MARKET REPORT 2011

National Electricity Market of Singapore

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Energy Market Company: Letter from the Chairman

Dear Industry Members

Against a backdrop of impressive double-digit growth in the preceding year, Singapore's economy grew by a modest 4.9 percent in 2011. In line with the lower economic growth, electricity demand in the National Electricity Market of Singapore (NEMS) also registered slower growth compared to the year before.

On an annual basis, metered demand inched up slightly to hit 43 terawatt hours, an increase of 1.3 percent compared to 2010. Wholesale electricity prices, on the other hand, rose considerably in 2011. The annual Uniform Singapore Energy Price (USEP) increased by 26.0 percent compared to the previous year, reaching a new height of $215 per megawatt hour. The higher price propelled the annual trading value in the NEMS to a record $9.7 billion.

A significant factor behind the high USEP was the switch from natural gas to more costly fuel (diesel and fuel oil) for power generation as a result of gas supply disruptions. This, together with rising oil prices, higher demand, facility maintenance and forced outages of generation and a gas onshore receiving facility, contributed to the upward pressure on the USEP.

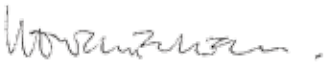
A notable event in 2011 was the withdrawal of a market participant (MP) from the NEMS, the first seen since trading started in 2003. The impact on supply, however, was minimal in view of the small registered capacity involved. One new MP joined the market during the year, adding a new gas turbine unit which was registered as an embedded generator. Overall, the available capacity in the NEMS increased by 1.0 percent and remained above the 6,500MW level.

The NEMS remained competitive in 2011. There was ongoing shift towards more efficient technologies, prices in general moved in tandem with demand and supply conditions, and the market continued to attract new investments.

Looking ahead, the move towards more efficient generation will continue in 2012 when Senoko Energy completes its repowering of two combined-cycle gas turbine units. Supply in the NEMS is also expected to increase, with new plantings from Keppel Merlimau Cogen and Sembcorp Cogen around 2013 and 2014 respectively, and new MPs like Exxonmobil Asia Pacific, GMR Energy Singapore and Tuaspring coming on board over the next few years.

At this point, I would like to convey my appreciation to the members of the Rules Change Panel, the Market Surveillance and Compliance Panel and the Dispute Resolution and Compensation Panel for their ongoing contributions and commitment. They play an important role in ensuring the competitive and efficient operation of the market.

I look forward to another successful year for the NEMS in 2012.



Wong Meng Meng
Chairman
Energy Market Company

MARKET OVERVIEW

Market Overview: Market History

The opening of the National Electricity Market of Singapore (NEMS) in January 2003 was the culmination of a number of structural reforms to Singapore's electricity industry. Singapore's journey to liberalisation started in October 1995, when industry assets were corporatised and put on a commercial footing. In 1998, the Singapore Electricity Pool, a day-ahead market, began operation. On 1 April 2001, a new legal and regulatory framework was introduced that formed the basis for a new electricity market.

The NEMS places Singapore alongside an international movement to introduce market mechanisms into the electricity industry as a way to:

- increase economic efficiency through competition;
- attract private investment;
- send accurate price signals to guide production and consumption decisions;
- encourage innovation; and
- provide consumer choice.

Market Reform Milestones

Corporatisation	**1995**	Electricity functions of the Public Utilities Board corporatised
		Singapore Power formed as a holding company
	1996	Singapore Electricity Pool (SEP) design process began
Singapore Electricity Pool (SEP)	**1998**	SEP commenced
		PowerGrid is SEP Administrator and Power System Operator (PSO)
	1999	Review of electricity industry
National Electricity Market of Singapore (NEMS)	**2000**	Decision for further reform to obtain full benefits of competition
		New market design process began
	2001	Electricity industry legislation enacted
		Energy Market Authority (EMA) established as industry regulator and PSO
		Energy Market Company (EMC) established as the NEMS wholesale market operator
		Initial phase of retail contestability
	2002	Draft Market Rules issued
		Testing and trialling of wholesale market system began
	2003	NEMS wholesale market trading began
		More large consumers introduced to retail contestability
	2004	Vesting contract regime introduced
		Interruptible loads (IL) began to participate in the reserves market
	2005	Further batches of large consumers introduced to retail contestability
	2006	First wholesale market trader joined the market and commenced trading as IL provider
		Keppel Merlimau Cogen joined the market and started trading
		Retail contestability expanded to 75 percent of total electricity demand
	2007	Removal of the Market Registration Application Fee
	2008	Sale of Tuas Power to China Huaneng Group in March, Senoko Power to Lion Consortium in September, and PowerSeraya to YTL Power in December
		Embedded generators joined the market
	2009	Revised regulation price cap of $300/MWh was implemented
		New embedded generators, small generators and incineration plants joined and started trading
	2010	Vesting tender was introduced to tender out a percentage of non-contestable electricity demand to generation companies for bidding
		Shell Eastern Petroleum joined the market as an embedded generator and started trading

