



IMPLEMENTING DEMAND RESPONSE IN THE NATIONAL ELECTRICITY MARKET OF SINGAPORE

FINAL DETERMINATION PAPER

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1. Executive Summary

1.1. The Energy Market Authority (EMA) issued a public consultation paper on 22 October 2012 to seek feedback on the suggested approach for the implementation of a Demand Response programme in the National Electricity Market of Singapore (NEMS). The consultation exercise closed on 19 November 2012 and stakeholders including electricity licensees, potential licensed load providers, consumers and other interested parties responded to the paper. Based on the feedback received from the public consultation paper and after careful consideration, the programme has been further refined. This paper sets out details of the key features and regulatory framework of the Demand Response programme.

1.2. Demand response can be broadly defined as the change in electricity usage in response to market conditions particularly during periods of high wholesale market prices or when system reliability is adversely affected. An effective Demand Response programme brings about market wide benefits, including the following:

- Improving the overall efficiency of the market through an enhanced price discovery process in the form of demand-side bidding;
- Promoting efficient investment decisions for system expansion such as reducing the need to build capacity to cater for peak demand, which occur infrequently; and
- Providing an additional resource that can help improve system reliability to ensure that electricity demand can be effectively met.

1.3. One feedback received from the public consultation exercise relates to the parties who would benefit from the Demand Response programme. Specifically, some consumers and generators are of the view that contestable consumers who have fixed price retail contracts with their electricity retailers do not benefit from such a programme and therefore should not have to bear the corresponding cost. The EMA's assessment is that all contestable consumers will benefit from the programme, as market participants who buy on behalf of contestable consumers procure electricity from the wholesale market at Uniform Singapore Energy Price (USEP) to sell to their consumers. Hence, those buying electricity at the USEP benefit directly from a decrease in USEP due to the Demand Response programme, while those on fixed retail prices will benefit indirectly in their next retail contract negotiation as USEP is generally considered as a reference price for retail contract prices. In response to the feedback received, the framework has been adjusted to allow for the retailers buying on behalf of such consumers to choose to opt out of the payment of the uplift charges arising from the programme if they are of the view that they do not benefit from the programme. In return, they will not be given the

Demand Response rebate, which is the decrease in USEP as a result of the Demand Response programme. This means that such retailers will be paying at the same level of wholesale electricity price as if the Demand Response programme was not in place.

- 1.4. There were also concerns that the compliance regime for load providers was onerous and that the penalties associated with non-compliance were too high. The EMA maintains the view that key safeguards need to be in place to prevent gaming behaviour. For example, reductions of load which would have occurred anyway under “business-as-usual” circumstances should not be rewarded with payments under the Demand Response programme, and hence the need for the demand-side bidding mechanism as opposed to the use of a baseline based on historical consumption which several stakeholders have suggested. Demand response programmes which revolve around the use of historical baselines to measure load reductions are typically prone to gaming. For example, in Jun 2013 the US Federal Energy Regulatory Commission (FERC) imposed a penalty of US\$780,000 on a licensed load provider for artificially increasing the baseline consumption of a consumer (by turning on the stadium lights of a baseball park when the lights were not required) prior to the period of curtailment in order to inflate the load reduction and the corresponding payments. Nevertheless, in response to the feedback from stakeholders, the EMA has taken in suggestions on the refinements to the rules and requirements of the Demand Response programme, to reduce the cost of compliance and to provide more flexibility to licensed load providers where possible without compromising system security. For example, the requirement for loads to be curtailed within 10 minutes as proposed in the consultation paper has been revised to such that the dispatch of licensed load providers is based on the loads’ ramp-up and ramp-down rates (similar to what is done for the generators currently). This will increase the flexibility for licensed load providers to manage load reductions within that half hour, thereby allowing more consumers to participate in the Demand Response programme. The compliance regime has also been revised such that penalties will be imposed on licensed load providers only if they are compliant with less than 95% of their dispatched schedule. In addition, the EMA has taken in suggestions, such as the setting of the price floor at a dynamic level based on 1.5 times the Balance Vesting Price, instead of a fixed price floor, in order to cater for changes in market conditions.
- 1.5. The final demand response programme comprises two distinct features – (i) demand side bidding, and (ii) the consumer surplus sharing mechanism.
- 1.6. **Demand side bidding** allows consumers to bid their loads, either directly as a licensed load provider, or through relevant market participants (including licensed load providers and electricity retailers) for scheduling in the energy market, similar to how generators currently offer their capacity. This allows consumers to indicate their “willingness to consume” at various price points by adjusting their loads in response to real-time supply and demand conditions. The enhanced interaction between both supply and demand conditions, supported by demand side bidding, will lead to a more efficient price discovery process in the wholesale market, thereby enhancing competition. The demand side bidding will be co-optimised with the existing Interruptible Load (IL) scheme where loads can be offered for the provision of reserves.

- 1.7. **Consumer surplus sharing mechanism:** Compliant licensed load providers whose loads reductions are cleared will share one-third of the additional consumer surplus generated as a result of the load curtailments dispatched, capped at the existing USEP cap at \$4,500/MWh. The consumer surplus sharing mechanism works on the basis that licensed load providers are paid only if there is a verified drop in USEP due to the demand response reductions, and ensures that the majority of the benefits accrue to the broader consumer base, while providing an appropriate level of incentives for consumers to participate in the demand response programme.
- 1.8. A review will be conducted after 3 years upon the implementation of the programme, and will take into consideration the effectiveness of the Demand Response programme and its impact on the market, the level of payouts to the licensed load providers as well as the participation rate.

2. Background

- 2.1. The NEMS has been in operation since 2003 with the objective of promoting an efficient supply of competitively priced electricity. It comprises a spot wholesale market for energy, reserve and regulation electricity products.
- 2.2. Contestable consumers can choose to buy electricity directly from the NEMS as direct market participants (DMP) at half-hourly prices and manage price fluctuations in the wholesale electricity market on their own. In addition, they can participate in the IL scheme to allow their supply of electricity to be used as reserves to cater for system disturbances, in return for reserve payments.
- 2.3. Building on the existing initiatives, the EMA is reviewing how participation by contestable consumers can be broadened through a Demand Response programme, where consumers can offer their loads for scheduling in the energy market. Demand response can be broadly defined as the change in electricity usage in response to market conditions particularly during periods of high wholesale market prices or when system reliability is adversely affected.
- 2.4. An effective Demand Response programme brings about market wide benefits in several ways, which are summarised below¹:
 - 2.4.1. *Firstly*, a Demand Response programme allows contestable consumers to participate in the wholesale electricity market through demand-side bidding. This enables such consumers to adjust their electricity usage in response to real-time price signals, thereby improving the overall efficiency of the market and enhancing the price discovery process.
 - 2.4.2. *Secondly*, allowing demand side participation in the market provides incentives for contestable consumers to shift demand from peak to non-peak periods. This in turns lower peak demand and helps to promote efficient investment decisions for system expansion, such as reducing the need to build capacity to cater for peak demand, which occur infrequently.
 - 2.4.3. *Thirdly*, demand response provides an additional resource to ensure that electricity demand can be effectively met, thereby improving system reliability especially during periods of disturbances when there is a shortfall in supply.

3. Views from the Public Consultation Paper

- 3.1. The EMA published a public consultation paper on 22 October 2012 to seek feedback on the suggested approach for a Demand Response programme to be implemented in the NEMS. The consultation closed on 19 November 2012 and 17 parties responded to

¹ A detailed write-up on the benefits of demand response can be found in the EMA's consultation paper "Implementing Demand Response in the National Electricity Market of Singapore, dated 22 October 2012.

the EMA's consultation (see [Table 1](#)). The respondents' feedback and EMA's corresponding responses are detailed in the document titled "Response to Feedback from Industry Participants on Consultation Paper 'Implementing Demand Response in the National Electricity Market of Singapore'" set out in [Appendix 1](#).

