means, such as press releases, speeches and public documents. MAS is of the view that the current approach is adequate for the transparency of MAS' responsibilities over FMIs.

Application of the Principles for FMIs (Responsibility D)

61. MAS agrees with IMF's recommendation to revise the Monograph on Supervision of FMIs to describe the standards used for designated system-wide important payment systems and the associated risks which are assessed relative to the PFMI. MAS will also annually assess the need to apply the PFMI to system-wide important payment systems.