Market Overview: Industry Structure

Singapore's electricity industry is structured to facilitate competitive wholesale and retail markets. Competitiveness is achieved by separating the ownership of the contestable parts of the industry from those with natural monopoly characteristics.

New Market Participant Joined the Market

Green Power Asia joined the NEMS on 23 March 2011 with a 8MW generation settlement facility. This increases the total number of embedded generators in the NEMS to six.

Participants and Service Providers in the NEMS

Active Generators	Keppel Merlimau Cogen National Environment Agency PowerSeraya Sembcorp Cogen Senoko Energy Senoko Waste-to-Energy Shell Eastern Petroleum Keppel Seghers Tuas Waste-To-Energy Plant (Tuas DBOO Trust) Tuas Power Generation
Wholesale Market Traders	Air Products Banyan Utilities Diamond Energy Green Power Asia ISK Singapore IUT Singapore[1] Pfizer Asia Pacific Schering-Plough/MSD International GmbH (Singapore Branch)[2] Singapore Oxygen Air Liquide
Active Retailers	Keppel Electric Sembcorp Power Senoko Energy Supply Seraya Energy Tuas Power Supply
Market Support Services Licensee (MSSL)	SP Services
Market Operator	Energy Market Company
Power System Operator (PSO)	Power System Operator
Transmission Licensee	SP PowerAssets

[1]IUT Singapore withdrew as a market participant with effect from 11 May 2011.

[2]Change in ownership and renamed MSD International GmbH (Singapore Branch) with effect from 1 March 2011.

Market Overview: Industry Structure

Generation Licensees
All generators that are connected to the transmission system are licensed by the EMA unless their facilities are less than 10MW. All generators with facilities of 1MW or more that are connected to the transmission system must participate in the NEMS and be registered with EMC.

Wholesale Market Traders
Wholesale Market Traders are companies, other than generators or retailers, that are licensed by the EMA to trade in the wholesale electricity markets.

Retail Electricity Licensees
Retailers that sell electricity to contestable consumers are licensed by the EMA. Retailers that are registered as market participants purchase electricity directly from the wholesale market.

Market Support Services Licensee — SP Services
A Market Support Services Licensee (MSSL) is authorised to provide market support services. Such services include consumer registration and transfer, meter reading and meter data management, retail settlements and billing for contestable consumers. SP Services is the only MSSL.

Market Operator—EMC
EMC operates and administers the wholesale market. This role includes calculating prices, scheduling generation, clearing and settling market transactions and procuring ancillary services. EMC also administers the rule change process and provides resources that support market surveillance and the compliance and dispute resolution processes.

Transmission License—SP PowerAssets
SP PowerAssets owns and is responsible for maintaining the transmission system.

Power System Operator
The Power System Operator (PSO, a division of the EMA) is responsible for ensuring the security of supply of electricity to consumers. The PSO controls the dispatch of generation facilities, co-ordinates scheduled outages and power system emergency planning and directs the operation of the high-voltage transmission system.

Regulator—EMA
The EMA is the regulator of the electricity industry and has the ultimate responsibility for the market framework and for ensuring that the interests of consumers are protected.

Consumers
Consumers are classified as being either contestable or non-contestable, depending on their level of electricity usage. Contestable consumers may choose to purchase electricity from a retailer, directly from the wholesale market or indirectly from the wholesale market through the MSSL, SP Services. Non-contestable consumers are supplied by SP Services.