Table 1: List of parties who have responded to the EMA's Consultation Paper

Stakeholder Group	Parties that have responded
Licensees	<ul style="list-style-type: none"> • Energy Market Company (EMC) • Keppel Energy • PacificLight Power [formerly GMR Energy] • Senoko Energy • Tuas Power • YTL Power Seraya
Potential Licensed Load Providers	<ul style="list-style-type: none"> • CPvT Energy Asia • EnerNoc Pty Ltd • KiWi Power Ltd • Panasonic Corporation • Viridity Energy, Inc
Consumers	<ul style="list-style-type: none"> • Changi Airport Group (CAG) • Globalfoundries Singapore • Petrochemical Corporation of Singapore (PCS) • Singapore Oxygen Air Liquide (SOXAL)
Others	<ul style="list-style-type: none"> • Joint submission by Dr. Barbara R. Barkovich, Jack Ellis and Roger Levy • The Pwee Foundation

4. Summary of feedback and the EMA's assessment

4.1. Feedback from consumers

4.1.1. Some consumers have highlighted that contestable consumers who have fixed price retail contracts with their electricity retailers do not benefit directly from any decrease in the USEP. Hence, while the proposed Demand Response programme is designed in such a way that consumers who curtailed their load will only be paid when there is a verifiable decrease in USEP arising from the Demand Response programme, the corresponding uplift charge creates uncertainty for some consumers, especially those who have chosen to enter into fixed price retail contracts with electricity retailers. Some respondents have suggested allowing such consumers to opt out of paying the uplift charges.

4.2. Feedback from the generators and retailers

4.2.1. The generators and retailers are generally of the view that only the contestable consumers buying at wholesale electricity price will benefit from the downward pressure on USEP prices due to the Demand Response programme, while contestable consumers who have signed fixed retail contracts do not. As such, the

generators are of the view that the payments for the programme are not appropriately allocated to the beneficiaries. Some generators have also provided suggestions to specific features of the proposed framework, including incorporating a dynamic price floor (as opposed to a static price floor of \$300/MWh put forth in the EMA's consultation paper) so as to take into account changes to market conditions such as fuel price movements.

4.3. Feedback from potential licensed load providers

- 4.3.1. As payment for demand response is made only when there is additional consumer surplus generated as a result of the action of the curtailed load, potential licensed load providers highlighted concerns on the uncertainty of the payment for demand response arising from the demand-side bidding procedures, especially during periods in when there is no decrease in USEP due to the Demand Response programme. Some stakeholders have advocated using historical consumption for the purpose of setting the baseline, instead of requiring licensed load providers to bid their baseline into the market.
- 4.3.2. In addition, potential licensed load providers were also concerned that the compliance regime for the licensed load providers was onerous and that the penalties associated with non-compliance were too high. Some stakeholders have indicated that the uncertainty in payments, together with the strict compliance regime may discourage participation in the Demand Response programme.

4.4. The EMA's Assessment

- 4.4.1. The EMA notes the views of some stakeholders that contestable consumers on fixed retail prices do not benefit from the Demand Response programme and therefore should not be made to pay for the corresponding uplift charges. However, in the submissions to the consultation paper, there was no substantial justification or empirical evidence provided to support such a view. The EMA's assessment is that *all* contestable consumers will benefit from the programme, as market participants who buy on behalf of contestable consumers procure electricity from the wholesale market at USEP to sell to their consumers. Hence, those buying electricity at USEP benefit directly from a decrease in USEP due to the Demand Response programme, while those on fixed retail prices will benefit indirectly in their next retail contract negotiation as USEP is generally considered as a reference price for retail contract prices. The EMA's view is also supported by evidence from studies in other jurisdictions, which confirm the positive correlation between wholesale prices and retail prices. Overseas regulators such as the Office for Electricity and Gas Markets (Ofgem) of the United Kingdom have also used wholesale prices as an input to retail prices paid by consumers, when assessing the competitiveness of the retail electricity market.
- 4.4.2. As such, all contestable consumers will benefit from an effective Demand Response programme. In particular, the contestable load less that of the relevant regulatory

contracts² (which prices are determined by the EMA) are the beneficiaries. Hence, the additional consumer surplus derived through the Demand Response programme will be based on the corresponding load and the drop in USEP calculated with and without the demand response loads (called the “Implicit Demand Response Rebate”).

4.4.3. Nevertheless, in response to the feedback that some contestable consumers who have hedged their electricity purchases through fixed price contracts may not find the Demand Response programme beneficial, the EMA has refined the framework to allow for the retailers buying on behalf of such consumers to choose to opt out of the payment of the uplift charges arising from the programme, and in return forgo the Implicit Demand Response Rebate. This means that consumers buying from such retailers will be paying the same level as if the Demand Response programme had not been in place. The forgone Implicit Demand Response Rebate from such retailers will then be allocated to market participants who have not chosen to opt out of the payment of the uplift charges. As an illustration, suppose the USEP (with demand response) was \$300/MWh and the counterfactual USEP (without demand response) was \$330/MWh and that the uplift charge to be paid to the licensed load providers was \$10/MWh. In such a case, all market participants (i.e. retailers and SP Services) buying on behalf of contestable consumers will pay \$310/MWh. With the opt-out mechanism, retailers can choose not to pay for the uplift charge of \$10/MWh, but in turn will not be given the Implicit Demand Response Rebate, which in this case is \$30/MWh. Such retailers will pay the equivalent of \$330/MWh, which would have been the equivalent wholesale price if the Demand Response programme had not been in place. Details on the revised collection mechanism are provided in Section 5.

4.4.4. The EMA notes the feedback from the potential licensed load providers on the uncertainty of payments and the compliance regime of the Demand Response programme. With respect to the payments to the licensed load providers, the EMA maintains the view that, aligned with the policy objective of the Demand Response programme, licensed load providers will be paid a portion of the consumer surplus created only when a decrease in USEP can be demonstrated. While there is uncertainty revolving around the level of payouts, this is balanced by the fact that there are mechanisms, such as the pre-dispatch schedules, including the currently published forecasted prices and quantities, which are available to market participants (including the licensed load providers) to provide an indication whether the market participants are cleared to provide load curtailment. This reduces the uncertainty of dispatch for the licensed load providers.

4.4.5. With respect to the comments on the compliance framework, the EMA is of the view that key safeguards need to be in place to prevent gaming behaviour.³ For example,

² Contestable consumers bear a portion of the regulatory contracts which include Vesting Contracts and the Forward Sales Contracts (FSC).

³ An example of such gaming is reported by FERC on 7 June 2013, available at: <http://www.ferc.gov/enforcement/civil-penalties/actions/143FERC61218.pdf>.

reductions of load which would have occurred anyway under “business-as-usual” circumstances should not be rewarded with payments under the Demand Response programme, and hence the need for the demand-side bidding mechanism as opposed to the use of a baseline based on historical consumption which several stakeholders have suggested. Demand response programmes which revolve around the use of historical baselines to reward licensed load providers are typically prone to gaming behaviour. For example, in Jun 2013 the US Federal Energy Regulatory Commission (FERC) imposed a penalty of US\$780,000 on a licensed load provider for artificially increasing the baseline consumption of a consumer (by turning on the stadium lights of a baseball park when the lights were not required) prior to the period of curtailment in order to inflate the load reduction and the corresponding payments. To prevent gaming, the level of penalty should commensurate with the potential payouts to the licensed load providers. Nevertheless, in response to the feedback from stakeholders, the EMA has taken in suggestions on the refinements to the rules and requirements of the Demand Response programme, to reduce the cost of compliance and to provide more flexibility to licensed load providers where possible, without compromising system security. For example, in response to the feedback that the requirement for loads to be curtailed within 10 minutes as proposed in the consultation paper restricts the type of loads which can participate, the revised framework allows licensed load providers to offer their ramp-up and ramp-down rates for the Market Clearing Engine (MCE) to dispatch the load curtailment volumes based on these rates (similar to how MCE uses the ramp-up and ramp-down rates of generators to determine the dispatch for generators). The licensed load providers will then be checked based on the amount of energy consumed within that half hour for compliance. Such a mechanism will increase the flexibility for licensed load providers to manage load curtailments within that half hour, and will in turn allow more consumers to participate in the Demand Response programme. The compliance regime has also been revised such that penalties will be imposed on licensed load providers only if they are compliant with less than 95% of their dispatched schedule. In addition, the EMA has taken in the suggestion for the price floor to be set at a dynamic level of 1.5 times of the Balance Vesting Price (BVP) instead of a fixed price floor of \$300/MWh, to cater for changes in market conditions.

