Smart Energy, Sustainable Future

Consultation Paper

DEVELOPMENT OF A SECONDARY GAS TRADING MARKET ("SGTM") IN SINGAPORE

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EXECUTIVE SUMMARY

1. Today, natural gas users in Singapore typically procure gas under bilateral contracts. EMA is looking into setting up a Secondary Gas Trading Market ("SGTM"), where gas buyers and sellers can trade gas within Singapore.

2. Having a SGTM will allow domestic gas price discovery that reflects Singapore's demand and supply conditions. Gas users will be able to complement their portfolio of long- and medium-term gas supplies, so that they can optimise their gas supply portfolios and to mitigate price volatility. In the long run, a SGTM will enhance Singapore's position as a hub for LNG and gas trading activities, and pave the way for the potential establishment of a gas forward market to trade financial contracts for gas.

3. EMA had commissioned Frost & Sullivan (Singapore) Pte Ltd ("F&S") to study the potential development of a SGTM in Singapore. F&S had engaged Singapore gas industry players to examine the feasibility and benefits of establishing a SGTM in Singapore, and recommended a possible eventual SGTM conceptual design and a roadmap for implementing the transition to a SGTM. The proposed SGTM design draws on market arrangements currently operating in other jurisdictions, particularly Belgium, UK and the Netherlands, while taking into account local conditions.

4. This consultation paper seeks industry feedback and comments on:

   a) The eventual conceptual design of a SGTM in Singapore; and

   b) The roadmap for transitioning from the current market structure and regulatory framework to the eventual conceptual design.

5. EMA also intends to establish an Industry Working Group comprising representatives from Government agencies and potential gas market trading participants to develop the detailed design of the SGTM. The Industry Working Group will deliberate on the key design parameters of the SGTM, jointly develop the detailed design of the SGTM, and fine-tune the transition steps towards the eventual SGTM. EMA envisages that the first steps would require initiatives to improve the liquidity of our gas market, initiatives to facilitate greater access to gas pipeline capacity, and the establishment of an initial gas trading platform that will be run by the Gas Market Operator ("GMO").

6. EMA invites comments and feedback to the consultation paper. Please submit written feedback to EMA_RD_GPID@ema.gov.sg by 20 November 2015 (5pm). Alternatively, you may send the feedback by post/fax to:

Gas Policy and Infrastructure Department
Regulation Division
Energy Market Authority
991G Alexandra Road, #01-29
Singapore 119975
Fax: (65) 6835 8020

7. Anonymous submissions will not be considered.

8. EMA will acknowledge receipt of all submissions electronically. Please contact Ms Vivien Chin at 6376 7525 or Ms Hazel Yeo at 6376 5671 if you do not receive an acknowledgement of your submission within two business days.

9. EMA will be happy to meet with industry players on an individual basis to discuss their feedback. Please contact EMA via EMA_RD_GPID@ema.gov.sg if you wish to arrange a meeting with EMA.

10. EMA reserves the right to make public all or parts of any written submissions made in response to this consultation paper and to disclose the identity of the source. Any part of the submission, which is considered by respondents to be confidential, should be clearly marked and placed as an annex. EMA will take this into account in the disclosure of the information in the submissions.

SECTION 1: EVENTUAL SGTM CONCEPTUAL DESIGN

1. Today, gas users in Singapore typically procure gas under bilateral contracts. Such gas contracts are usually for a term of one year and longer. In addition, as bilateral gas trading cannot be done anonymously and requires the contracting parties to reveal their purchase/sale, there could be discomfort in doing so.

2. Gas trading can be enhanced through the introduction of an exchange, i.e. a SGTM. A SGTM can be a **physical gas trading platform** that allows market participants to anonymously post offers to buy or sell gas on a short term basis (e.g. within the day or for the next day), without having to go through a negotiation process. This allows the purchasing/selling of shortfall/excess gas quickly and anonymously.

3. A SGTM will also enable domestic gas price discovery that reflects Singapore's demand and supply conditions at any point in time. Gas users will be able to complement their portfolio of long- and medium-term gas supplies, so that they can optimise their gas supply portfolios and to mitigate price volatility. In the long run, a SGTM will enhance Singapore's position as a hub for LNG and gas trading activities, and pave the way for the potential establishment of a gas forward market. A gas forward market will enable discovery of gas prices in Singapore over time periods such as the coming months, quarters and for the year ahead, and allow the trading of financial contracts that settle against the spot price for gas. Gas consumers can enter into financial contracts to mitigate their price risks.

4. A SGTM would bring about the following benefits to the gas industry and consumers:

   a) **More efficient outcomes in our gas market.** A SGTM improves the ability of gas buyers and sellers to trade gas with one another (i.e. on-selling) within Singapore, and provides them with more options to optimise their gas supply portfolios and to mitigate price volatility. This enhances competition and efficiency in the domestic gas market, and ultimately benefits domestic electricity consumers downstream.

   b) **Create a trading platform for discovery of domestic gas prices** (similar to the USA's Henry Hub or the UK's National Balancing Point). Today, all of Singapore's gas prices are indexed (i.e. linked) to oil prices. The SGTM will allow us to discover a domestic gas price based directly on demand and supply of gas. This will provide gas consumers an additional option for pricing their gas purchase, which can help to mitigate the volatility in oil prices.

   c) The trading of natural gas at the SGTM will complement Singapore's position as a hub for LNG trading activities, thus aiding in the price discovery of Asian LNG.

5. EMA had commissioned F&S to study the potential development of a SGTM in Singapore. F&S had engaged Singapore gas industry players to examine the feasibility and benefits of establishing a SGTM in Singapore, and recommended a possible eventual SGTM conceptual design and an implementation roadmap for a SGTM.

6. Under the proposed eventual SGTM conceptual design, market participants will have the option to trade gas at a single "Singapore hub" covering the entire onshore gas

transmission system, through an exchange operated by the GMO. The SGTM can co-exist with the traditional model of trading gas through bilateral contracts.

7. The proposed SGTM design draws on market arrangements currently operating in other jurisdictions, particularly Belgium, UK and the Netherlands, while taking into account local conditions.

Key Design Parameters of the SGTM

8. EMA has identified 5 key design parameters for the SGTM as follows:

a) Should the SGTM be a gross market or net market?

b) Should the SGTM be mandated for balancing of gas in our system?

c) Should gas trading in the SGTM be transacted at a physical or virtual hub?

d) How should pipeline capacity rights be allocated?

e) Should an exchange be established for facilitating and clearing gas trades?

Design Parameter 1: Gross Market or Net Market

9. The physical market can be structured on a gross or net basis. In the former, all gas that participants wish to physically flow for the coming day would need to be transacted through the physical market, similar to the way electricity is traded on the National Electricity Market of Singapore ("NEMS").

10. Under the net market approach, participants are only required to buy/sell shortfall/excess gas to complement their gas portfolio through the market. Most of the gas requirements of buyers are expected to be transacted through bilaterally negotiated contracts struck outside the SGTM.

International Experience of Gross and Net Markets

11. Almost all overseas jurisdictions that have physical gas trading markets have adopted the net market approach. These include all the developed gas markets in Europe, North America and most gas markets in Australia, with the exception of the Declared Wholesale Gas Market ("DWGM") in the Australian state of Victoria.

Differences between Gross and Net Markets

12. The main differences between the net and gross market arrangements are as follows:

a) **Transparency** – A gross market arrangement provides more transparency because the "buy" and "sell" offers for the entire gas demand are available to market participants. In contrast, under a net market approach, only shortfall/excess gas volumes that a market participant wishes to buy/sell are offered on the market on a voluntary basis.

b) **Liquidity and Gas Price Discovery** – As all the gas that participants wish to physically flow will be offered through the gross market, compared with the net volumes that would be sold on a voluntary basis through the net market, the gross market would have greater liquidity than the net market. This, in turn, would translate into a domestic gas price more reflective of the supply and demand situation.

c) **Degree of Alignment with the NEMS** – Singapore's electricity market, i.e. the NEMS, is based on a gross market model. There could be greater scope for integration and system cost savings if the gross market approach were to be adopted for the gas market.

d) **Transition Issues** – A gross market model is a substantial change from the existing gas market framework, and all existing participants are required to transit towards the new model and amend their existing bilateral gas contracts.

13. While there seem to be benefits in adopting a gross market approach, EMA prefers to pursue a net market approach in the first instance, and keep the option open to eventually transition to a gross market approach for the following reasons:

a) It would be faster and more efficient to 'graft on' arrangements to facilitate secondary gas trading from today's gas market, rather than seeking to substantially modify the current arrangements to adopt a gross market model;

b) Participants and EMA will have the opportunity to make a progressive transition into the physical trading market arrangements, gaining valuable experience with each incremental step, rather than having to deal with the substantial and immediate changes required under a gross market arrangement;

c) The trading of balancing gas (see Design Parameter 2 below) should provide sufficient liquidity even in the case of a net market; and

d) Many of the steps required to adopt a net market would be beneficial if Singapore ultimately adopts a gross market model. In this respect, evolving the existing arrangements along the net market pathway would appear to be a 'no regrets' move.