Market Overview: Market Features

The NEMS has a number of features that drive efficiency and make its design truly world class. These include:

- co-optimisation of energy, reserve and regulation products;
- security-constrained dispatch and nodal pricing; and
- near real-time dispatch.

Co-optimisation of Energy, Reserve and Regulation Products

A sophisticated process involving about 50,000 different mathematical equations is used to determine the price and quantity of the energy, regulation and reserve products traded. Integral to this process is the concept of co-optimisation, wherein the market clearing engine (MCE) considers the overall costs and requirements of all products, then selects the optimal mix of generation and interruptible loads (IL) to supply the market.

Security-Constrained Dispatch and Nodal Pricing

To determine the prices for products traded on the wholesale market, offers made by generators and ILs are matched with the system demand forecast and system security requirements. The MCE produces security-constrained economic dispatch by taking into account the:

- available generation capacity;
- ability of generation capacity to respond (ramping);
- relationship between the provision of energy, reserve and regulation (co-optimisation);
- power flows in the system;
- physical limitations on the flows that can occur in the transmission system;
- losses that are incurred as power is transported; and
- constraints in relation to system security.

This process is run every half-hour to determine the:

- dispatch quantity that each generation unit is to produce;
- reserve and regulation capacity that each generation unit is required to maintain;
- level of IL that is required; and
- corresponding prices for energy, reserve and regulation in the wholesale market.

Energy prices—referred to as nodal prices—vary at different points on the network. The differences in nodal prices reflect both transmission losses and the physical constraints of the transmission system. This means that the true costs to the market of delivering electricity to each point on the electricity network are revealed.

The MCE models the transmission network and uses linear and mixed integer programming to establish demand and supply conditions at multiple locations (nodes) on the network. Modelling ensures that market transactions are structured in a way that is physically feasible given the capacity and security requirements of the transmission system. For each half-hour trading period, the MCE calculates the prices to be received by generators at the 44 injection nodes and the prices at approximately 694 withdrawal or off-take nodes that are used as the basis for the price to be paid by customers.

Energy, Reserve and Regulation Products

	Description	Purchaser	Seller
Energy	Generated electricity	Retailers	Generators
Reserve	Stand-by generation capacity or IL that can be drawn upon when there is an unforeseen shortage of supply. Three classes of reserve are traded: 1) primary reserve (8-second response) 2) secondary reserve (30-second response) and 3) contingency reserve (10-minute response)	Generators	Generators, Retailers and Wholesalers
Regulation	Generation that is available to fine-tune the match between generation and load	Generators and Retailors	Generators

This method of price determination encourages the economically-efficient scheduling of generation facilities in the short term and provides incentives to guide new investment into the power system infrastructure in the long term.

EMC uses metered demand and generation from the MSSL and market prices to settle market transactions on a daily basis. Generators receive the market price for energy that is determined at their point of connection to the transmission network (injection node). Retailers pay the Uniform Singapore Energy Price (USEP) for energy, which is the weighted-average of the nodal prices at all off-take nodes.

Generators pay for reserve according to how much risk they contribute to the system. Regulation is paid for by retailers in proportion to their energy purchase and by dispatched generators up to a ceiling of 5 megawatt hours (MWh) for each trading period.

Near Real-Time Dispatch

Market prices and dispatch quantities for energy, reserve and regulation are calculated five minutes before the start of each half-hour trading period. This ensures that the market outcomes reflect the prevailing power system conditions and the most recent offers made by generators. The result of near real-time calculation of dispatched generation quantities ensures as little real-time intervention as possible, and hence minimal deviation from a competitive market solution.

To support near real-time dispatch, EMC produces market forecast schedules up to a week ahead of the relevant trading period. These forecast schedules increase in frequency as the trading period approaches to ensure that MPs have the information they need to adjust their trading positions prior to physical dispatch.

MARKET GOVERNANCE

Market Governance: Overview

Governing Documents and Institutions

The Energy Market Authority (EMA) was established under the Energy Market Authority of Singapore Act 2001. The EMA is the electricity market regulator under the Electricity Act 2001 and is responsible for, among other mandates:

- creating the market framework for electricity and gas supply;
- promoting development of the electricity and gas industries;
- protecting the interests of consumers and the public;
- issuing licences; and
- advising the Government on energy policies.