- 4.4.6. Some respondents have questioned the need for the price floor, which was intended to avoid payment to licensed load providers for reductions in load which would have occurred in absence of the demand response programme or in “business-as-usual” conditions. To illustrate, suppose a manufacturing company intends to participate in the Demand Response programme, and that this consumer switches off its equipment at the end of the day as part of its normal operating circumstances (which would reduce their electricity consumption say from 10MW to 3MW). The price floor works by preventing the licensed load providers to “game” the system by submitting very low bids during such circumstances which effectively ensures the dispatch of the load reduction when in fact there was no actual reduction in consumption. Some potential licensed load providers have raised the argument that this consumer should be allowed to bid into the market for the reduction (7MW in this example) that would have been turned off under “business-

as-usual” conditions. EMA disagrees and reiterates that the Demand Response programme is conceptually different from energy conservation or energy efficiency initiatives. The Demand Response programme is designed to incentivise short term load curtailments particularly during periods of high demand and high prices, while energy conservation or energy efficiency initiatives seek to encourage longer term baseload reductions in energy consumption through behavioural changes. With that in mind, the EMA assessed that it is important to provide the proper level of incentives, while ensuring that sufficient safeguards, such as the price floor, are in place to prevent gaming. These features will be covered in greater detail in Section 5, which sets out the final design of the Demand Response programme as well as the key changes from the consultation paper.

5. The EMA's Final Determination

5.1. This section sets out the key features and the regulatory framework of the Demand Response programme in the NEMS.

5.2. Eligibility

5.2.1. Similar to the IL Scheme, a contestable consumer who is able to offer a load curtailment of at least 0.1 MW can participate in the Demand Response programme. Such consumer's load can participate either directly as a licensed load provider or through relevant market participants, including licensed load providers and electricity retailers.

5.3. Licensing and market registration

5.3.1. Market participants who hold the "Retail Electricity" Licences are eligible to participate as load providers under their existing licenses. All other load providers participating in the Demand Response programme will be required to apply for a new class of licence (Wholesaler (Demand Side Participation)). Details of the new class of licence are provided in [Appendix 2](#). The new class of licence allows the licensed load provider to participate as single site participant or multi-site aggregator. Wholesaler (Demand Side Participation) licensees, who wish to participate in the IL Scheme will be required to hold a separate Wholesaler (Interruptible Load) licence, and vice versa.⁴ [Table 2](#) summarises the allowable licensed activity under different licences.

Table 2: Allowable activity based on licence type

Licence Type	Allowable Activity Based on Licence Type		
	Participation in Demand Response programme	Participation in IL Scheme	Retail of electricity
Wholesaler (Demand Side Participation)	Yes	No	No
Wholesaler (Interruptible Load)	No	Yes	No
Retail Electricity	Yes	Yes	Yes

5.3.2. Similar to generators in the NEMS, all licensed load providers are required to register as Market Participants with the Energy Market Company (EMC) and comply with the Market Rules.

⁴ Each load facility or accounts under a single address can only participate in Demand Response and the IL scheme through one market participant.

5.4. Approval from the Power System Operator

- 5.4.1. All licensed load providers will be required to seek the relevant approval of their facilities from the PSO. As part of the registration, licensed load providers will be required to provide the locations and meter numbers of all load facilities. For facilities with more than one meter installed, all the meter numbers will need to be registered. Each registered load facility (per consumer site) has to be able to provide load curtailment of at least 0.1 MW. Licensed load providers aggregating more than one facility will be required to register the facilities in blocks based on the current IL zones.⁵ While there are no restrictions on the number of blocks that licensed load providers can offer into the market, the load facilities within each block must be within the same zone.
- 5.4.2. At the point of registration, licensed load providers will need to submit the linear ramp up and down rates (MW/min) of the registered blocks with the PSO and EMC. The ramp rates need to be supported by audit evidence or tests by an independent party. The ramp rates serve two purposes: firstly as an input for the MCE for the purpose of producing the dispatch orders based on the co-optimisation principle (analogous to how MCE considers the ramp rates of generators when producing the dispatch orders); and secondly as an input for the calculation of the “*Implied Energy Consumption*” and “*Implied Energy Curtailment*” for settlement verification checks (details in Section 5.9). With the inclusion of ramp rates into the demand bids, the classification of load providers into class A & class B previously proposed in Section 5.3 of the consultation paper will no longer apply. This refinement is made in view of the feedback received from the consultation exercise, where some stakeholders have expressed views that the 10 minutes restriction in the consultation paper limits the participation of loads. Therefore, the replacement of load classification with ramp rates will increase the amount of potential load for the Demand Response programme, thereby allowing more contestable consumers to participate in the programme. Furthermore, the inclusion of ramp rates in the MCE will allow a more accurate least-cost solution to be generated for dispatch in each period.

5.5. Metering and Monitoring for system security

- 5.5.1. After considering feedback received from the consultation exercise that the proposed 30-second sampling may be too stringent for licensed load providers, the EMA has further assessed that 5-minute sampling data for the purpose of the communication requirement between the licensed load provider and the PSO is adequate for the monitoring of system operation and stability by the PSO.⁶ This revision in the metering requirement will reduce the compliance cost of participation in the programme without compromising system security.

⁵ In the event that there is any network reconfiguration which results in the reclassification of the facilities to another zone(s), the load facilities will be re-classified accordingly.

⁶ The PSO reserves the right to review the necessary communications infrastructure from time to time to ensure system stability.

- 5.5.2. Data to be submitted to the PSO must be in 5-min intervals, and organised according to the block they are aggregated for. For licensed load providers who are also participating in the IL scheme, the existing IL metering requirement will apply. PSO reserves the right to require submission of historical meter reading of each registered facility or site for audit purpose.
- 5.5.3. For licensed load providers aggregating from multiple sites, communications to the PSO can be in the aggregated form by the registered block.

5.6. Demand side bidding, scheduling and dispatch

- 5.6.1. To participate in the programme, licensed load providers will have to submit demand bids into the NEMS for the periods in which they intend to offer load curtailments through a process called demand side bidding. The demand bids for a particular trading period will consist of the following: total load (in MW) for the registered block, a series of energy curtailment and price quantity tranches and the linear ramp rates (MW/min) as determined during the registration stage.
- 5.6.2. The total load that a licensed load provider offers into the market forms the baseline to measure load reductions for purpose of measurement, compliance and verification. The advantage of this design is that it obviates the need to set an artificial baseline to measure the load reductions, which can be subject to gaming as described earlier. Instead, the licensed load providers will be checked for compliance of the total load (including the reduction quantities) of that consumer for that half-hour, which will require the licensed load providers to be accurate about the consumption levels of that consumer when submitting the bids.
- 5.6.3. Similar to that for generators, the licensed load provider will be allowed to submit up to 10 tranches of price-quantity pairs tranches in a single bid. Each tranche of load curtailment must be at least 0.1 MW in size, as per current arrangements for the IL scheme. The quantum of the 0.1 MW is set on the basis that loads smaller than this threshold is unlikely to have a material impact in the wholesale electricity market.
- 5.6.4. Licensed load providers can simultaneously bid into both the reserves and energy markets. However, the MCE will dispatch the least cost solution such that each load facility will only be scheduled in either the reserves (IL) or energy (Demand Response) market, but not both during a single dispatch period.
- 5.6.5. The demand side bidding process will be introduced as per current market processes according to Section 6 of the Market Rules, including the submission of demand bids 65 minutes before the actual trading period. Demand bids will be submitted according to the zone in which the load block is registered to. As each block will only be allowed to register within one IL zone, load providers considering multi-site aggregation cannot substitute dispatch of facilities across the blocks/zones.

- 5.6.6. *Volume Cap*: There will be no limit on the amount of load that can be licensed and registered for the Demand Response programme. For power system operation and security reasons, the amount of load curtailment that can be cleared by the MCE will be capped at 200 MW, for both the Demand Response and the IL scheme.⁷ The current caps and zonal limits for IL for the 3 classes of reserves (i.e. primary, secondary and contingency) will remain unchanged. The cap will be reviewed under relevant circumstances such as when there are significant changes to the power system.
- 5.6.7. *Price Floor*: Safeguards need to be in place to avoid payment to licensed load providers for reductions in load which would have occurred in absence of the demand response programme or in “business-as-usual” conditions. To prevent potential gaming where licensed load provider submits very low price bids for loads that would not have been consumed in their “business-as-usual” condition, a price floor will be implemented as part of the Demand Response programme, where only demand bids above the price floor will be accepted by the MCE. The price floor will be set at 1.5 times of the prevailing BVP.⁸ The EMA reserves the right to review the price floor to serve as an effective safeguard against gaming.