Feedback sought

(I) Should Singapore adopt a net market approach or gross market approach for the eventual SGTM conceptual design?

Design Parameter 2: Trading of Balancing Gas[1]

14. The amount of gas that is injected into and offtaken from the gas pipeline network must be balanced over time to ensure the safe and reliable operation of the gas pipeline network (i.e. to avoid situations of under- or over-pressure within the network). This is monitored by PowerGas Ltd, who is the owner and operator of the gas pipeline network ("Transporter"). If there is any difference between the injection and offtake quantities, the Transporter will charge the "Shipper"[2] at a single Administered Commodity Variance ("CV") Price[3].

15. Under the current arrangement, a Shipper that incurs an imbalance at the Administered CV Price may gain financially if this price is significantly different from their actual contracted gas prices. For example, a Shipper could profit from causing an imbalance if it over-injects gas and its own contracted gas is cheaper than the Administered CV price. This is not good for the system.

16. Arrangements in overseas jurisdictions typically comprise a mix of (i) Shipper 'self-balancing' incentives, which is done through either managing their injection/offtake themselves[4], or the trading of gas on the market to achieve a balanced position (known as "Primary Balancing"); and (ii) intervention by a balancing agent to resolve any system imbalance not addressed by Primary Balancing (known as "Residual Balancing").

17. Balancing and the SGTM are closely related to each other because:

a) Dynamic trading of gas is one of the important tools that Shippers can use to self-balance. Shippers can trade this gas on the SGTM;

b) The trading of balancing gas provides the necessary liquidity for the SGTM to be viable;

c) When a balancing agent takes a Residual Balancing action to maintain the pressure in the gas system, the balancing agent facilitates a 'trade' between two parties (one that caused the imbalance and the other that sold or bought gas to offset the imbalance, as the case may be); and

d) With dynamically priced gas in the SGTM, a Shipper would be incentivised to be self-balanced through Primary Balancing, rather than to take the price risk of

[1] Balancing gas refers to the shortfall or excess gas required to net off the difference in gas injection and offtake volumes, as the case may be.

[2] A Shipper is a party that engages the Transporter to convey gas through the gas pipeline network. Shippers are required to nominate to the Transporter the amount of gas to be injected and offtaken. Gas users can either be licensed as a Shipper, or engage a Shipper to act on their behalf.

[3] Under the current Gas Network Code (GNC), each Shipper's CV refers to the actual deviation between (a) the Shipper's total quantity of gas injected into the gas transmission network, and (b) its total quantity of gas offtaken from the transmission network, for each day. For any excess gas injected (i.e. positive CV), the Shipper will be paid by the Transporter at the Administered CV price, which is set at a gas price equivalent to 110% of spot High Sulphur Fuel Oil ("HSFO") price. Conversely, the Shipper will have to pay the Transporter at the Administered CV price for any excess gas offtaken (i.e. negative CV).

[4] For instance, a Shipper could conceivably re-nominate injection volumes in order to maintain balance in his injection and offtake if he projected that his injection would be higher than offtake in future balancing periods.

Residual Balancing. This approach is also adopted in other jurisdictions such as Belgium and the Netherlands.

18. The balancing agent monitors aggregate system conditions and will conduct Residual Balancing if required (i.e. it will purchase gas from or sell gas to the market to balance the gas system). With an integrated gas balancing and trading arrangement, the Residual Balancing transactions are made using the same SGTM platform that supports the physical gas trading. When a Residual Balancing action occurs, causers of the system imbalance will pay the costs associated with the balancing action (or receive the proceeds if the balancing agent has to sell gas to balance the gas system). This means that the costs of balancing actions would be market-determined.

19. EMA prefers a Primary Balancing and Residual Balancing arrangement, with an appointed balancing agent conducting Residual Balancing to resolve system imbalances. This will create a self-correcting and market-driven balancing mechanism that will enhance the stability of our gas system. Given the limited pipeline capacity in Singapore's onshore system, the existing arrangement of triggering pressure override mechanisms as a "backstop", should system imbalances threaten the stability of the gas network, will remain.

Feedback sought

(II) What are the pros and cons of transitioning to a Primary Balancing and Residual Balancing arrangements, with a balancing agent conducting Residual Balancing to resolve system imbalances?

(III) How could Shippers be incentivised to conduct Primary Balancing?

(IV) Who could be appointed as the balancing agent? In other jurisdictions, this could be the pipeline operator or a separate entity that oversees the dispatch of gas throughout the network.

Design Parameter 3: Physical Hub or Virtual Hub

International Experience with the Location of Trading and Title Transfer

20. Physical trading hubs have evolved at locations where major transmission pipelines converge (such as at Henry Hub in Louisiana, where 16 interstate and intrastate gas pipelines converge). When gas is traded at a physical hub, the title of the gas is transferred at a designated physical point in the system.

21. On the other hand, the European gas markets, some of which have compact transmission systems compared to North America, have adopted virtual hubs. A set of pipelines is designated to form a common 'market area'. All gas within the hub can be traded, irrespective of its actual physical location in the pipeline system.

22. Physical hubs adopt point-to-point transactions whereby parties are required to book the same quantity for both entry and exit of gas in the system (which is the case in the Singapore's pipeline capacity booking regime). This assumes that gas injected into the network at one point will always be offtaken at a predetermined destination. On the other

hand, virtual hubs do not require a pair of injection and offtake points for the transaction to occur since all gas injected and offtaken at the hub is fungible[5]. This allows individual buyers and sellers to book different quantities for entry and exit of gas into the system. Gas at the hub becomes a fungible commodity that need not have a predetermined destination, thus increasing the ease of trading.

Pros and cons of physical versus virtual hub

23. A virtual hub has the following advantages for Singapore:

a) Market depth and liquidity in a virtual hub is expected to be materially greater than a physical hub since in our gas pipeline network, there is no single 'natural' point where physical gas trading would be expected to converge.

b) A virtual hub would promote market liquidity by providing anonymity to all parties.

c) A virtual hub would also avoid the need for parties to account for varying distance-based transmission costs which could complicate trading and make price comparisons more difficult.

24. A physical hub on the other hand fragments market liquidity. Furthermore, the need to indicate a title transfer location in a physical hub would make it difficult for some parties to trade anonymously, where the location is unique to a particular trading party.

25. EMA prefers to adopt a virtual hub approach for Singapore, given our compact transmission system. This would require changes to the existing capacity booking regime to adopt separate entry and exit capacity bookings, and consequently the tariff regime for pipeline capacity.

26. However, by adopting separate entry and exit capacity bookings, it is possible for entry and exit capacities to differ, which can create an imbalanced network. Therefore, a virtual hub requires an appointed balancing agent who will act promptly to ensure that the system remains balanced, and to maintain the reliability and safety of the network.

[5] A gas buyer could be offtaking gas injected from several different points within the hub; and a gas seller could be injecting gas intending for several different offtakers from different points in the network. The gas buyer only needs to book exit capacity at his offtake point for the aggregate volume of his gas offtake, while the gas seller only needs to book entry capacity at his injection point for the aggregate volume of his gas sales.

Feedback sought

(V) Should Singapore adopt a virtual or physical gas trading hub as part of its eventual SGTM conceptual design?

(VI) What are the pros and cons for moving away from today's regime in Singapore whereby Shippers can book capacity based on balanced injection and offtake pair, to a regime where there are separate entry and exit capacity bookings which will therefore have corresponding differences in pipeline tariffs. Consider the following:

i. Can a virtual trading hub be achieved without changing the pipeline capacity booking regime?

ii. What would be the difficulties faced by Shippers if there are separate entry and exit capacity bookings? Are there ways to overcome these difficulties?

Design Parameter 4: Allocating Pipeline Capacity Rights for Gas Trading

27. To trade gas, sellers/buyers must have rights to deliver/take gas to/from the point of sale through the gas pipeline network. The right to use network capacity can be allocated through booking of capacity rights on a 'first come, first served' basis (which is the approach currently used in Singapore), through periodic auctions of pipeline capacity, or on an interruptible basis similar to that adopted by the Victorian DWGM.

International Experience in Allocating Capacity Rights

28. Typically, when a new gas transmission pipeline is built, the pipeline owner seeks some revenue certainty by asking potential pipeline users to enter into long-term contracts for the right to use the pipeline, via an open season process. Once the pipeline capacity is fully contracted, a user who needs pipeline capacity has to buy capacity rights from existing users. This approach incentivises pipeline users to hoard capacity to avoid having to purchase capacity rights from others in future.