Rule Change Process

The day-to-day functioning of the National Electricity Market of Singapore (NEMS) wholesale market is governed by the Singapore Electricity Market Rules.

The rule change process is the responsibility of the Rules Change Panel (RCP). Appointed by the Energy Market Company (EMC) Board, the RCP members represent generators, retailers, wholesale market traders, the financial community, the Power System Operator (PSO), the Market Support Services Licensee (MSSL), the transmission licensee, electricity consumers and EMC, ensuring representation by all the key sectors of the industry.

The rule change process is designed to maximise transparency and opportunities for public involvement. Rule modifications recommended by the RCP require the support of the EMC Board and the EMA. When approving changes to the Market Rules, the EMA is required to consider whether the proposed rule modifications (i) unjustly discriminate in favour of or against a market participant (MP) or a class of MPs; or (ii) are consistent with the functions and duties of the EMA under subsection 3(3) of the Electricity Act. Each year, the RCP establishes and publishes its work plan to ensure that stakeholders remain informed about the likely evolution of the market. The work plan can be found at www.emcsg.com.

Market Surveillance and Compliance

The Market Surveillance and Compliance Panel (MSCP), comprised of professionals independent of the market, is responsible for monitoring, investigating and reporting on the behaviour of MPs and the structural efficiency of the market. The panel identifies market rule breaches and assesses market operations for efficiency and fairness. In circumstances in which the MSCP determines that an MP is not compliant with the Market Rules, it may take enforcement action, which may include levying a penalty. The MSCP also recommends remedial actions to mitigate any rule breaches or inefficiencies identified. The panel publishes the MSCP Annual Report, which has been published together with the NEMS Market Report since 2007.

Dispute Resolution

The Market Rules contain a process that facilitates the resolution of disputes between MPs and service providers. The dispute resolution process is designed to be a cost-effective way of resolving disputes and preserving market relationships by avoiding court proceedings. This process is managed by the Dispute Resolution Counsellor (DRC).

Market Governance: Letter from the Chair, Rules Change Panel

Dear Industry Members

The Singapore Electricity Market Rules govern the wholesale market operations of the NEMS. These rules, and consequently the market framework they represent, are under the guardianship of the Rules Change Panel (RCP). Amidst changes to the industry landscape, the RCP has guided changes to the rules to ensure that they remain relevant, and that the market operates efficiently.

This year, the RCP addressed an extensive range of rule changes that spanned market design, and technical and administrative topics. Even as issues grow in complexity, the Panel has relentlessly applied in-depth analysis and sound market principles when assessing rule changes. On this note, I would like to congratulate all Panel members for carrying out their duties with professionalism, diligence and impartiality.

Several issues tackled by the RCP required a delicate balance of costs and benefits, and across divergent goals. For example, in deciding whether to recover reserve and regulation payments from providers that failed to provide, the RCP had to weigh the implementation costs against the need to set in place the correct incentives for the provision of reliable ancillary services. And in deciding whether facility registered capacities should be published, the goal of data transparency was measured against the downside of potential abuse of data. The Panel engaged in a robust discussion on these issues, and this healthy tension allowed all members to come away with a deeper understanding of the market.

The RCP continually fine-tunes the Market Clearing Engine (MCE) to unlock efficiencies in the scheduling and dispatch process. This year, the Panel refined the basis upon which regulation offers from generation facilities are qualified for provision in the upcoming period. Using the revised method, EMC conducted a simulation and found that it resulted in more qualified regulation offers, and a more optimal dispatch with higher net benefit values.

The make-up of the RCP is important in assuring industry stakeholders of the independence of market evolution and governance. This year, the Panel grappled with the issues of relative representation from the various stakeholder groups on the RCP, and whether to lift the exemption which allows Temasek Holdings affiliates to be concurrently represented on the Panel. I am heartened by the debate on these issues, which reflects the willingness of Panel members to set aside personal interests and make decisions for the good of the market.