5.7. Incentive Payment to licensed load providers

- 5.7.1. Licensed load providers will be paid a share of the additional consumer surplus generated as a result of the load curtailments dispatched. When licensed load provider(s) is cleared to provide load curtailments in a particular period, the MCE will be run twice, once with the load curtailed and once without. The USEP generated in the former case will be the market clearing price paid by market participants and/or consumers for the half-hour period; while the price generated in the latter case serves as a “counterfactual” USEP as if the Demand Response programme was not in place during the half-hour period. The difference in these two prices, called the *Implicit Demand Response Rebate*, will then be used to calculate the additional consumer surplus.
- 5.7.2. The EMA’s view is that all contestable consumers will benefit from the proposed programme. Those buying through SP Services or retailers at wholesale prices will benefit directly, while those buying through retailers at fixed prices contracts will also benefit from a more competitive retail price in the longer term as a result of the downward pressure on wholesale prices. Specifically, given that contestable consumers bear a portion of the regulatory contracts (of which the prices are regulated by the EMA), the relevant consumer base to be used for the purpose of the Demand Response programme will be the loads not associated with the regulatory contracts. This principle will be used when determining the additional

⁷ The cap applies only for the load curtailment volumes, and not the entire load of the facility.

⁸ The BVP, as used in the EMA’s Procedures for Calculating the Components of the Vesting Contracts, approximates the long run marginal cost of a theoretical new entrant that uses the most economic generating technology in operation in Singapore and contributes to more than 25% of total demand. The calculation of the BVP will follow the prevailing methodology under the procedures for Vesting Contracts.

consumer surplus derived from the licensed load providers and when determining the market participants to be charged for the uplift of the programme.

- 5.7.3. The increase in consumer surplus as a result of the Demand Response programme is calculated as follow:

Table 3: Formulae for the computation of additional consumer surplus (no energy deficit)

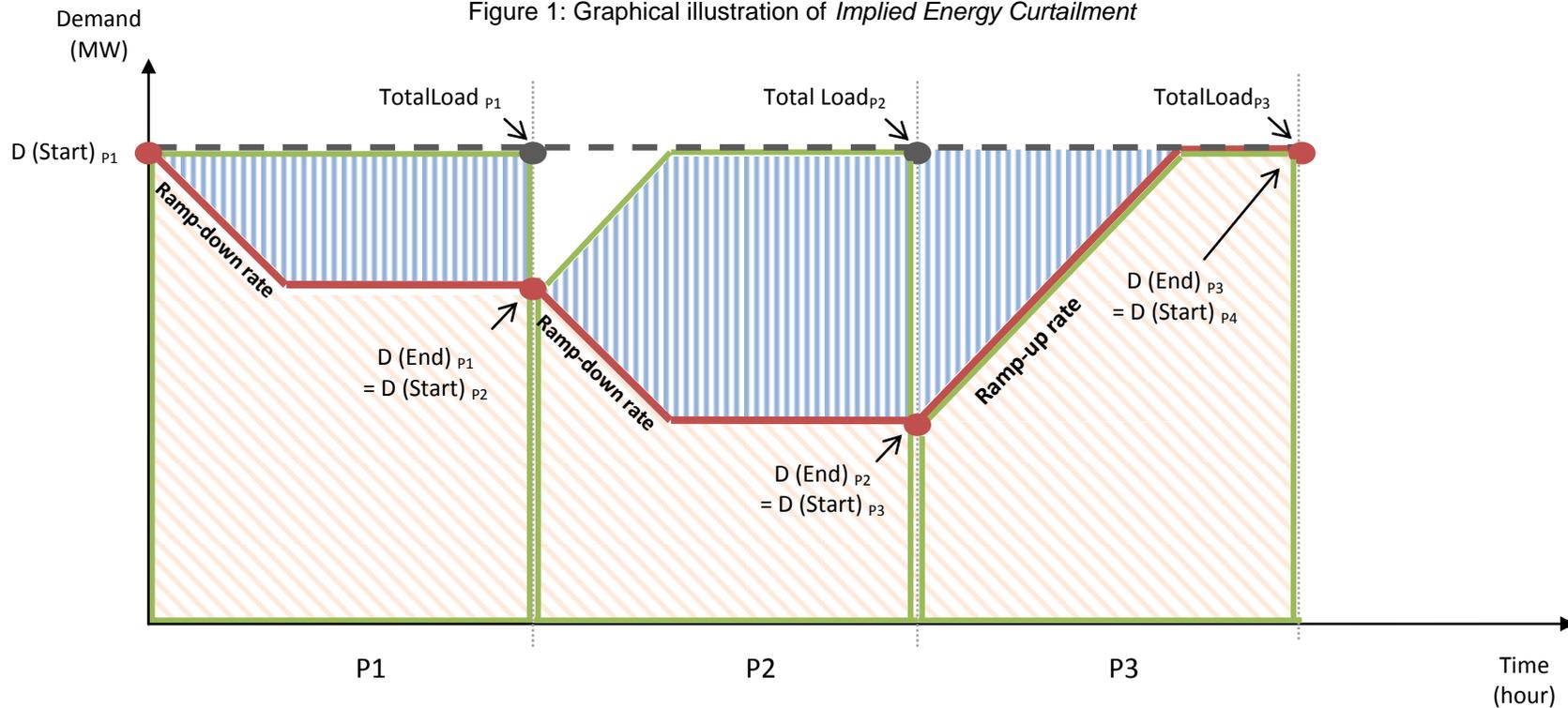
	Formulae
Additional Consumer Surplus	$\text{Max} \{[(\text{Implicit Demand Response Rebate}) \times \text{loads not associated with regulatory contracts}^9, 0]\}$ $=$ $\text{Max} \{[(\text{"Counterfactual" USEP without curtailment}) - (\text{USEP with curtailment})] \times \text{loads not associated with regulatory contracts}, 0\}$

- 5.7.4. The total incentive payment to all licensed load providers that have been dispatched to provide load curtailments and have complied with their dispatch schedules will be one-third of the additional consumer surplus generated as a result of the load curtailment dispatched, capped at the existing maximum USEP of \$4,500/MWh.¹⁰ The one-third sharing factor will ensure that majority of the benefits (i.e. two-thirds of the additional consumer surplus generated) accrue to the rest of the consumer base, specifically for the non-regulatory load, while providing a fair return to licensed load providers for the services they provide in the market. In the event that demand response does not result in a decrease in USEP, no payment would be made.
- 5.7.5. Only licensed load providers who are compliant with at least 100% of the scheduled load curtailment will be paid. Licensed load providers who have partially complied with their scheduled curtailment will not be entitled to any incentive payments. In addition, penalties will be imposed on licensed load providers who are compliant with less than 95% of their scheduled curtailment (refer to section 5.11 on Enforcement for more details).
- 5.7.6. The incentive payments will be allocated to the eligible licensed load providers based on their respective *Implied Energy Curtailment* in accordance with their dispatch schedule for the particular period, taking into consideration the relevant ramp rates. This is illustrated in [Figure 1](#). [Table 4a and b](#) provides the detailed formulae on how the incentive payments will be allocated based on the *Implied Energy Curtailment*.

⁹ This refers to demand subtracted off regulatory contracts between MSSL and the Gencos, including the Vesting Contracts and relevant contracts such as Forward Sales Contracts (FSC).

¹⁰ This is in recognition that generators and licensed load providers provide similar services to the market, and therefore the maximum payment to licensed load providers should not exceed that of the generators. There will be no partial payment to licensed load providers in the event when they are partially compliant to their dispatch schedule.

Figure 1: Graphical illustration of *Implied Energy Curtailment*



Legend

- Load based on dispatch scheduled by MCE¹¹
- - Total Load based on demand bid submitted¹²
- Implied Energy Consumption (Cleared)*
- Implied Energy Consumption (Bid)*
- Implied Energy Curtailment*

¹¹ In P1 and P2, the load is scheduled for curtailment, while in P3 the load is not scheduled for curtailment (i.e. scheduled to maintain its load at its TotalLoad submitted as part of its demand bid).

¹² Total Load submitted by the licensed load provider in [Figure 1](#) is assumed to be the same across the periods.

Table 4a: Definitions for computing incentive payment

	Definitions
TotalLoad	TotalLoad is the total load submitted by the load provider as part of its demand bid for each trading period (i.e. assuming load reduction is not cleared).
D(Start)	D(Start) is the load at the start of the period. Hence: <ul style="list-style-type: none"> ▪ If there is a demand bid in the preceding period, D(Start) for the current period refers to the load at the end of the preceding period, based on the scheduled load in the preceding period, taking into consideration the relevant ramp down or ramp up rates. ▪ If there is no demand bid in the preceding period, D(Start) is the <i>TotalLoad</i> for the current period.
D(End)	D(End) is the load at the end of the current period (or start of the next period) based on the scheduled load in the current period, taking into consideration the relevant ramp-down or ramp-up rates.