29. Capacity hoarding can be discouraged by imposing Use-it-or-Lose-it ("UIOLI") rules or mandating the Transporter to make available part of the pipeline capacity for short-term use. The European Union ("EU") has adopted a combination of these approaches. It requires that part of pipeline capacity to be auctioned for use for a period of less than a year, and the UIOLI rules will apply to such capacity rights within the year.

30. A different approach is adopted in the Victorian DWGM - capacity right is 'stapled' (i.e. attached) to the traded gas commodity. In other words, if a trader successfully bids to inject and/or offtake gas from the Victorian DWGM transmission system, the trader will have the corresponding right to use the required pipeline capacity. A similar concept is adopted in the Short-Term Trading Market ("STTM") in New South Wales, South Australia and Queensland. While the booking of firm capacity is possible outside the STTM, it does not guarantee gas flow if the trade is unsuccessful on the STTM. Consequently, it is possible to displace a 'firm capacity' user whose gas is not scheduled via the STTM (i.e. all capacity is

effectively interruptible). Should this occur, a capacity payment is made to the Shipper whose firm-capacity gas is displaced and a capacity charge is levied on the Shipper whose non-firm-capacity gas is scheduled.

Pros and Cons of the Approaches of Allocating Capacity Rights

31. Today, Singapore adopts a 'first come, first served' approach in allocating pipeline capacity. However, in a small market such as Singapore's, this approach can result in capacity hoarding. The problem is aggravated by the granting of long-term capacity rights, which results in fewer short-term capacity rights available for allocation. This concern can be mitigated by tightening the UIOLI rules.

32. Periodic capacity auctions of standardised capacity products, coupled with prohibition of all capacity to be auctioned at once, provides new market participants with the opportunity to bid and compete with existing participants for capacity rights. However, a drawback of periodic capacity auctions is the higher administration cost.

33. The approach of attaching capacity rights to the traded gas commodity, as in the Victorian DWGM, would facilitate gas trading as it removes a potential constraint in trading of gas in the SGTM. This approach would consequently enhance market depth and liquidity. However, this type of capacity arrangement does not provide Shippers with firm physical capacity rights, but rather firm financial capacity rights. Some stakeholders may have concern on the uncertainty in securing the required pipeline capacity to flow gas arising from their heavy reliance on natural gas to fuel electricity generation or production processes. This concern could be addressed if generation companies or industry users make bids and offers for gas in a manner that ensures they are dispatched. In addition, updates on available unscheduled and uncontracted capacity could be published more frequently, without compromising commercial confidentiality. This would provide market participants with greater certainty that their trades would not be constrained.

Feedback sought

(VII) Would there be interest in being able to book interruptible capacity in today's gas market?

(VIII) Is there a preference among the following options:

i. Model our capacity allocation arrangements after that of the Victorian model: SGTM-traded gas will come with capacity rights; and all Shippers only have interruptible capacity rights; or

ii. Maintain status quo whereby Shippers will obtain their capacity rights from the Transporter outside the SGTM. This implies that Shippers will be able to obtain firm physical capacity; and

iii. If Option (ii) is preferred, move away from the 'first come, first served' model and transition to auctioning of capacity. Auctioned capacity would be firm physical capacity.

Design Parameter 5: Establishing an Exchange for Gas Trading

34. Gas trading in Singapore currently occurs via Over-the-Counter ("OTC") agreements that are bilaterally negotiated. Once an agreement is struck, the counterparties take the necessary actions to execute the trade, such as arranging firm transmission capacity (if not already in place), making gas injection/offtake nominations and undertaking invoicing and settlement.

35. This method of trading gas can be slow because of the time required to invite offers, evaluate multiple offers and make the necessary arrangements to execute the trade. It may not be able to facilitate dynamic gas trading under the SGTM, particularly for the purchasing/selling of shortfall/excess gas (e.g. within-day trading that is needed for gas balancing purposes).

36. Bilateral trading has two other drawbacks. There is no publicly visible price to act as a reference point for parties contemplating possible trades, and parties are unable to post offers anonymously (unlike trading via an exchange). Both of these factors tend to reduce market depth and liquidity.

International Experience with Market Platforms

37. Jurisdictions with frequent trading typically utilise a platform-based arrangement like an exchange, where "buy" and "sell" offers can be posted anonymously for a range of standard products (such as physical gas delivered for the day-ahead).

38. The provision of a market clearing service where the exchange acts as counterparty for all trades facilitates the anonymous presentation of offers, and allows counterparty risk to be dealt with efficiently.

39. EMA prefers the SGTM trades to be implemented via an exchange. Interested parties could post “buy” and “sell” offers with corresponding quantities and prices. The offers would be cleared by the GMO by matching the offers and the price will be set based on the marginal offer cleared. The GMO would then act as counterparty to both buyer and seller for the trade.

Feedback sought

(IX) Should an exchange be implemented to facilitate trading under the eventual SGTM conceptual design?

SECTION 2: PROPOSED ROADMAP FOR TRANSITIONING TO EVENTUAL SGTM CONCEPTUAL DESIGN

1. Overseas jurisdictions have typically required years to transition from bilateral OTC gas trading to a well-functioning SGTM. The transition in Singapore is also expected to take a number of years, and it will be an evolutionary, rather than revolutionary, process.

2. The pace of SGTM development are influenced by wider factors including:

a) Decisions on the five key design parameters as set out in Section 1 of this paper;

b) Contractual constraints – for example, the presence of on-selling restrictions and destination clauses in existing gas contracts that could inhibit the free trade of gas; and

c) Physical constraints – for example, the different pressure regimes of Transmission Network 1 and Transmission Network 2 will have to be harmonised to enable physical trading of gas across the two networks.

SGTM Roadmap

3. A phased approach is proposed for developing the trading platform to support the SGTM, starting with a relatively simple bulletin board and progressing to a cleared market. Table 1 sets out the main steps in the proposed transition.

Table 1: Transition steps for SGTM trading platform

	Market design step	Description	Trigger for transition to this step
1.	*Day-ahead products traded on a Bulletin Board*	Bulletin Board operated by GMO for matching buyers and sellers for day-ahead quantities using a standard contract.	When GMO has a Bulletin Board and Master Agreement for standard products in place
2.	*Cleared market*	Introduce a central counterparty (possibly the GMO) to clear all transactions and establish prudential requirements.	When GMO has systems in place and has considered prudential requirements.
3.	*Market-based balancing*	Require all balancing gas to be procured by the balancing agent via the trading platform.	When the regulator and industry players are confident that the market has sufficient depth and liquidity for Residual Balancing.
4.	*Eventual design*	Electronic exchange for gas trading and balancing at a virtual hub.	Introduction of entry-exit pricing on the main transmission pipelines.

Industry Working Group for SGTM Development

4. The successful development of the detailed design parameters for the SGTM, and the implementation of the transition towards the SGTM, would require industry feedback and

participation. Hence, EMA proposes to set up an Industry Working Group comprising representatives from the Government agencies and potential gas market trading participants by April 2016. The Industry Working Group, to be chaired by EMA, will formulate the implementation details of the recommendations.

Feedback sought

(X) Who should be represented in the Industry Working Group to work out the details of the SGTM recommendations? Industry players may indicate their interest to be part of the Industry Working Group.

Workstreams to Implement the SGTM Transition

5. The Industry Working Group would deliberate on the feedback received on this paper, and translate the feedback into actionable items. EMA envisages that four workstreams will be needed to take the first step towards the eventual SGTM conceptual design:

a) Improving liquidity and enhancing gas balancing arrangements;

b) Facilitating access to transmission pipeline capacity;

c) Establishing the roles of the GMO that will be responsible for operating the SGTM platform; and

d) Facilitating secondary gas trading via the establishment of a trading platform.

Workstream 1: Improving Liquidity and Enhancing Balancing Arrangements

6. This workstream will study methods to enhance the liquidity for SGTM such as removing barriers to trade (e.g. on-selling restrictions in gas contracts).

7. The workstream will also look at ways on how to incentivise self-balancing, which could also provide more liquidity for SGTM. Market participants will also need to receive accurate and timely information on their actual and projected imbalance positions so that they can take corrective action if required to self-balance.

Feedback sought

(XI) How should the transition path for balancing incentives be like? In particular:

i. Aside from ensuring that Shippers have access to timely and accurate information on imbalances, what other factors should be considered for the transition?

ii. What are the possible ways to incentivise self-balancing?