The close of 2011 marks the end of the current Panel's term. I would like to take this opportunity to thank outgoing Panel members for their dedicated contributions over the years: Henry Gan, Philip Tan Pei Lip, Robin Langdale, Dr Goh Bee Hua and Michael Lee Kwee Thye. At the same time, I would like to welcome Toh Seong Wah, Koe Pak-Juan, Michael Wong Ho Ming, Phillip Tan Eng Siong, Dr Toh Mun Heng and Low Cheong Kee to the new Panel. This is part of the Panel's rejuvenation process, and I look forward to the fresh perspectives that these new members will bring to our discussions.

Beyond the Panel, I would like to express my gratitude to all others who have contributed to making 2011 a fruitful year, including the EMA, the EMC Board, EMC's Market Administration team and all other market participants whose valuable inputs have contributed to the success of the rule change process.

Dave Carlson
Chair
Rules Change Panel

The following rule changes were discussed and approved, as part of the RCP's continual efforts to guide the evolution of the wholesale electricity market.

Deregistration of a Generation Facility that is Not Directly Connected to the Transmission System

The current deregistration process requires the transmission licensee to physically disconnect a generation facility (GF) from the transmission system before that GF can be deregistered from the Singapore Wholesale Electricity Market (SWEM). This requirement is not feasible when the GF is not directly connected to the transmission system – for example, when it is connected through a substation instead. In such instances, disconnecting the link directly from the transmission system may inadvertently disconnect other downstream facilities.

To address such situations, a rule change was made to remove this requirement from the deregistration procedures entirely. The rule change also introduced a requirement for EMC to notify the PSO, transmission licensee and MSSL upon the deregistration of a GF.

Eligibility of Regulation Offer

Generators are physically able to provide regulation service only when their energy output is within a given range. Thus, the MCE checks if a generator's expected generation output at the start of the upcoming period is within this range before qualifying it to provide regulation for that period.

Currently a generator's output at the start of the upcoming period is proxied using its output captured 10 minutes before the start of the period. Given the 10-minute lag, this proxy could be a poor estimate that compromises the effectiveness of the eligibility check, especially if the generator is ramping up or down.

EMC refined this check by using the generator's scheduled energy instead, which is the energy output a generator is required to reach at the end of the current period (or correspondingly, the start of the upcoming period). For situations where the generator is physically unable to reach this scheduled output level – for example, due to ramping constraints – EMC will extrapolate its expected output at the start of the upcoming period using its actual output 10 minutes before and its maximum ramping capabilities.

Before the proposal was implemented, EMC conducted a simulation and found that the revised eligibility check resulted in more qualified regulation offers, and a more optimal dispatch with higher net benefit values.

Recovery and Refund of Reserve and Regulation Payments

Currently, reserve and regulation providers are paid based on their scheduled quantities, which are determined in the real-time dispatch schedule produced before the given dispatch period. Even if these providers fail to provide the respective service – for example, if they trip during the dispatch period – they would still receive their reserve and regulation payments.

This arrangement of paying non-providers of reserve and regulation in real time is undesirable, as it compromises system security and does not encourage the reliable provision of ancillary services. The RCP thus decided to recover reserve or regulation payments made to such non-providers.

Under the rule change, the PSO will identify the non-providers and provide the information to EMC. All non-providers identified within five business days of the trading period (i.e. before the preliminary settlement statement is posted) will not be paid. Non-provision cases identified after five business days may be referred to the MSCP, whereby any recovered amounts arising from the MSCP determinations will be refunded to the market through the Monthly Energy Uplift Charge.

Publication of Generation Registered Capacity by Facility

At present, generation companies (gencos) allocated vesting contracts are privy to each other's total registered capacity used in the determination of vesting contract allocation by the EMA. The rest of the industry and the public only have access to this information in a chart format, without accompanying figures, as published in EMC's annual NEMS Market Report. This contrasts with the level of detail for licensed capacity data, which is publicly available on EMA's website. Generally, registered capacities could differ from licensed capacity due to generation facilities being de-rated, decommissioned for repowering or when plants are yet to be built.

Data transparency should be supported as it allows interested parties to make better decisions and improves the competitiveness of the market. The exceptions are when it creates national security risks, causes adverse financial impact for any identified party, adversely impacts market efficiency – for example, by facilitating collusion – is a trade secret, is legally prohibited or is too costly to make available.