Table 4b: Formulae for the computation of incentive payment

	Formulae
Implied Energy Consumption (Bid)	This is the implied energy consumption based on the total load bid submitted by the load provider as part of its demand side bidding, represented by the area under the curve between D(Start) and TotalLoad , taking into consideration the respective ramp-up or ramp-down rates.
Implied Energy Consumption (Cleared)	This is the implied energy consumption if the demand bid submitted by the licensed load provider is cleared (i.e. scheduled to either maintain load at TotalLoad or reduce load), represented by the area under the curve between D(Start) and D(End) , taking into consideration the respective ramp-up or ramp-down rates.
Implied Energy Curtailment	<i>Implied Energy Consumption (Bid) – Implied Energy Consumption (Cleared)</i>
Incentive payment for each MWh of load curtailment	Min [(1/3 x <i>Additional Consumer Surplus</i>) / Total <i>Implied Energy Curtailment</i> of all licensed load providers, \$4,500]
Incentive payment to each compliant licensed load provider	<i>Implied Energy Curtailment</i> for each licensed load provider x Incentive payment for each MWh of load curtailment

5.8. Incentive payment in the event of energy deficit

- 5.8.1. In the event that there is an energy deficit in the system, the Constraint Violation Penalty (CVP) in the MCE kicks in and the USEP clears at the cap of \$4,500/MWh to signal the shortage of supply. Should the demand response volume scheduled for dispatch be less than the energy deficit, the USEP remains at \$4,500/MWh. Based on the additional consumer surplus formula previously described, the licensed load provider will not be paid because there is no change in the USEP as a result of the CVP. However, the EMA recognises the value of load reduction by the licensed load providers during such periods where demand response resource can bolster system security and help to reduce the amount of energy deficit in the system. Hence, the incentive payment mechanism should be designed in such a manner to send the correct market signal for the licensed load providers to bid the loads in during such periods.
- 5.8.2. Conceptually, there is additional consumer surplus created from demand response due to the decrease in energy deficit.¹³ However, the counterfactual price cannot be determined due to the CVP. Given that the implied Value of Loss Load (VoLL) is \$5,000/MWh in the NEMS, this price can be used for the purpose of deriving the counterfactual USEP, on the basis that the load which had avoided load shedding as a result of the demand response has an implied value of \$5,000/MWh.¹⁴
- 5.8.3. In the event of an energy deficit, the additional consumer surplus to licensed load providers will be calculated as follow:

Table 5: Formulae for the computation of additional consumer surplus (in event of energy deficit)

	Formulae
Additional Consumer Surplus (in event of energy deficit)	Max {(implied VoLL) – (energy price cap)} x loads not associated with regulatory contracts, 0}

- 5.8.4. The payment to the licensed load provider will be based on the one-third additional consumer surplus per MWh of curtailment provided by the licensed load provider, capped at \$4,500/MWh. Similarly, the allocation of incentive payments to the compliant licensed load providers will be based on their respective *Implied Energy Curtailment* for the particular period, according to Section 5.7.

¹³ There will be a gain in consumer surplus from the load that had avoided load shedding in an Under Frequency Load Shedding or energy deficit event, due to demand response.

¹⁴ Refer to EMC paper EMC/RCP/60/2012/CP38. Available at http://www.emcsg.com/f1027,70943/CP38_Review_of_VoLL_60RCP_.pdf

5.9. Settlement verification checks

- 5.9.1. Settlement verification checks will be conducted to ensure that licensed load providers comply with their dispatch schedules. The verification checks will be performed by comparing the relevant *Implied Energy Curtailment* (if scheduled for load reduction) or *Implied Energy Consumption* (if not scheduled for load reduction), with the Metered Energy Consumption. Section 5.11 on Enforcement provides more details on the rules for compliance, for the cases when the load curtailment offered was either cleared or not. Based on the implied energy consumption concept, there will be no need to match the load profile of the load provider with the implied load profile from the dispatch schedule for the purpose of compliance check (i.e. the actual trajectory of the load during the period does not matter).
- 5.9.2. While licensed load providers can offer the same loads for both the energy (Demand Response) and reserves (IL) market, each block of offers can only be dispatched for either Demand Response or IL, but not both. This is because in the event that the IL activated by the PSO for curtailment in the reserves market, it is not possible to verify the licensed load provider's compliance for the Demand Response programme. The MCE will determine the dispatch of the loads based on the co-optimisation of the energy and reserves markets. Table 6 summarises the compliance matrix when a licensed load provider has offered a block of loads for both the energy and reserves markets.

Table 6: Compliance Matrix for the interaction of the Demand Response programme and the IL Scheme

		Dispatched in the Reserves Market (IL)?	
		Yes	No
Dispatched for load curtailment in the Energy Market (DR)?	Yes	Not allowed.	Refer to Section 5.11 Enforcement (Table 6a) for the compliance framework.
	No	Compliance for IL applies. Compliance for the Demand Response scheme will not apply.	Refer to Section 5.11 Enforcement (Table 6b) for the compliance framework.

5.10. Settlement/ Collection Mechanism

- 5.10.1. As indicated in Section 4, the EMA notes the feedback received to allow retailers who have consumers that are on fixed price contracts to choose to opt out of the Demand Response programme. As such, the EMA has refined the programme to

allow existing retailers to choose to opt out¹⁵ from the payment of the uplift charge arising from the Demand Response programme.

5.10.2. Such retailers will in turn forgo the *Implicit Demand Response Rebate* which is equal to the difference between the market clearing USEP and the “counterfactual” USEP in their settlement statements. This means that these retailers will be paying at the same level as if there was no demand response in the market.

5.10.3. Payments to compliant licensed load providers will be collected through the Hourly Energy Uplift Charge (HEUC). Any rebates foregone by retailers who have chosen to opt out of the programme will be used to offset the equivalent HEUC amount to be collected from market participants who have not chosen to opt out. The settlement mechanism is summarised in Table 7. Box examples 1 and 2 illustrate how the market settlement mechanism works without and with the opt-out loads.

Table 7: Settlement mechanism for Demand Response programme

Charges	Retailers who have <u>not</u> chosen to opt out and Market Support Service Licensee buying on behalf of contestable loads	Retailers who have chosen to opt out	Market Support Service Licensee buying on behalf of non-contestable loads
USEP	Market Clearing USEP	Market Clearing USEP	Market Clearing USEP
HEUC	HEUC (original) ¹⁶ + HEUC (DR) ¹⁷	HEUC (original) + HEUC (DR)	HEUC (original) + HEUC (DR)
DR refund	Nil	- HEUC (DR)	- HEUC (DR)
Implicit Demand Response Rebate_{CC} Forgone	Nil	“Counterfactual” USEP - Market clearing USEP	Nil

¹⁵ The EMA will conduct a one-off exercise to allow existing retailers (i.e. licensed electricity retailers as at 28 Oct 2013) to opt out of the payment of the uplift charge arising from the Demand Response programme.

¹⁶ HEUC (original) refers to the charges as per current market settlement.

¹⁷ HEUC (DR) is calculated based on the following: HEUC (DR) = [Payment to all compliant licensed load providers less the Implicit DR rebate forgone collected from contestable load of retailers who have chosen to opt out] / Relevant load which benefits from Demand Response programme. At present, the relevant load refers to the contestable load of retailers which have not opt out. To ensure transparency, EMC will publish the HEUC (original) and HEUC (DR), so that market participants and consumers are informed of the cost of the Demand Response programme.

Box Example 1: Settlement mechanism for Demand Response programme without opt-out loads

Market Parameters		
<ul style="list-style-type: none"> Total Demand¹⁸ = 2,500 MWh Load associated with regulatory contracts = 1,375 MWh Amount of load curtailment dispatched for DR = 50 MWh Total Metered Contestable Load = 1,750 MWh (no retailers have chosen to opt out of the programme) Market Clearing USEP = \$450/MWh; “Counterfactual” USEP = \$460/MWh HEUC (original) = \$2/MWh 		
Demand Response Calculations		
<ul style="list-style-type: none"> Implicit Demand Response Rebate_{cc} = \$460 - \$450 = \$10/MWh Additional Consumer Surplus = Implicit Demand Response Rebate_{cc} x Loads not associated with regulatory contracts = (\$460 - \$450) x (2,500 - 1,375) = \$11,250 Total Demand Response Payout = One-third of Additional Consumer Surplus = 1/3 x 11,250 = \$3,750 HEUC (DR), i.e. Payment for Demand Response = (Payment to all compliant licensed load providers - Implicit Demand Response Rebate collected from retailers who have chosen to opt out) / Total Metered Contestable load that have not chosen to opt out = [3,750 - (10 x 0)] / 1,750 = \$2.14/MWh 		
Market Settlement		
	Retailers and Market Support Service Licensee buying on behalf of contestable loads	Market Support Service Licensee buying on behalf of non-contestable loads
USEP (\$/MWh)	450.00	450.00
HEUC (\$/MWh)	HEUC (Original) = 2.00	HEUC (Original) = 2.00
	HEUC (DR) = 2.14	HEUC (DR) = 2.14
DR Refund (\$/MWh)	-	-2.14
Implicit Demand Response Rebate_{cc} Forgone (\$/MWh)	-	-
Total (\$/MWh) with Demand Response programme	454.14 (compared to \$462/MWh without the Demand Response programme)	452.00

¹⁸ Assuming a demand of 5,000MW for the half-hour trading period.