Workstream 2: Facilitating Access to Transmission Pipeline Capacity

8. EMA is currently pursuing initiatives to improve access to transmission pipeline capacity. For example:

a) Gas industry players responded positively to EMA's earlier consultation paper in May 2015 to revise the pipeline capacity calculation methodology to improve the utilisation of the pipeline capacity.

b) EMA plans to interconnect Transmission Networks 1 and 2, which would improve connectivity of the pipeline networks in the longer term when the two different pressure regimes are harmonised.

9. The main objectives of these initiatives are to improve the access to pipeline capacity and ensure that gas traded bilaterally or on the SGTM is able to flow to the market participants. While EMA is working closely with the industry on these initiatives, it is also pertinent to work on providing greater transparency to the pipeline capacity-related information.

Providing greater transparency of pipeline capacity information

10. Information relating to network capacity should be made available unless there is a good reason for not doing so (e.g. not to prejudice the commercial position of the party who supplies the information). The availability of timely and accurate information enables buyers and sellers to make better-informed decisions.

11. The following list could act as a starting point for assessing what physical capacity information could be published for all gas users, for all relevant points on the transmission pipeline network:

a) Maximum physical capacity at entry points;
b) Total contracted firm and interruptible capacity;
c) Available capacity for a period of at least 18 months ahead, with this information to be updated at least every month;
d) Rolling long-term forecasts (up to 10 years ahead) of available capacities;
e) Aggregated data on nominated and forecast gas flows for all receipt and delivery points over the next seven days;
f) Aggregated data on actual gas flow for all receipt and delivery points;
g) User information including nameplate and consumption data (MMBtu/hour), so long as the publication of such data would not reveal confidential information about that user's production process (e.g. user consumption data can be at a daily resolution);
h) Information on the methodology and key assumptions used to calculate pipeline capacity; and
i) Clear information on pipeline operating and capacity management procedures (balancing, curtailment, etc).

12. Information on pipeline capacity trading may also need to be published to facilitate pipeline capacity trading. For example, price and quantity information relating to historical

bids, offers and cleared prices could be published to enable market participants to make an informed decision before bidding for the capacity in the next period. This information should be anonymised to protect commercial confidentiality.

Feedback sought

(XII) What pipeline capacity information could be useful, and what principles should be applied to publishing capacity data (e.g. to what level should the data be aggregated).

Workstream 3: Appointment of an SGTM Gas Market Operator

13. PowerGas Ltd, as the Transporter, is responsible for the transportation of gas through Singapore's gas pipeline network. PowerGas also undertakes some trading-related activities today. Specifically, it facilitates, via an electronic bulletin board:

a) The secondary trading of firm capacity rights between gas market participants; and

b) Cumulative CV transfers between gas market participants.

14. Significant changes to the Transporter's trading function would be required if it were to operate the eventual SGTM. Under the eventual SGTM conceptual design, the GMO may conduct the following functions:

a) Publishing certain market information (e.g. bids and offers, market prices, quantities settled);

b) Clearing and settling market trades;

c) Managing prudential requirements for SGTM trading; and

d) Market monitoring and administering market rule changes.

Internationally SGTM GMOs are often independent entities

15. Overseas experience points to SGTM operators typically being independent entities (e.g. Belgium, UK, New Zealand, and the USA).

16. This outcome is not only because of the different expertise required to establish and operate a successful gas market, but also for ease of implementation. To get the gas market up and running quickly, it has been simpler and more expedient to appoint an independent GMO which would then "bolt" itself on to existing market arrangements and cooperate with the Transporter, instead of transforming the existing Transporter into an integrated Transporter/GMO.

17. The DWGM in Victoria, Australia is an exception. The government-led initiative that established this market placed all of the central service provision roles (Transporter and GMO) within one entity that is independent of gas shippers, traders and the pipeline owner.

SGTM GMOs use different expertise compared to Transporters

18. The skill-set for operating an organised exchange for the secondary trading of gas differs from that for operating gas networks. Operating an SGTM is more heavily reliant on commercial expertise in areas such as finance, economics and trading, rather than on engineering expertise. This is particularly so when trading arrangements become more complex.

SGTM GMOs and Transporters have different organisational cultures

19. SGTM GMOs and Transporters typically have different organisational cultures. Transporters are expected to err on the side of caution. Reliability and security of supply are paramount. On the other hand, SGTM GMOs look for ways to increase depth and liquidity on their respective exchanges. To achieve this, a SGTM GMO may want a Transporter to operate the network less conservatively, or to invest in the network to increase physical capacity or connect more users. While some of these actions may be in the Transporter's interest, others may not – particularly operating the network in a less conservative manner.

20. Having the market operation and network operation roles in separate organisations is expected to enable a healthy tension and give rise to more innovation in the trading arrangements, than if the roles were in the Transporter.

Feedback sought

(XIII) Should the GMO role be independent of the Transporter role in Singapore?

Process of selecting the GMO

21. It is important to involve the GMO as soon as possible in the development of SGTM so that the GMO can engage the following key stakeholders early:

a) **EMA** – To define GMO's exact scope, enabling legislation/code changes, and working out regulated revenue framework.

b) **PowerGas** – To understand PowerGas' existing systems and processes, and work out the framework for resource/system/personnel transfer.

c) **Industry** – To ensure the market is tailored to the industry's requirements through a series of industry workshops.

22. It would be preferable for the GMO to be appointed before the Industry Working Group refines the recommendations on SGTM for implementation. The GMO could be appointed via a competitive process through a Request for Proposal ("RFP") or by having the industry to choose their preferred GMO.

Feedback sought

(XIV) What should be the process for the appointment of the GMO?

Workstream 4: Creating an SGTM Platform

23. The finalised SGTM platform will take years to develop. Nevertheless, it is possible for Singapore's gas market to derive some benefits from the secondary trading of gas by implementing an initial SGTM platform that would eventually evolve into the finalised SGTM platform. This would also give time for gas industry players to acclimatise to a more dynamic trading market.

24. The creation of the initial SGTM platform requires:

a) Establishing a physical trading hubs for a start; and

b) Establishing a Bulletin Board and standard product.

Establish one or two physical trading hubs for a start

25. Whilst the concept of a virtual hub is being considered and developed, the initial trading market could be based on one or more physical trading hubs.

26. Trading at either one or two physical hubs is proposed as a first step towards the eventual SGTM conceptual design. The Sakra Onshore Receiving Facility ("ORF") and the Jurong Island LNG Terminal are identified as well-connected locations that maximise the opportunities for trading between multiple participants taking gas supply at these points.

27. Choosing one of these points as the physical hub for the initial Bulletin Board SGTM trading platform would encourage liquidity at that trading point. On the other hand, limiting trading to only one point may make it more difficult for some parties to trade. The on-selling restrictions applying to some of the Piped Natural Gas ("PNG") agreements supplied via Sakra suggests that the Jurong Island LNG Terminal would be the logical choice if only one trading hub is chosen.

Feedback sought

(XV) Should there be one or two physical gas trading hubs as a first step towards transitioning to the eventual SGTM conceptual design; and if only one hub, whether it should be at the Sakra ORF or the Jurong Island LNG Terminal?

Establish a Bulletin Board and standard product

28. The pace of transition in platform arrangements would depend on (and influence) the rate at which depth and liquidity develop in the SGTM.

Initial SGTM trading platform

29. A bulletin board (or 'matching' platform) is proposed as the first step because it would be lower in costs and straightforward to implement, compared to a cleared exchange.

30. The proposed platform would operate as follows:

a) Participants would identify which parties meet their prudential requirements (i.e. potential counterparties with a satisfactory creditworthiness for trading purposes) – this would form a "whitelist" of parties that can be matched with each other on the platform;

b) Participants would enter offers to buy or sell gas on to the platform. Offers would specify a price, volume, delivery date(s), and trade location (i.e. Sakra ORF or Jurong Island LNG Terminal); and

c) Offers and bids that are accepted and that meet whitelist criteria would form a binding contract between parties and the platform would record the match and advise both parties of the matched trade.

31. Once a trade is matched, the trading parties would be responsible for making the necessary arrangements to effect, verify and settle the trade, using the normal mechanisms that are already in place to give effect to OTC trades.

Standard product design

32. For the initial SGTM trading platform, it is proposed that only day-ahead products be offered. These could be offered from one day ahead, out to one month ahead (or more) depending on demand. The minimum trading size would be 1 MMBtu per hour for 24 hours.

33. It would be desirable to also offer 'on-the-day' products, as these will facilitate self-balancing by participants.

Feedback sought

(XVI) Is there a need for an initial bulletin board and what products should be offered during the initial SGTM trading platform?

SECTION 3: SUMMARY LIST OF QUESTIONS

1. This paper has raised a number of specific questions that EMA seeks feedback and comments on. These questions are summarised below for ease of reference.