Given that registered capacity data is static data that is unlikely to flout any of the six criteria above, publishing it simply aligns it to the current level of detail of licensed capacity data. The RCP thus decided to publish the following:

For each generation facility:

- the identity of the MP of that facility;
- the identity of the facility;
- whether the facility is a generation registered facility, generation settlement facility or commissioning generation facility;
- the type of generation facility (i.e. technology);
- whether the facility is an embedded generation facility;
- the maximum generation capacity;
- the maximum reserve capacity for each class of reserve (primary/secondary/contingency) that the facility is registered to provide;
- the maximum regulation capacity that the facility is registered to provide; and
- whether the facility is frequency responsive.

For each load registered facility:

- the identity of the MP of that facility;
- the identity of the facility; and
- the maximum reserve capacity for each class of reserve that the facility is registered to provide.

Removal of Requirement to Withdraw Market Advisory Notices

Under the Market Rules, EMC produces dispatch and forecast schedules with different coverage horizons, and publishes market advisory notices if any of the following types of incidents are expected for any period(s) within these horizons:

Type 1) Surplus/Shortfall/Price Warning – When the MCE forecasts either energy surplus or energy/reserve/regulation shortfall. In conjunction with these surplus or shortfall situations which will likely lead to price spikes, price warning advisories will be issued informing the market that prices may be subject to price revision.

Type 2) System Status – When PSO expects a major equipment outage, load shedding or other abnormal conditions.

Type 3) Communications Warning – When EMC expects difficulties in delivering or receiving communications between EMC and PSO, or between EMC and MPs.

The intent of the advisories is to give MPs advance notice, so that they are given the opportunity and lead time to react. Conversely, so long as the (expected) conditions cease to exist, the Market Rules provide for the withdrawal of these advisories so as not to mislead MPs.

The RCP discussed and agreed that that it was not necessary to withdraw Type 1 advisory notices issued in respect of MCE schedules. Since the MCE schedules are run at regular intervals, the latest market conditions and any related advisories are continually being updated. MPs should just refer to the most recent advisories. However, there is still a requirement for the withdrawal of the other two types of notices (Types 2 and 3), as they are not subject to regular updates.

Review of Exemption to Allow Affiliates of Temasek Holdings to be Concurrently Represented on the RCP

To ensure fair representation on the RCP, affiliated companies ideally should not be represented concurrently on the Panel. However, to ensure adequate representation at the commencement of the SWEM, exemption was given to MPs and the MSSL that were affiliates of Temasek Holdings (Private) Limited. This exemption was subject to an annual review by the RCP, the EMC Board and the EMA.

A proposal was raised to narrow the exemption to apply only to the non-competitive service providers of the SWEM (i.e. the transmission licensee and the MSSL). This proposal was raised on the grounds that the original concern is now invalid since most Temasek-affiliated gencos have already been divested.

EMC conducted a survey of all MPs, potential MPs and the MSSL to assess their affiliation to Temasek or any other participating companies in the SWEM. The survey found that there was no longer a concentration of MPs affiliated to Temasek, and adequate representation on the RCP was possible even when the exemption was only applied to the non-competitive service providers. A rule change was thus passed to narrow the exemption to apply only to the transmission licensee and the MSSL, and remove the requirement for an annual review of this narrowed exemption.

Other Issues

The Panel also discussed the following proposals but decided not to support them, either because the timing was not right for implementation, or the potential benefits did not justify the costs.

New Forms of Collateral

To fulfill their credit support requirements in the SWEM, MPs can provide cash, bankers' guarantees, letters of credit and Singapore government treasury bills as collateral.

The RCP explored the use of other forms of collateral including corporate guarantees and insurance bonds. Corporate guarantees could be accepted as collateral provided they meet the following requirements:

- guarantor should not have a direct or indirect legal or beneficial interest of 5 percent or more of the value of shares in the MP;
- guarantee must be issued by an institution that has an S&P credit rating of "A" or above;
- guarantor must agree to a prescribed standard form of agreement issued by EMC; and
- guarantor must be an entity incorporated in Singapore.

Stakeholders, however, expressed difficulty in sourcing for corporate guarantees that met all the above requirements.