Box Example 2: Settlement mechanism for Demand Response programme with opt-out loads

Market Parameters			
<ul style="list-style-type: none"> Total Demand= 2,500 MWh Load associated with regulatory contracts= 1,375 MWh Amount of load curtailment dispatched for DR = 50 MWh Total Metered Contestable Load = 1,750 MWh (750 MWh have chosen to opt out of the programme) Market Clearing USEP = \$450/MWh; “Counterfactual” USEP = \$460/MWh HEUC (original) =\$2/MWh 			
Demand Response Calculations			
<ul style="list-style-type: none"> Implicit Demand Response Rebate_{cc} = \$460 - \$450 = \$10/MWh Additional consumer surplus for the purpose of Demand Response calculation = Implicit Demand Response Rebate_{cc} x Loads not associated with regulatory contracts = (\$460 - \$450) x (2,500 - 1,375) = \$11,250 Total Demand Response Payout= One-third of Additional Consumer Surplus = 1/3 x 11,250 = \$3,750 HEUC (DR), i.e. Payment for Demand Response = (Payment to all compliant licensed load providers - Implicit Demand Response Rebate collected from retailers that have chosen to opt out) / Total Metered Contestable Load that have not chosen to opt out = [3,750 - (10 x 750)] / 1,050 = -\$3.75/MWh 			
Market Settlement			
	Retailers who have <u>not</u> chosen to opt out and Market Support Service Licensee buying on behalf of contestable loads	Retailers who have chosen to opt out	Market Support Service Licensee buying on behalf of non-contestable loads
USEP (\$/MWh)	450.00	450.00	450.00
HEUC (\$/MWh)	HEUC (Original) = 2.00	HEUC (Original) = 2.00	HEUC (Original) = 2.00
	HEUC (DR) = -3.75	HEUC (DR) = -3.75	HEUC (DR) = -3.75
DR Refund	-	- (-3.75)	- (-3.75)
Implicit Demand Response Rebate_{cc} Forgone (\$/MWh)	-	10.00	-
Total (\$/MWh) with Demand Response programme	448.25 (compared to \$462/MWh without the Demand Response programme)	462.00	452.00

5.11. Enforcement

5.11.1. Penalties will be imposed on licensed load providers who fail to comply with their dispatch schedules.

5.11.2. The compliance tables are shown in Tables 8a and 6b. All penalties will be returned to the wholesale electricity market through the Monthly Energy Uplift Charge (MEUC) as per the current Market Rules.

Table 8a: Compliance table I (when load is scheduled for curtailment)

Compliance based on <u>Implied Energy Curtailment</u>	<i>Actual Energy Curtailment</i>¹⁹	Applicable payment/penalty
Fully Compliant	At least 100% of <i>Implied Energy Curtailment</i> ²⁰	Eligible for incentive payment.
Partially Compliant	Less than 100%, but at least 95% of <i>Implied Energy Curtailment</i>	Not eligible for incentive payment; No penalty imposed.
Non-compliant	Less than 95% of <i>Implied Energy Curtailment</i>	Subjected to penalty, set as follows: One-third of the <i>Additional Consumer Surplus</i> , allocated based on the licensed load providers' <i>Implied Energy Curtailment</i> , capped at \$4,500/MWh. ²¹

¹⁹ *Actual Load Curtailment* is the difference between *Implied Energy Consumption (Bid)* and *Metered Energy Consumption*.

²⁰ As per section 5.9, this also means that the *Metered Energy Consumption* is not more than its *Implied Energy Consumption (Cleared)*.

²¹ This refers to the incentive payment for each MWh of load curtailment described in Table 4b.

Table 8b: Compliance table II (when load is not scheduled for curtailment)

Compliance based on <i>Implied Energy Consumption (Cleared)</i>	<i>Metered Energy Consumption</i>	Applicable payment/penalty
Compliant	At least 95% of <i>Implied Energy Consumption (Cleared)</i>	Not applicable
Non-compliant	Less than 95% of <i>Implied Energy Consumption (Cleared)</i>	Subjected to penalty, set as follows: Max $\{(2 \times (\text{USEP} + \text{HEUC}_{\text{total}}) \times [\text{Implied Energy Consumption (Cleared)} - \text{Metered Energy Consumption}], \$5,000)\}^{22}$

5.11.3. The EMA recognises that there may be valid reasons where licensed load provider(s) is unable to comply with the dispatch schedule. Under such situations, load providers can appeal to the Market Surveillance and Compliance Panel (MSCP) for a waiver of the penalty if the licensed load providers can demonstrate to the MSCP's satisfaction that the non-compliance falls under one of the situations listed in [Table 9](#).

Table 9: List of situations in which penalties for non-compliance for Demand Response can be waived

Situations in which the penalties for non-compliance by licensed load providers can be waived
<ul style="list-style-type: none"> - The safety of any persons would be endangered - Any applicable law would be violated

5.11.4. In cases of repeated non-compliance, licensed load providers may have their licences revoked by the EMA.

5.12. Retailers' code of conduct

5.12.1. The design of the Demand Response programme allows contestable consumers to sign separate contracts with licensed load providers to provide for demand response-related services, as well as electricity retailers for their supply of electricity. To prevent potential misrepresentations due to a potential conflict of commercial incentives between the licensed load providers (which would require consumers to curtail electricity consumption) and electricity retailers (which typically earn more

²² The penalty is analogous to the Automatic Penalty Scheme (APS) for the generators for implementation in the NEMS.

through the higher sales of electricity to consumers), the EMA will modify the relevant provisions in the Code of Conduct for Retail Electricity Licensees to prohibit electricity retailers from discouraging, restricting or prohibiting contestable consumers from participating in demand response or energy efficiency initiatives.²³

5.12.2. With respect to the generators/retailers' views on the objective of the additional clause in the Retailers' Code of Conduct, the EMA clarifies that the intention of the clause is to ensure that contestable consumers are not restricted in the participation of the Demand Response programme due to their retail contract arrangements. For example, retailers' contracts should not have any explicit or implicit provisions that restrict their customers from participating in demand response or energy efficiency-related activities. This is aligned with the EMA's mandate to create a competitive electricity market and to promote greater variety of choices among the contestable consumers for related electricity services. Taking into consideration the feedback received from the retailers, the following modification will be made.

5.12.3. The Code of Conduct for Retail Electricity Licensees will be modified with an additional clause in Section 2.2.2 as follow (full details in [Appendix 3](#)):

"A licensee shall comply with the following when retailing electricity:

- (k) not discourage, restrict or prohibit consumers from participating in demand response and energy efficiency initiatives."

5.12.4. The modification takes effect from 28 Oct 2013.

5.13. Review Period and Summary of key changes from the Consultation Paper

5.13.1. The Demand Response programme will be subjected to a review 3 years from the implementation of the programme, taking into consideration the effectiveness of the demand response programme and its impact on the market, the level of payouts to the licensed load providers as well as the participation rate. The EMA retains the right to review any aspect of the Demand Response programme within the 3-year period.

5.13.2. [Table 10](#) highlights the key changes in the Demand Response programme from the proposed programme detailed in the EMA's Consultation Paper published in October 2012.

²³ The Code of Conduct for Retail Electricity Licensees sets forth minimum standards of performance in accordance with which a Licensee is required to conduct its retail activities.