The eventual SGTM conceptual design

(I) Should a Net or Gross Market approach be adopted for Singapore's eventual SGTM conceptual design?

(II) What are the pros and cons of transitioning to a Primary Balancing and Residual Balancing arrangements, with a balancing agent conducting Residual Balancing to resolve system imbalances?

(III) How could Shippers be incentivised to conduct Primary Balancing?

(IV) Who could be appointed as the balancing agent?

(V) Should Singapore adopt a virtual or physical gas trading hub as part of its eventual SGTM conceptual design?

(VI) What are the pros and cons for adopting separate entry and exit capacity bookings, which will therefore have corresponding differences in pipeline tariffs?

i. Can a virtual trading hub be achieved without changing the pipeline capacity booking regime?

ii. What would be the difficulties faced by Shippers if there are separate entry and exit capacity bookings? Are there ways to overcome these difficulties?

(VII) Would there be interest in being able to book interruptible capacity in today's gas market?

(VIII) Is there a preference among the following options:

i. SGTM-traded gas will come with capacity rights; and all Shippers only have interruptible capacity rights.

ii. Maintain status quo whereby Shippers will obtain their capacity rights from the Transporter outside the SGTM. This implies that Shippers will be able to obtain firm physical capacity.

iii. If Option ii) is preferred, move away from the 'first come, first served' model and transition to auctioning of capacity. Auctioned capacity would be firm physical capacity.

(IX) Should an exchange be implemented to facilitate trading under the eventual SGTM conceptual design?

The SGTM roadmap

(X) Who should be represented in the Industry Working Group to work out the details of the recommendations?

(XI) How should the transition path for balancing incentives be like? In particular,

i. Aside from ensuring that Shippers have access to timely and accurate information on imbalances, what other factors should we considered for the transition?

ii. What are the possible ways to incentivise self-balancing?

(XII) What pipeline capacity information could be useful in Singapore's gas market and what principles should be applied to publishing capacity data (e.g. to what level should the data be aggregated)?

(XIII) Should the GMO role be independent of the Transporter role in Singapore?

(XIV) What should be the process for the appointment of the GMO?

(XV) Should there be one or two physical gas trading hubs as a first step towards transitioning to the eventual SGTM conceptual design, and if only one hub, whether it should be at the Sakra ORF or the Jurong Island LNG Terminal?

(XVI) Is there a need for an initial bulletin board and what products should be offered during the initial SGTM trading platform?

Smart Energy, Sustainable Future

PREPARING FOR FUTURE

POWER GENERATION INVESTMENTS IN SINGAPORE

CONSULTATION PAPER

Closing date for submission of comments and feedback:

21 December 2015

26 October 2015

ENERGY MARKET AUTHORITY
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SINGAPORE 119975
www.ema.gov.sg

Disclaimer:

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TABLE OF CONTENT

EXECUTIVE SUMMARY

1. The liberalisation of the electricity industry over the last two decades has resulted in a significant change in the fuel mix for power generation for Singapore. The National Electricity Market of Singapore ("NEMS") is designed to promote the efficient supply of competitively-priced electricity through encouraging efficient investments in the power system infrastructure. Since its inception in 2003, it has attracted commercial investments through the planting of new generation capacity which are predominantly gas-fired. The shift from the use of fuel oil to natural gas has benefited electricity consumers as the higher efficiency levels of the gas-fired plants have reduced the cost of electricity production, while resulting in a more environmentally sustainable carbon footprint.

2. The Energy Market Authority ("EMA") seeks to work with the industry to further facilitate power generation investment decisions in Singapore through making available more information and providing greater visibility to investors. This consultation paper consists of three key sections: i) the proposed information that the EMA hopes to put out on the long term outlook of the energy market; ii) proposed enhancements to the regulatory approval process for new and existing generation assets to give greater visibility on the capacity coming on-stream; and iii) a proposed framework to allocate land for new generation assets.

3. Given the high capital cost, significant lead time and long pay-back period for power generation investments, there is a need for a long term view on the outlook of the energy landscape in Singapore. While the EMA has been proactive in providing market information such as energy generation and consumption to facilitate planning, there is scope for the EMA to enhance longer horizon visibility for efficient investments to take place. The EMA therefore proposes to share with the industry its view of the longer term outlook of the sector. This could include projected growth of electricity system demand, as well as an indicative mix of generation sources (gas-fired plants, solar, electricity imports etc.) in 2030 based on technology developments, evolving business models and broader policy considerations.

4. In line with the above, the EMA also intends to provide guidance on the staging horizon of the different generation sources. To improve supply reliability and network utilisation through the diversification of the geographical locations of power plants, the EMA's preference is to facilitate the next tranche of planting in the north-eastern part of Singapore.

5. The EMA is also reviewing the regulatory approval process for new and existing generation assets, with the objective of providing greater visibility on the total generation capacity on a forward-looking basis. One proposal is for generation licensees or new investors to submit binding plans for retirement, repowering, life extension or new planting of generation assets. The aggregated data could be put out so that there is visibility on the net new capacities that will be coming on-stream. This would help mitigate the risk of oversupply (where investors rush to plant without factoring in other investors' decisions), as well as undersupply (where investors delay investment decisions because of the uncertainty around other investors' decisions).

The EMA is also open to other suggestions on how to enhance the regulatory framework for generation plans and investments, with the goal of creating a more conducive investment climate.

6. The EMA has safeguarded land for the development of new power plants to meet Singapore's future energy needs. We propose a framework for allocating utility land to new investors. Under this framework, the EMA will indicate the land available for power generation planting. A potential investor can trigger the process by writing to the EMA to express interest to build new generation capacity. The EMA will then conduct an open call to invite the industry to participate in the Invitation-to-Invest ("ITI") exercise for that site. In the event that there is only one interested investor, it will be awarded that site at the market price of the land as valued by the Chief Valuer. However, if there is more than one interested investor, a Request-for-Proposal ("RFP") would be called. Possible criteria for evaluation of the proposals include power density for the land requested, efficiencies of the proposed technologies, and the price of the land. The EMA seeks views on the process of the proposed land allocation framework as well as the selection criterion for the RFP process.

Consultation Process

1. The EMA invites comments and feedback to the consultation paper. Please submit written feedback to ema_policy@ema.gov.sg by 21 December 2015 (5pm). Alternatively, you may send the feedback by post/fax to:

   Policy Department
   Energy Planning and Development Division
   Energy Market Authority
   991G Alexandra Road, #01-29
   Singapore 119975
   Fax: (65) 6835 8020

2. Anonymous submissions will not be considered.

3. The EMA will acknowledge receipt of all submissions electronically. Please contact Annabelle Chan at 6376 7523, He Songhua at 6376 7473 or Lyana Yeow at 6376 7624 if you have not received an acknowledgement of your submission within two business days.

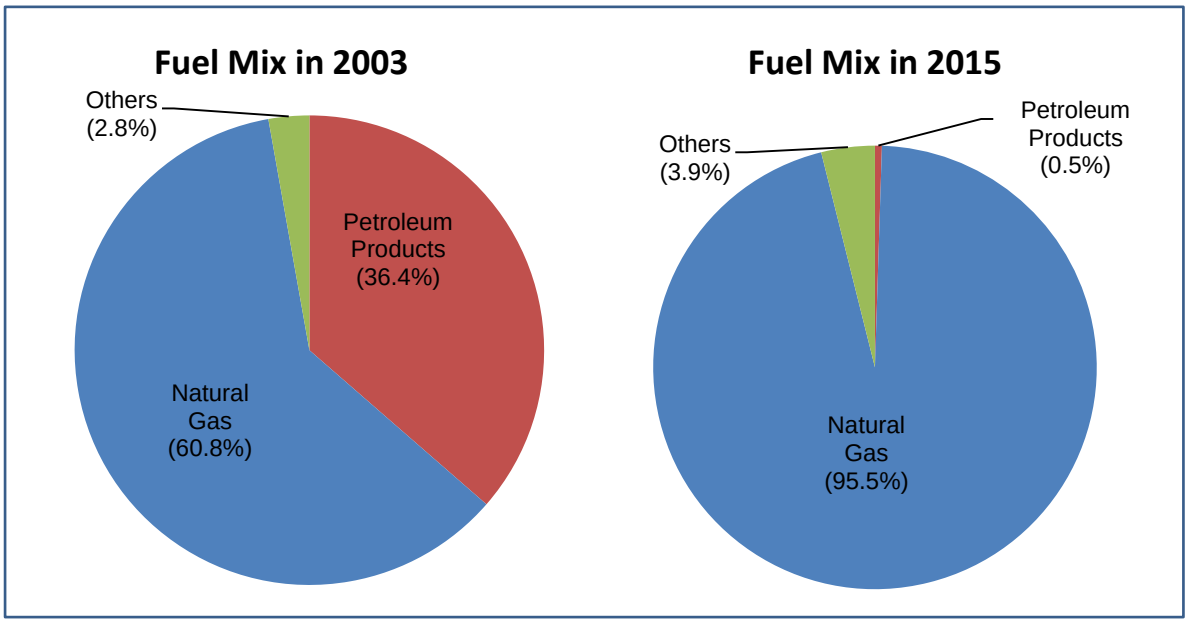
4. The EMA can facilitate meetings with stakeholders on an individual basis to discuss their feedback to this consultation paper. Please contact the EMA via ema_policy@ema.gov.sg if you wish to arrange a meeting.

