Co-Creation with Industry:
Fast Start Service Survey and Feedback

This deck is a living document and EMA will continue to iterate and update its content as we receive more feedback.

Background.

- Singapore has **one of the most reliable** electricity supply in the world with average interruption times of less than a minute per customer annually.

- This is made possible due to the **robust measures** to maintain power quality and **mitigate effects of power plant outages**.

- As Singapore's energy landscape continues to change and demand grows, there is **value to explore new strategies** to maintain our power supply **reliability and security**.

Overview of Ancillary Market services.

- Ancillary Services are essential to the security of the PSO controlled system and ensuring that electricity supplies in Singapore are of acceptable quality. Ancillary Services are mostly concerned with balancing power supply and demand over short time intervals throughout the PSO controlled system.

Service	Market	Details	Response Time
Regulation	Real time spot market	Used to fine tune demand and supply variations in the grid and minimise grid frequency deviation (from 50Hz).	In minutes
Reserve	Real time spot market	Standby generation capacity or resources (e.g. interruptible load) that can be called upon when there is an unforeseen supply disruption (e.g. power plant outage).	Primary (In seconds) Contingency (In minutes)
Fast Start	Negotiated contracts	Resource that is can be called upon quickly to begin generation at a set level. A secondary safety net in the event **scheduled reserves are insufficient** (e.g. depleted).	In minutes

Maximising resource efficiency is key as EMA looks to enhance our market systems.

- Ancillary services are primarily provided by generation resources such as power plants. As such, tapping on existing consumer loads would free up those resources which could be channeled for other purposes. This enhances our energy sustainability and resource efficiency.

- **Fast Start** is a potential service where resources could be channeled more efficiently.
  - Service is procured by the Energy Market Company (EMC), the market operator, on a contract basis instead of via real-time market like regulation and reserve.

- EMA is keen to maximize available resources and explore leveraging on **Interruptible Load (IL)** to provide the service.
  - IL is a Load Facility, (e.g. factory, office building) which is able to curtail energy demand when called upon to address a shortage in overall power supply.

- Consumers with **backup generators** (e.g. diesel generators[1], on-site energy storage) may also consider participating as IL or Fast Start provider.
  - Such consumers would run up their backup generators so that they reduce the electricity drawn from the grid in times of system needs.

1. Diesel generators would need to comply with prevailing National Environment Agency (NEA) regulations.

What is Fast Start Service?

- **Resources providing Fast Start** are normally called upon to **restore reserve** lost following an outage of online generating units. They may also be activated to address energy or reserve shortfalls due to start-up failures of other generation units.
- Fast Start resources are required to:
  - Synchronise to the transmission system **within 10 minutes upon receipt of instruction** from the Power System Operator (PSO).
  - Proceed to **ramp up to the instructed output level within 15 minutes** of synchronisation.
  - Be able to **maintain its instructed output level for at least 4 hours** after synchronisation.
    - Resources may be called upon to stay online until the power system normalizes in the event of major system disturbance.
- Further details and can be found in the **Appendix**.
- Fast Start resources are traditionally procured by EMC **via Ancillary Service Contracts (ASC)**.
- Despite its low incidence[1] of being called upon, the service remains an important component contributing to our energy security.

1. Average activation of 6 times per year.

Consumer Loads have the potential to provide for the Fast Start Service and be remunerated.

Technical Details

- Consumers interested to provide Fast Start need to commit their capacity for the **delivery year in advance.**
  - For **contracted Fast Start service providers**, 5 years advance notice is required if they intend to reduce their IL capacity.
  - For example, if a facility is contracted for Fast Start in 4 years time to provide 100MW but on the 5th year onwards, it only wants to provide 50MW, then it needs to submit their request to EMA for the reduction.
- Resources need to be connected to the grid at the **Transmission level (i.e. 66 kV and above)**.
- Resources being activated for Fast Start service shall have their loads curtailed for a minimum of 4 hrs and shall only normalize upon PSO instructions.
- Penalties would apply upon failure to comply to PSO instructions.

Interested consumers can already participate through the real-time reserve market. In future, they can also participate in the Forward Capacity Market (FCM).

- Today, consumers can already participate as an Interruptible Load to provide reserves (not Fast Start), by registering their facilities with EMC. More details can be found here.

- In 2021, consumers can also participate in the FCM auction. Requirements include:
  - To be subjected to a resource qualification process to validate their QCAP.
  - **Commit to a forward delivery period and year round availability** (i.e. auction in 2022 to deliver in 2026 and be available throughout 2026).
  - Cleared resources also have a **must-offer requirement during scarcity periods** or be **subjected to penalties** under FCM penalty framework. Scarcity period is a dispatch period where the PSO controlled system is in the Emergency Operating State.
  - For more information, please refer to the FCM Consultation Papers on EMA's website in this link.

The FCM is one avenue where interested providers can offer their capacity into the market.