Table 10: Summary of the proposed changes to the Demand Response programme

Key Features	Proposed changes	Rationale
Price Floor	The price floor is revised to 1.5 times of the prevailing Balance Vesting Price (BVP) (instead of the proposed \$300/MWh). Demand bids with price tranches below the price floor will not be accepted.	Feedback received from consumer(s) and potential licensed load provider(s) suggest that a dynamic price floor which takes into account fuel prices will serve as a better safeguard against gaming.
Metering and communications requirements	Half- hourly metering, with communications to PSO at 5-minute sampling rate will be required for the metering communications infrastructure (instead of the more stringent 30-second sampling rate proposed in the consultation paper).	Feedback received from consumer(s) and potential licensed provider(s) suggests that a sampling rate of 30-second is too stringent. Upon further assessment, 5 minute sampling data for purpose of communications between the licensed load provider and the PSO is deemed to be adequate for the purpose of monitoring system operation and stability.
Demand Bids for MCE's solving	In addition to other inputs (e.g. total load (MW), a series of energy curtailment and price quantity tranches (\$/MWh)), self-declared linear ramp-up and down rates (MW/min) will be submitted by licensed load providers at point of registration.	Feedback received from consumer(s) and potential licensed provider(s) suggest that a longer response time would allow more load to participate in the Demand Response programme. The inclusion of ramp rates into the demand bids will increase the amount of potential load for the Demand Response programme, thereby allowing more contestable consumers to participate in the programme.
Class of load providers	The classification of load providers into class A & class B is no longer required as load providers will instead submit linear ramp rates of the load facility/block in their demand bids for the MCE's solving.	The inclusion of ramp rates in the MCE will allow a more accurate least-cost solution to be generated for dispatch in each period.
Compliance check	Compliance checks will be performed by comparing the metered energy consumption against implied energy consumption based on the dispatch schedule.	Given that the PSO will not be monitoring compliance of demand response load at real-time, compliance check will be performed by comparing the metered energy consumption against implied energy consumption based on the dispatch schedule. Additionally, the compliance regime has been revised such that penalties will be imposed on licensed load providers only if they are compliant with less than 95% of their implied energy curtailment (if they are scheduled to reduce load) or implied energy consumption (if they are not scheduled to reduce load).
Collection of Payment	Retailers may choose to opt out of the Demand Response	Feedback received on the generator(s) suggests that the industry prefers to have

Key Features	Proposed changes	Rationale
	<p>programme if they deem that the programme is not beneficial for them.</p> <p>Such retailers will not have to pay the uplift due to the programme, but in return have to forgo the Implicit Demand Response Rebate.</p>	<p>the option to pay for demand response. As such, the EMA has revised the settlement and collection mechanism to provide retailers the choice to opt out of the Demand Response programme.</p>

6. Indicative Implementation Timeline

- 6.1. The details of the market rules and system changes will be implemented by the relevant stakeholders as per current procedures.
- 6.2. The indicative timeline for the implementation of the Demand Response programme is provided in [Table 11](#). Interested participants may apply for a Wholesale (Demand Side Participation) licence with EMA from the date of issue of this final determination paper.

Table 11: Indicative timeline for the implementation of Demand Response programme

	Process	Date
1	Issue of the EMA's Final Determination Paper	28 October 2013
2	Modification of the Market Rules and necessary system changes in the NEMS ²⁴	2013 - 2014
3	Commencement of Demand Response Programme	2015

²⁴ The EMA will work with EMC to ensure that the modifications of the market rules and necessary system changes in the NEMS for the implementation of the Demand Response programme is a high priority item under the Rules Change Panel (RCP) work streams.

**Response to Feedback on
Implementing Demand Response in the National Electricity Market of
Singapore**

Electricity Licence for Wholesaler Licensee (Demand Side Participation)

granted under

the Electricity Act (Cap. 89A) to

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PART I: SCOPE OF THE LICENCE

1. The Energy Market Authority of Singapore (the “Authority”), in exercise of the powers conferred by Section 9 of the Electricity Act (Cap. 89A) (the “Act”), hereby grants to Company XXX, (“the Licensee”), a company incorporated in the Republic of Singapore with Registration Number xxxxxxxxx, an electricity licence (the “licence”) authorising the Licensee **to participate in demand side activities** in any wholesale electricity market operated by the Market Company, subject to the conditions of this licence (the “Conditions”).
2. The Conditions are subject to modification in accordance with their terms or Section 12 of the Act.
3. Subject to paragraph 4 below, this licence shall be for a term of 10 years commencing on the date set out below. The Licensee may, no later than 2 (two) years prior to the expiry of this licence, apply to the Authority, in writing, for a renewal of the licence. The renewal shall be on such terms and conditions as the Authority deems fit and will be notified to the Licensee, in writing, no later than 1½ (one and a half) years prior to the expiry of this licence.
4. The Authority may at any time during the term of this licence revoke or suspend this licence in accordance with Section 13 of the Act.

Chief Executive

Energy Market Authority of Singapore

PART II: CONDITIONS OF THE LICENCE

Condition 1: Interpretation

1. Unless the context otherwise requires, words and expressions used in this licence shall be construed as if they were in an Act of Parliament and the Interpretation Act (Cap. 1) applied to them and references to an enactment shall include any statutory modification or re-enactment thereof or any legislation substituted therefor after the date when this licence comes into operation. A reference in this licence to a body, whether statutory or not, which ceases to exist or whose functions are transferred to another body includes a reference to the body which replaces it or which substantially succeeds to its functions, powers or duties. A reference in this licence to the word “including” or a grammatical variation thereof means “including but not limited to”.
2. Unless the context otherwise requires or the term is otherwise defined in paragraph 3 of this Condition, all terms defined in the Act shall have the same meaning when used in this licence.
3. In this licence, unless the context otherwise requires:
 - “authorised business” means, in respect of the Licensee, the business of trading in any wholesale electricity market operated by the Market Company for the purpose of participating in demand side activities;
 - “demand side activities” means the activities related to the bidding of load reductions into the wholesale electricity market operated by the Market Company;
 - “demand response load” means the load reduction capacity of a load facility that can be dispatched by the Market Company for energy in any wholesale electricity market operated by the Market Company;
 - “director” means any person who is a “director” within the meaning of Section 4(1) of the Companies Act (Cap. 50);
 - “load” means the withdrawal of energy from the transmission system;
 - “load facility” means any facility that draws energy from the transmission system;
 - “power system” means a system comprising (a) the transmission system; and (b) generation facilities and load facilities, as defined in the market rules, connected to the transmission system;
 - “Power System Operator” means the Authority acting in its capacity as the person responsible for ensuring the security of supply of electricity to consumers and arranging for secure operation of the transmission system in accordance with the market rules and applicable codes of practice as described in Section 3(3)(e) of the Act;
 - “regulatory contract” means an agreement or arrangement which an electricity licensee is required, by condition of licence, to enter into under Section 9(7)(a)(ii) of the Act;
 - “related enterprise” in relation to the Licensee or its subsidiary means any company or partnership over which the Licensee or its subsidiary, as the case may be (either directly or through another subsidiary company) is able to exercise control, that is, to direct the decision-making process of the company or partnership, whether through holding issued share capital or voting power of the company or partnership; and
 - “relevant legislation” means the Act and the Energy Market Authority of Singapore Act (Cap. 92B), and includes in each case the regulations made thereunder.

4. For the purposes of the restriction on the transfer of this licence, the provisions of Section 11 of the Act shall apply and, accordingly:
 - (a) this licence is not transferable without the approval in writing of the Authority; and
 - (b) any purported transfer of this licence shall be void.
5. Any reference in this licence to a numbered paragraph is a reference to the paragraph bearing that number in the condition in which the reference occurs.
6. Where in this licence the Licensee is required to comply with any obligation within a specified time limit, that obligation shall be deemed to continue after that time limit if the Licensee fails to comply with that obligation within that time limit.
7. The provisions of Section 99 of the Act shall apply for the purposes of the service of any document pursuant to this licence.

Condition 2: Composition of the Board of Directors

1. The Licensee shall procure that at all times its directors shall not be employed by nor hold any office or engagement with:
 - (a) any person authorised by an electricity licence or exempted from the obligation to hold an electricity licence, to engage in an activity referred to in one or more of subsections (b), (e), or (g) of Section 6(1) of the Act; or
 - (b) a gas transporter under the Gas Act (Cap. 116A).
2. The Authority may, on such terms as it may specify in writing and notified to the Licensee, waive or vary any of the requirements of this Condition.

Condition 3: Prohibition of Acquisition of Shares

1. The Licensee shall not directly or indirectly through its related enterprises acquire or hold any shares in:
 - (a) any person authorised by an electricity licence or exempted from the obligation to hold an electricity licence, to engage in an activity referred to in one or more of subsections (b), (e), or (g) of Section 6(1) of the Act; or
 - (b) a gas transporter under the Gas Act (Cap. 116A).
2. The Authority may, on such terms as it may specify in writing and notified to the Licensee, waive or vary any of the requirements of this Condition.