5. The EMA reserves the right to make public all or parts of any written submissions made in response to this consultation paper and to disclose the identity of the source. Any part of the submission, which is considered by respondents to be confidential, should be clearly marked and placed as an annex which the EMA will take into account regarding the disclosure of the information submitted.

SECTION 1 BACKGROUND

1.1 Over the past two decades, Singapore has gradually restructured and liberalised the electricity industry. The NEMS, which was formed in 2003, is designed to promote the efficient supply of competitively-priced electricity, through encouraging efficient investments in the power system infrastructure and the gradual opening up of the retail market for competition. The fuel mix for Singapore's electricity generation has also changed significantly since the start of the market, as a result of gencos switching away from the older fuel oil-fired steam plants and making commercial investments in new gas-fired plants (see Diagram 1 for the fuel mix comparison between 2003 and 2015). The shift of the fuel mix towards natural gas has brought about tangible benefits for Singapore. The higher efficiency level of the gas-fired plants – about 50% for gas-fired plants compared to about 30% for fuel oil-fired steam plants – has reduced the cost of electricity production and put downward pressure on electricity wholesale prices, benefiting electricity consumers. In addition, as gas-fired plants have significantly lower carbon emissions (about 0.412 tCO_2/MWh) compared to fuel oil-fired steam plants (about 0.897 tCO_2/MWh), the introduction of more gas-fired plants in the electricity market has enhanced the environmental sustainability of the power generation sector.

Diagram 1: Fuel mix comparison between 2003 and 2015[1]



1.2 In Singapore's liberalised market environment, power generation investments are commercially driven. Prices in the electricity market send signals to investors to make investment decisions with respect to the timing of new plantings, as well as the amount

[1] Data for 2015 as of 1Q 2015

of capacity and the type of technology. For example, when the supply in the market is tight (relative to electricity demand), the market will signal the need for more investments through higher electricity wholesale prices. The prices provide the incentives for investors to plant in the market, and the new generation supply coming on-stream as a result of an investment corrects the price signals in the market accordingly. The outcome is a more efficient process of investment decisions, which is one of the key objectives of Singapore's liberalisation of the electricity industry.

1.3 The EMA is cognizant of characteristics of the power generation industry, such as the high capital cost, significant lead time required for power generation planting (typically 3-4 years for a greenfield site), as well as the long pay-back period. Hence, more information on the longer term outlook of the sector can potentially enable investors to make better informed decisions for efficient investment plantings.

1.4 In addition, there are externalities which even a well-functioning market would not be able to address effectively, such as energy security and environmental sustainability. Therefore, there is also a need for the EMA to ensure that the objectives of the energy "trilemma" – energy supply for Singapore which is competitive, secure and environmentally sustainable – are balanced, and achieved. Going forward, the development of new technologies and business models will open up more choices for Singapore through the deployment of advanced power generation technologies, renewable energy technologies such as solar power, as well as electricity imports. Hence, the EMA intends to work closely with the industry to shape a secure, competitive and environmentally-sustainable energy landscape for Singapore.

1.5 Up to now, power generation investors have directly approached Jurong Town Corporation ("JTC") to secure industrial land for the construction of their plants[2]. To ensure that there will be sufficient land for planting to meet the increase in electricity demand in future, the EMA has worked with relevant agencies including the Urban Redevelopment Authority ("URA") to safeguard utility land parcels for new power plant development. The EMA is formulating the policy and the process for allocating land for commercial power plants to interested investors, with the view of optimising our land use to meet future energy needs.

1.6 Taking the above developments into consideration, this consultation paper has been developed to seek views from the industry on the following:

(i) The proposed information that the EMA hopes to put out on the long term outlook of the energy market to facilitate power generation investments;

(ii) Proposed enhancements to the regulatory approval process for new and existing generation assets, so as to give better visibility of total generation capacity on a forward-looking basis; and

(iii) A proposed framework to allocate land for new generation assets.

[2] Typically co-generation plants that produce steam used for industrial processes.

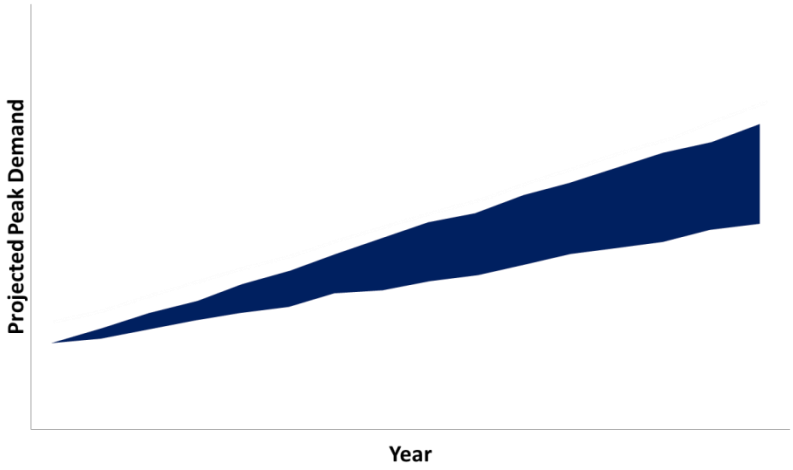
SECTION 2 PROPOSED INFORMATION FOR POWER GENERATION INVESTMENTS

2.1 To allow the industry to better ascertain the longer-term market outlook for the power generation industry, relevant and timely information is needed to enable investors to make informed investment decisions. To achieve this objective, the EMA proposes to put out information on future electricity system demand, indicative future mix of generation sources (gas-fired plants, solar, electricity imports etc.), as well as the possible staging horizon for the different sources. The information will thereafter be updated on a periodic basis[3].

2.2 **Indicative Future Electricity System Demand:**

2.2.1 The EMA proposes to share with the market the projected electricity system demand[4] over the next 15 years. This takes into consideration drivers of system demand, such as trends in growth of Gross Domestic Product ("GDP"), population changes and potential reduction in electricity consumption due to efforts such as energy efficiency. Diagram 2 shows an illustration of how the indicative future electricity system demand could be put out to the industry.

Diagram 2: Illustration of indicative future electricity system demand



[3] The proposed information to be put out is intended to serve as a broad and non-binding reference, as it will evolve based on factors such as prevailing assumptions and projections, policy considerations and geopolitical climate. The EMA will undertake periodic reviews of the information, which are subject to changes from time to time.

[4] System demand is the total electricity demand in Singapore, including the works units as well as transmission and distribution losses but excluding the demand met by embedded generators.

2.3 **Indicative Future Mix of Generation Sources for Singapore:**

2.3.1 The EMA proposes to indicate how the future mix of generation sources could look like over the next 15 years, taking into account projected technology developments, evolving business models and broader policy considerations. Investment decisions in the electricity market will ultimately still be commercially driven. As such, the indicative mix is intended as a broad reference to help potential investors make informed decisions, and can be expected to change from time to time.

2.3.2 The indicative mix will also take into account our commitments on climate change. In anticipation of the United Nations Framework Convention on Climate Change ("UNFCCC")'s 21st Conference of the Parties ("COP") meeting in Paris in December 2015, Singapore has submitted its Intended Nationally Determined Contribution ("INDC") that aims to reduce our Emissions Intensity by 36% from 2005 levels by 2030, and stabilise our emissions with the aim of peaking around 2030[5].

2.3.3 The switch from fuel oil to natural gas has benefited electricity consumers through the lowering of the cost of production of electricity, while at the same time significantly reducing the overall carbon footprint (given that carbon emissions from the power generation industry amounts to about 46% of total carbon emissions[6]). Natural gas will likely continue to play a dominant role in the indicative mix for the power generation sector. Going forward, based on projected improvements in Combined Cycle Gas Turbine ("CCGT")-related technologies, the efficiencies of new power plant investments (either new plantings or repowering projects) would be expected to improve over time. Higher efficiencies translate into lower costs of production of electricity, which provide the incentives for gencos to adopt such technologies to compete more effectively in the electricity market. Hence, it is likely that more advanced technologies will be deployed for new investments, which will benefit electricity consumers directly through efficiency gains, while contributing to further reductions in carbon emissions.