Potential Revenue

- Load facilities may participate by offering their capacity in the FCM auction (e.g. 4 years ahead). Cleared IL resources will be paid the uniform clearing price.
  - Specifically, the IL facility will be qualified by PSO to identify its Qualified Capacity (QCAP) in MW.
  - If the IL facility wins the FCM auction and is cleared up to its QCAP quantity, it will be paid in the delivery year a total of QCAP (in MW) multiplied by FCM clearing price (in $/MW-year).
  - Currently, the **proposed price floor and ceiling** for a provider to offer in the auction is **0.2 X Net CONE**[1] and **1.5 X Net CONE** respectively.
  - This translates to an **estimated range** of $29.7/kW-year to $223/kW-year.
  - Potentially, a 5MW facility could earn FCM revenues between **$149k to $1.1mil** per delivery year.

1. Net CONE (Cost of New Entry), is an administrative estimate of the long-run marginal cost of capacity ($/kW-year) from a reference resource based on the generation technology most likely to enter the market. It includes capital recovery plus the fixed and variable costs of operation for a new resource, net of expected revenues received from the energy and ancillary services markets.

Load Facilities may also be procured via direct ancillary contracts to provide for Fast Start.

- Another potential revenue stream for eligible resources would be via direct contract.
  - Currently, only Black-Start services are required but other ancillary services may be called upon by the PSO to ensure security and reliability of the power system.
  - Details are currently being determined and we will welcome feedback on the procurement methodology.

- In 2003, EMC procured 408MW of Fast Start from PowerSeraya and Senoko Power at **$20.7mil.**

- Load facilities will only be paid under **one method** to prevent double-counting and double-payment. Specifically:
  a) Through the **FCM and Singapore Wholesale Electricity Market** (SWEM); or
  b) Ancillary Service Contracts (ASC).

EMA is keen to ascertain industry interest to participate in Fast Start and feedback on the service.

Some areas of particular focus include:

1. **Indication of interest to participate in Fast Start service**
   - Available capacity to participate (in MW)
   - Possible commencement dates
   - Minimum commitment period
2. **Feedback on Fast Start service requirements.**
3. **Feedback on avenues to offer capacity for Fast Start.**
4. **Feedback on potential technical difficulties for interested providers.**
5. **Feedback on advance commitment period requirement.**
6. **Suggestions on alternative options for Fast Start service and any additional feedback.**

EMA will review feedback and refine our considerations on an on-going basis.

- EMA may reach out to respondents to clarify and better understand their capabilities and considerations.
- EMA may engage in sandboxes and trials to testbed consumer facilities for Fast Start.

Please share your feedback via forms.sg

https://go.gov.sg/il-fast-start-survey-nov2020

Please be assured that all information received will be treated on a confidential basis.

APPENDIX

FAST START FAQS

What are the requirements for Fast Start resources	• The Fast Start Unit/Resource must synchronise to the *transmission system* within 10 minutes upon receipt of instruction from the *PSO*. It must then proceed to ramp up to the instructed output level within 15 minutes of synchronisation. The *Fast Start* unit resource must be able to maintain its instructed output level for at least 4 hours after synchronisation.
	• For a Fast Start facility/resource to be accepted as a provider of Fast Start service, it must meet the following requirement:
	  • Minimum ramp-up rate of 10MW/min.
	  • Time from notification receipt to synchronisation should not be more than 10 minutes.
	  • Time from synchronisation to reach full load rated capacity should not be more than 15 minutes.
	  • The unit must be able to maintain its output for a minimum duration of 4 hours.
	• Failure to comply to PSO instructions shall be considered as an event of non-compliance under SOM and shall be referred to MSCP for compliance monitoring.

How are Fast Start providers paid and what are the penalties?	• Fast Start providers are procured through Ancillary Service Contracts via EMC. • If Ancillary Service Provider can't provide and meet the requirements in Ancillary Service Contract, EMC will be able to terminate or suspend Ancillary Service Provider with PSO's consent and may require Ancillary Service Provider to refund any payment it has received for the applicable Contracted Ancillary Service in relation to any period during the term of the Agreement prior to the date of suspension or termination.
Instances where Fast Start is activated.	• Fast start unit is normally called upon to restore reserve lost as a result of forced outage of an online generating unit. Fast start unit may also be called upon to cover energy/reserve shortfall as a result of failure to start-up (i.e. synchronisation to the transmission system as per NEMS dispatch schedules) of other generating unit or during periods of rapid demand rises. Both situations require generating units that can be synchronised and produce power within a short time so as to restore security of the PSO controlled system in the shortest possible duration. • For info, there were no instances of Fast Start activation called for by PSO in 2019

ILLUSTRATIVE SEQUENCE OF EVENTS FOR FAST START

Timeline	Use of IL as Fast Start	
	IL is highly responsive (e.g. diesel gen)	IL is not responsive (e.g. consumer load drop)
T = zero: 1st Outage occurs • **Primary Reserves inject**	• OCGT or IL comes online as standby capacity • 10-15 min allowance	• IL told to activate and cut load in 10 mins time
T+10 min: No new event • **Contingency Reserves inject**	• OCGT or IL are ready to inject if 2nd outage occurs	• IL cuts loads to balance system • Contingency reserves backs-off, acting as Fast Start instead
T+45 min: 2nd Outage occurs • **Contingency Reserves continue to inject**	• OCGT or IL inject to support network	• Contingency Reserves (acting as fast start) inject
T+4 hrs: Able to resolve 1st outages	• IL is backed off • Contingency continues to inject	• IL is backed off • Contingency continues to inject
T+5hrs: Able to resolve both outages. System normalised	• All reserves and fast-start backed off	