Condition 4: Compliance with Market Rules

1. The Licensee shall not trade in any wholesale electricity market operated by the Market Company unless it is registered as a market participant in accordance with the market rules. The Licensee shall at all times comply with the provisions of the market rules applicable to the Licensee.
2. If the Licensee applies to the Market Company for registration as a market participant, the Licensee shall notify the Authority:

- (a) of the filing of such application;
- (b) upon being registered or denied registration as a market participant;
- (c) upon having its registration as a market participant suspended or terminated; and
- (d) no later than 2 (two) months before any application is filed by the Licensee to withdraw its registration as a market participant.

Condition 5: Codes of Practice

1. The Licensee shall be subject to and shall comply with any codes of practice and standards of performance issued or approved under Section 16 of the Act that apply to the Licensee.
2. The Licensee may be required to participate in the development of any code of practice and standard of performance to be issued by the Authority if such code of practice or standard of performance will directly or indirectly affect the authorised business of the Licensee.
3. The Licensee may propose modifications to a code of practice or standard of performance that is in force at the relevant time by notifying the Authority in writing of the proposed modification. The Authority may:
 - (a) review the proposed modification to a code of practice and determine whether the proposed modification should be made, in accordance with the code modification process set out in the relevant code; and
 - (b) review the proposed modification to a standard of performance to determine whether the proposed modification should be made.
4. The Authority may by written notification, exempt the Licensee from compliance with any code of practice, in whole or in part, and subject to such terms and conditions as the Authority may determine.
5. (1) The Licensee shall not:
 - (a) with regard to its authorised business or the electricity industry,
 - (i) make, prepare, attest to or certify, orally or in writing, any representation or statement that is false, incorrect or misleading or open to misconstruction by any person; or
 - (ii) make any representation or statement, orally or in writing, or give any answer, orally or in writing, or otherwise conduct itself in a manner that is likely to mislead any person; or
 - (b) mislead or otherwise create any confusion in the mind of a person about its authorised business.
- (2) If the Authority is satisfied that the Licensee is contravening or has contravened any provision of paragraph (1), the Authority may, by notice in writing to the Licensee, direct the Licensee to take such steps, as are specified in such direction, to correct such false, incorrect or misleading representation, statement or answer or to correct such confusion, including without limitation, by

requiring the Licensee to publish a correction or to write to such persons to set out the correct facts within a specified period of time as directed by the Authority.

- (3) The Authority may take enforcement action against the Licensee in accordance with the provisions of the Act if the Licensee fails to comply with the direction of the Authority issued under paragraph (2) above.

Condition 6: Regulatory Contracts

1. The Licensee shall enter into the following regulatory contracts:
 - (a) an agreement with the Power System Operator for the purposes of creating a contractual relationship between the Power System Operator and the Licensee as a market participant; and
 - (b) if deemed necessary by the Authority, an agreement with a market support services licensee to obtain market support services.
2. The Licensee may be required to participate in the preparation of any regulatory contract to which the Licensee will be a party.
3. If after a period which appears to the Authority to be reasonable, or such period agreed to between the parties and approved by the Authority, or such other period as stipulated by the Authority from time to time, the Licensee has failed to enter into a regulatory contract, the Authority may, at the request of the Licensee or the party aggrieved by such failure, determine any terms of the regulatory contract in such manner as appears to the Authority to be reasonable. The Licensee shall thereafter enter into the regulatory contract on the terms determined by the Authority.
4. Paragraph 3 of this Condition shall not apply to any regulatory contract under which the Authority or an entity that is operated by or to which the Authority has a shareholding is a party, in which case an independent third party shall be appointed to negotiate any terms that remain unresolved as between the Authority or the aforesaid entity, as the case may be, and the Licensee.
5. Any dispute arising under a regulatory contract to which the Licensee is a party shall be resolved in accordance with the dispute resolution provisions of the regulatory contract.

Condition 7: Investigation of Offences

1. The Licensee shall monitor its activities with respect to compliance with this licence and shall report any suspected non-compliance to the Authority.
2. Where it comes to the attention of the Licensee that another electricity licensee has breached its electricity licence or relevant legislation, the Licensee may report any suspected non-compliance to the Authority.
3. Where the Licensee reports suspected non-compliance by itself or another electricity licensee, or requests the Authority to institute a prosecution against any person for contravening a provision of relevant legislation in relation to the authorised business, the Licensee shall furnish to the Authority:
 - (a) a written report on the suspected non-compliance or contravention; and

- (b) any relevant information and evidence in the possession or control of the Licensee and requested by the Authority within 30 (thirty) days of the Authority's request.
- 4. Where the Authority receives any information from any person other than the Licensee indicating that an offence under relevant legislation may have been committed in respect of activities or property belonging to or managed by the Licensee, the Authority may, subject to Section 5 of the Act, inform the Licensee of such information and the Licensee shall furnish to the Authority, within 30 days of the Authority's request,:
 - (a) a written report on the suspected offence; and
 - (b) any relevant information and evidence in the possession or control of the Licensee and requested by the Authority.
- 5. The Licensee and its directors and officers shall give full assistance and cooperation to the Authority and its prosecuting officer or counsel in connection with any prosecution proceedings arising from paragraphs 1 through 4 of this Condition.

Condition 8: Information, Access and Audit Rights of the Authority

- 1. The Licensee shall promptly inform the Authority of any circumstances that result, or are likely to result, in a change in the information provided to the Authority and shall provide updated information to the Authority in a timely manner.
- 2. Without prejudice to the powers of the Authority to call for information under or pursuant to any other conditions in this licence or relevant legislation, the Licensee shall, at its own cost, furnish to the Authority such information as the Authority requires pursuant to Section 4 of the Act and in such form as the Authority requires.

Condition 9: Payment of Fees

- 1. The Licensee shall, at the times stated hereunder, pay to the Authority fees of the amount specified in, or determined under, paragraphs 2 to 5.
- 2. The Authority shall, after the issue of this licence, notify the Licensee in writing of the initial fee to be paid and the Licensee shall pay such fee to the Authority within 30 (thirty) days.
- 3. The Authority shall notify the Licensee on or before the 1st of April of each subsequent year in which this licence is in effect of the fee to be paid and the Licensee shall pay such fee to the Authority on or before 30th April of each such subsequent year.
- 4. Without prejudice to any other powers of the Authority under this licence or the Act, if the Licensee shall fail to pay in full any fee due pursuant to this Condition on or before the due date for payment thereof the Licensee shall pay to the Authority interest at the Prescribed Rate described in paragraph 5 below, which interest shall accrue daily on the amount unpaid on and from such due date to the date of actual payment and shall be compounded monthly at the end of each calendar month.
- 5. The Prescribed Rate shall be the rate which is four percentage points (4%) above the arithmetic average of the rates quoted in Singapore by The Development Bank of Singapore Limited, Overseas-Chinese Banking Corporation Limited and United Overseas Bank Limited (or such other banks as the Authority may specify in writing from time to time) as being the respective prime lending rates of such banks for each

day of the period for which interest accrues, and in respect of any day during such period which is not a day for which such a rate is quoted the last preceding rate quoted shall apply.

Amendments to the Code of Conduct for Retail Electricity Licensees

2.2.2 A Licensee shall comply with the following when retailing electricity:

- (a) immediately and truthfully identify itself to a consumer in the manner specified in section 2.3;
- (b) clearly indicate that any offer to sell made by the Licensee is not being made by a person authorised by the Authority to transmit electricity or provide market support services;
- (c) not seek to mislead or otherwise create any confusion in the mind of a consumer about the identity of the Licensee, its promotion campaigns or trade mark, or those of other Electricity Licensees;
- (d) not exert undue pressure on a consumer;
- (e) provide sufficient time for a consumer to read thoughtfully and without harassment all documents provided by the Licensee;
- (f) not make, orally or in writing, any representation or statement, give any answer or otherwise conduct itself in a manner that is false or is likely to mislead a consumer with regard to any term in an offer to sell;
- (g) provide only accurate, verifiable and truthful comparisons;
- (h) not make any oral representations regarding retail contracts or related rights or obligations unless such representations are reflected in a written offer to sell;
- (i) ensure that all representations made in the Licensee's promotional material truthfully and accurately represent actual conditions, situations and circumstances; **and**
- (j) not use, in any document provided to a consumer, print that, due to its size or other visual characteristics, is likely to impair materially the legibility or clarity of the document; **and**
- (k) **not discourage, restrict or prohibit consumers from participating in demand response-related or energy efficiency-related initiatives.**