2.3.4 Electricity imports can also potentially improve the competitiveness of electricity prices in Singapore, and is an option that the EMA is considering as part of the overall mix.

2.3.5 Of all the renewable energy options, solar energy has the highest potential for Singapore, as the country is located within the tropical sunbelt with relatively good irradiance levels. Deploying more solar energy is advantageous from the perspective of the energy trilemma: it produces no emissions, it enhances Singapore's energy security by reducing the amount of fuel required to be

[5] More information on Singapore's INDC is available here: https://www.nccs.gov.sg/news/singapore%E2%80%99s-submission-united-nations-framework-convention-climate-change-unfccc

[6] More information on Singapore's carbon emissions can be found in Singapore's Third National Communication and First Biennial Update Report published in December 2014.

imported for electricity generation and boost economic competitiveness by potentially reduce wholesale electricity prices as solar energy production typically coincides with the peak energy usage of the system. However, solar energy is also variable and dependent on weather conditions. For example, a moving cloud could cause a sudden drop in solar energy output, which means that conventional generators need to be on standby to make up for the shortfall. Hence, the growth of solar generation must be balanced by the requirement to manage such technologies to ensure the stability of the power grid. As the technology of solar improves over time, the cost of solar generation installations will be reduced and greater deployment of solar resources could be expected. There has already been considerable growth in the number of solar installations and overall solar capacity since 2008 (see Diagram 3). There could also be a small percentage of the overall mix attributable to other sources of generation, such as waste-to-energy and coal-biomass plants.

2.3.6 Beyond these options, the EMA remains open to other fuel sources and technologies which can similarly achieve Singapore's climate change commitments[7]. Examples could include, but are not limited to, solar farms, coal combined with carbon capture-related technologies and biomass.

2.3.7 The EMA welcomes suggestions from the industry on other possible energy options for Singapore that are beneficial to our energy security and price competitiveness, while meeting our climate change commitments. Diagram 4 shows an illustration of how the indicative future mix of generation sources could be put out to the industry.

[7] For projects which utilise technologies with electricity as a by-product, the EMA will consider and support these projects on a case-by-case basis in consultation with the relevant government agencies

Diagram 3: Growth in the number of solar installations and overall solar capacity[8] from 2008 to Q3 2015

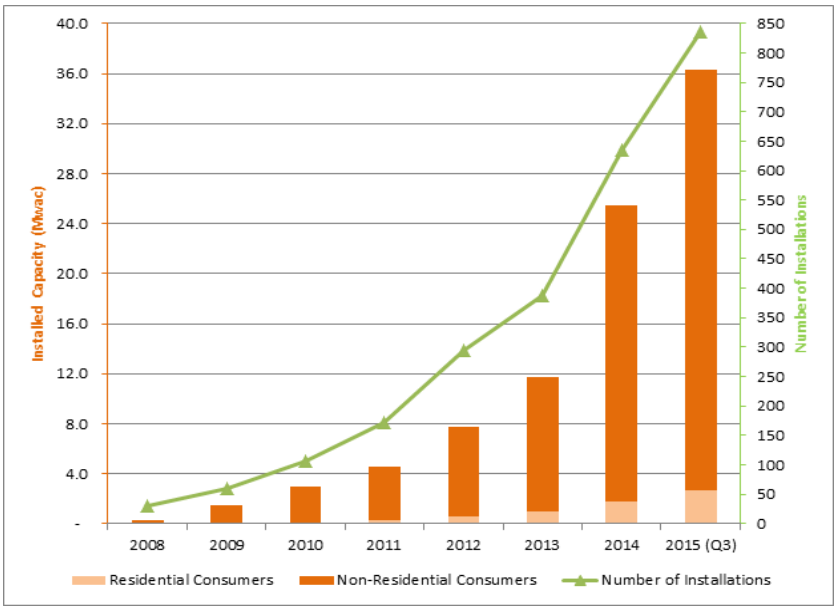
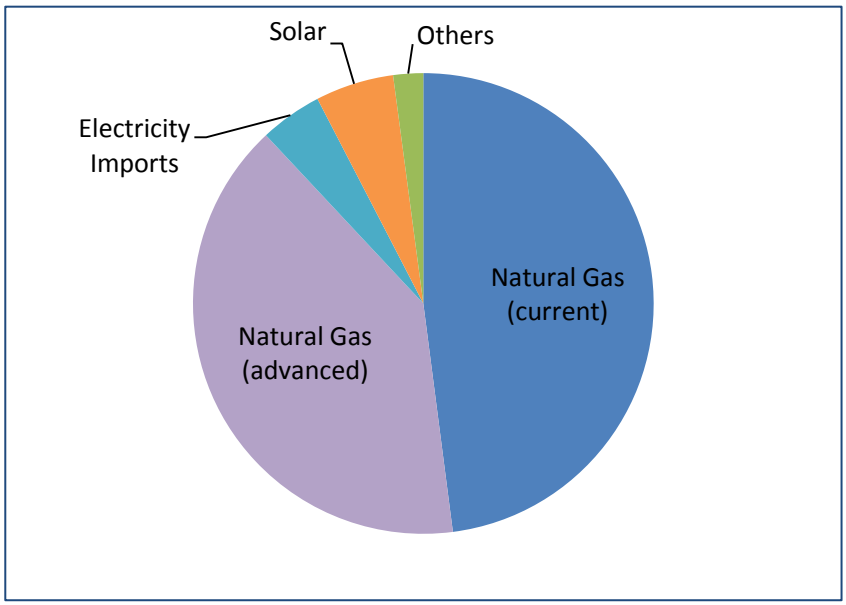


Diagram 4: Illustration of indicative future mix of generation sources for Singapore



[8] MWac is used here as a basis for comparison with capacity sizes of conventional power plants.

2.4 **Staging Horizon for the Different Types of Planting:**

2.4.1 The EMA also proposes to provide guidance to the industry on the staging horizon of the different types of planting.

2.4.2 The EMA's preference is for the next tranche of additional generation capacity to be on a site that has been set aside under the proposed land allocation framework. Specifically, the EMA's preference is to make available the first site of land in the north-eastern part of Singapore for 800 – 1000 MW of new generation capacity. Doing so has the advantage of enhancing Singapore's energy security, particularly since the current generation capacity is concentrated in the western region. Diversifying the geographical locations of power plants will improve supply reliability and network utilisation.

2.4.3 Solar is expected to continue to grow with improvements in technology. As for repowering of existing generation assets, this can take place at any point in time. However, the generation licensees are to submit their plans based on the enhanced framework proposed in Section 3 of this consultation paper.

SECTION 3 PROPOSED FRAMEWORK ON LICENSEES' GENERATION PLANS

3.1 To enable investors to make informed decisions in a functioning market, the EMA is cognizant that relevant information should be made available in a timely manner. Uncertainty arising from the information gap may lead to sub-optimal outcomes. For example, investors may overinvest because investments have not taken into account other investors' decision, causing an oversupply in the market and depressed electricity prices which are not sustainable. The converse is also possible, where uncertainty in the investment landscape results in inadequate generation investment, resulting in sustained high prices or even inadequate generation capacity. Hence, it is important for the EMA as the regulator and developer of the electricity and gas sectors to provide sufficient information to facilitate a conducive investment environment. This will enable generation planting to be carried out in a timely and sustainable manner.

3.2 Currently, approval from the EMA is necessary for the generation licensees to retire, repower or extend the life of their existing generation plants. However, no specific lead time is required of the licensees to submit their generation plans. There is also no good market visibility of the capacity that will be coming on-stream. A summary of the current requirements is shown in Table 1.

Table 1: Current requirements on generation plans

Generation Plans	Current Requirements
a. Retirement[9]	• The licensee is required to seek the EMA's approval for the decommissioning of generation plants. • There is no minimum lead time the licensee needs to provide between the date of application for approval and the proposed retirement date. • The licensee needs to comply with the Transmission Code, Market Rules and System Operation Manual throughout the process.
b. Repowering[10]	• The licensee needs to seek the EMA's approval for repowering plans. • The licensee needs to submit a plan indicating the timelines for the retirement of an existing generating unit and the commissioning of a new generating unit. • There is no minimum lead time the licensee needs to provide between the date of application for approval and the proposed decommissioning date and Commercial Operation Date ("COD"). • The licensee needs to comply with the Transmission Code, Market Rules and System Operation Manual throughout the process.
c. Life Extension[11]	• The licensee does not need to seek approval from the EMA. • The licensee needs to comply with the Transmission Code, Market Rules and System Operation Manual throughout the process.
d. New Generation	• A potential investor needs to apply for a generation licence, and is required to provide details including the generation plans (such as the COD) and relevant financial information. • An existing generation licensee seeking to expand its generation capacity needs to seek the EMA's approval and provide details of the generation plans. • New and existing licensees need to comply with the Transmission Code, Market Rules and System Operation Manual throughout the process.

[9] This refers to the decommissioning of an existing generation unit, which leads to a reduction in electricity supply in the system.

[10] This refers to the decommissioning of an existing generation unit, which is subsequently replaced with a commissioning of a new generation unit.

[11] This refers to the operation of an existing generation unit (including refurbishment of the plant) even though it has reached the end of its economic lifespan.

3.3 There are inherent challenges faced by investors under the current framework. Firstly, an investor may not be aware of the decisions of other investors, resulting in a sub-optimal and inefficient outcome. For example, an incumbent licensee may apply for the repowering of an existing plant for the EMA's approval because it has assessed that there is a shortfall of capacity in the market. A new investor may submit an application to the EMA at the same time for a new generation project on the same basis. The EMA will only take into consideration regulatory factors, such as the technical requirements and financial standings – if these requirements are fulfilled, the approvals will be granted. This is consistent with the approach of leaving investment decisions (including timing) to the market participants based on their own commercial calculations. However, the effect is that both projects could proceed without each investor being aware of the decision of the other investor, resulting subsequently in an oversupply situation.

3.4 Secondly, while the approvals may be granted by the EMA, the investors are currently allowed to shift the COD of the generation plans, which adds further to the uncertainty for the industry. Building on the earlier example, both investors may decide to delay their generation plans after learning about their respective approvals to avoid an oversupply situation. This could then result in a tight supply situation even though there are investors willing to plant. The coming years' situations described could potentially be avoided with appropriate refinements to the regulatory approval process to provide more visibility to the industry.

3.5 One proposal could be for licensees or new investors to submit plans which are binding. For example, an incumbent generation licensee would be required to submit their plans (such as the retirement, repowering, life extension or new generation) to the EMA at least, say 4 years ahead of time. The EMA's approval, after taking into consideration the relevant requirements, could be conditional on that licensee executing the plans within a year from the approval, failing which penalties may be imposed, such as the revocation of the approval for the plan. This would similarly apply to new generation licensees with new plantings in Singapore. The EMA may also consider the track record of the companies which are making the investments from the perspective of adhering to the schedules. For example, a licensee which had previously failed to comply with the schedule of their approved generation plans will be assessed unfavourably in subsequent applications. This is to increase the incentives for companies to adhere to their approved generation plans. Having sight of the plans ahead of time, the EMA could regularly publish, on an aggregated basis, the expected net generation capacity that will come on-stream in the coming years.

3.6 There are advantages for such a proposed approach. Firstly, the overall power generation investment community can factor in the more certain timeline of other investors when making decisions. Secondly, if the generation licensee whose plan has been approved does not undertake the investment, there is still sufficient time for other investors to step in to make the necessary investments. Overall, the EMA's intention is to make available information to facilitate investors to make informed and efficient investment decisions. The EMA will continue to approve applications based on technical merits.

3.7 The EMA would like to seek the views of the industry, including alternative suggestions, on how we could provide more information on generation plans in order to create a more certain and conducive investment climate.

SECTION 4 PROPOSED FRAMEWORK TO ALLOCATE LAND FOR NEW GENERATION ASSETS

4.1 The EMA has worked with relevant government agencies, such as the JTC and the URA to review the process of land allocation for power plants, including how land is safeguarded for the future development of power plants. Doing so has the advantage of streamlining the process with the EMA as the main government agency for investors to approach for power generation planting. Having a more coordinated approach among government agencies will also help Singapore better optimise our land use to meet future energy needs. Going forward, power generation investors seeking green-field sites for power planting can approach the EMA directly for land allocation.

4.2 Under the proposed power generation land allocation framework, the EMA will periodically release land which have been safeguarded and make available to investors for power generation planting. At least one site would be available at any point of time. If two or more sites are available, an investor can indicate their preference of which site to invest in. Accompanying information such as the availability of electricity and gas network capacity will also be made available. The EMA reserves the right to determine which site to allocate to the investor.

4.3 A potential investor can trigger the process by writing to the EMA to express interest to apply for a specific site. The EMA will then conduct an open call to invite the industry to participate in the ITI exercise for that site. In the event that the EMA receives interest from only one investor, the land will be directly allocated to that investor based on the market price of the land as assessed by the Chief Valuer.

4.4 If the EMA receives interest from 2 or more investors, the EMA intends to conduct an RFP process for interested investors to submit their proposals for the EMA's consideration. Possible attributes for evaluation of the proposals from the RFP process include power density (MW/ha) to maximise the electricity output per land area, efficiencies of the plants the investors intend to build, and the bid price for the land.

4.5 The proposed land allocation framework is triggered by investors, consistent with the market design in which power generation planting is driven commercially. Investors make informed decisions on new investments based on a variety of factors, including price signals from the market, projected growth in demand as well as projected new supply.[12]

[12] The only exception to this is when projected reserve margin (defined as excess generation capacity over peak electricity demand) over the next 5 years is expected to drop below the required reserve margin – currently set at 30% – needed for power system security. Under such situations, the EMA intends to actively put out land for tender to attract new generation planting in order to maintain the required reserve margin. In the event that there is still no interest for new generation planting 3 years prior to the period when the projected reserve margin dips below the required reserve margin, the EMA is prepared to activate the Capacity Assurance Scheme (CAS) (details of CAS available at http://www.ema.gov.sg/cmsmedia/Consultations/Electricity/1250839236UPLOAD_20061122104123.pdf)

4.6 The EMA seeks views from the industry on the above proposed land allocation framework, including the respective milestones of the land allocation process. Diagram 5 shows an indicative timeline for the land allocation from the time an investor triggers the process to the award of the land. The EMA also seeks views on the selection criteria to be considered for the RFP process, as well as the weightage to be given to each selection criterion, taking into consideration the primary objective to maximise the benefits to electricity consumers for the land to be awarded.

Diagram 5: Indicative timeline for the land allocation mechanism

Timeline and Milestones	WEEK																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Investor writes to the EMA expressing interest to invest in new generation capacity*																															
The EMA launches Invitation-to-Invest (ITI) exercise																															
ITI*																															
Close of ITI																															
Evaluation of participants for eligibility																															
(A) IF THERE IS ONLY 1 ELIGIBLE PARTICIPANT																															
Award of land to participant																															
(B) IF THERE ARE MORE THAN 1 ELIGIBLE PARTICIPANT																															
The EMA requests eligible participants to submit their proposals																															
Request for Proposals (RFP)																															
Close of RFP																															
Evaluation of participants' proposals																															
Award of land to successful participant																															

*Interested participants may be required to provide a security bond. It will be returned to participants who complete the process, regardless whether they are allocated the land.

SECTION 5 SUMMARY

5.1. The EMA seeks to work with the industry to review how relevant information can be made available in a more timely manner for the purpose of making informed commercial decisions on power generation planting.

5.2. This consultation paper articulates several initiatives that the EMA would like to seek the views of the industry, including the following:

(i) The proposed information that the EMA hopes to put out on the long term outlook of the energy market to facilitate power generation investments;

(ii) Proposed enhancements to the regulatory approval process for new and existing generation assets, so as to give better visibility of total generation capacity on a forward-looking basis; and

(iii) A proposed framework to allocate land for new generation assets.

5.3. The indicative timeline of the EMA's consultation process is summarised in Table 2.

Table 2: Indicative timeline for the EMA's consultation process

	Process	Date
1	Issue of the EMA's Consultation Paper	26 October 2015
2	Deadline for Submission of Comments and Feedback	21 December 2015
3	Issue of the EMA's Final Determination Paper	Q2 2016

REQUEST FOR COMMENTS AND FEEDBACK

The EMA invites comments and feedback to the consultation paper. Please submit written feedback to ema_policy@ema.gov.sg by 21 December 2015 (5pm). Alternatively, you may send the feedback by post/fax to:

Policy Department
Energy Planning and Development Division
Energy Market Authority
991G Alexandra Road, #01-29
Singapore 119975
Fax: (65) 6835 8020

Anonymous submissions will not be considered.

The EMA will acknowledge receipt of all submissions electronically. Please contact Annabelle Chan at 6376 7523, He Songhua at 6376 7473 or Lyana Yeow at 6376 7624 if you have not received an acknowledgement of your submission within two business days.

The EMA reserves the right to make public all or parts of any written submissions made in response to this consultation paper and to disclose the identity of the source. Any part of the submission, which is considered by respondents to be confidential, should be clearly marked and placed as an annex which the EMA will take into account regarding the disclosure of the information submitted.