Insurance bonds were found to be an unsuitable form of collateral, given the operational constraints in cashing out such bonds. As such, the RCP decided not to expand the forms of instruments that are accepted as collateral in the SWEM.

Review of Composition of RCP

Issues assessed by the RCP are decided based on majority voting. Currently, the generation and retail licensee classes are each allocated three votes on the RCP, while the wholesale trader class only has one vote. A proposal was received suggesting that there should be an equal number of votes across these three classes. In addition to these three classes, a further seven votes are held by other stakeholders.

In response to this proposal, EMC reviewed the representation model of the existing RCP and analysed the impact of changing the number of representatives for each class of licensees. On balance, the RCP decided that there was not a strong case to change the current composition of the RCP and thus, no changes were required.

Obligation to Revise Offers in the Event of Complete System Outage at EMC

The dispatch coordinators (DCs) of generation facilities are required to submit offer revisions under certain situations – for example, when their units trip. They can do so either through EMC's offer submission system or any one of the backup submission procedures, after which EMC will input these offer revisions into the MCE. A proposal was received suggesting that the market manual should map out what the DCs should do in the event that they need to revise their offers but EMC's NEMS systems are not available.

The RCP considered that when the NEMS systems were not available, the DCs could still submit offer revisions using backup submission channels such as secured electronic mail in a pre-specified format. In doing so, the DCs would have fulfilled their obligations. If EMC is unable to process the offer revisions, this constitutes a rule breach on the part of EMC which is governed by the MSCP. Thus, the RCP concluded that no changes were required.

Review of Dispute Resolution Procedures

During a regular review of the dispute resolution procedures (DRP), the RCP received three proposals and made the corresponding determinations:

Proposal 1: To introduce a detailed set of arbitration procedures

Determination: Given that there has not been any arbitration case to date, the cost of including detailed arbitration procedures in the Market Rules does not appear justified. Rather, the DRC could use the procedures that he proposed as a guide in carrying out arbitration cases. If there are sufficient arbitration cases in future, the DRC could refine the guide for possible inclusion in the Market Rules, using the experience gained from these cases.

Proposal 2: To require that at least one Dispute Resolution and Compensation Panel (DRCP) member possesses experience in power systems operations

Determination: This could be addressed by having the DRC appoint a member with experience in power system operations when selecting members to the DRCP, rather than specifying it as such in the Market Rules.

Proposal 3: To align the selection process for a mediator with that of an arbitration tribunal

Determination: Currently, a mediator is selected by the DRC, while the arbitration tribunal (comprising one or three persons) is selected by parties to the dispute under arbitration. The DRC only selects the arbitration tribunal in the event disputing parties fail to do so.

There is a good reason for this differentiation. As a mediator cannot bind the parties, and the rationale was to set up the mediation quickly, it was felt that it would be better to have one mediator appointed by the DRC. There is no necessity for three mediators as there is no adjudication, and the mediator's role is only to facilitate. The arbitrator, on the other hand, acts as an adjudicator with binding powers and thus, the parties could select him from the Panel. As the two processes are different, there is no validity in aligning the selection process.

The RCP thus concluded this round of DRP review with no changes made to the Market Rules.

Market Governance: Letter from the Dispute Resolution Counsellor

Dear Industry Members

Dispute Resolution and Compensation Panel

The Dispute Resolution and Compensation Panel (DRCP) was established under the Market Rules to provide dedicated dispute resolution services to the NEMS when required.

DMS Contacts

Pursuant to the Market Rules, each market entity has nominated Dispute Management System (DMS) contacts to be the first point of engagement in the event of a dispute.

The DMS contacts are:

1. Air Products - Tay Wee Ann
2. Air Products - Shawn Zhang
3. Diamond Energy - Mohammed Rozaiman Rosidi
4. Energy Market Company - Abdul Aziz Yatim
5. Energy Market Company - Coco Choo
6. Keppel Electric - Janice Bong
7. Keppel Electric - Joelyn Wong
8. Keppel Merlimau Cogen - Sean Chan
9. Keppel Merlimau Cogen - Tini Mulyawati
10. National Environment Agency - Winston Chew
11. National Environment Agency - Joseph Boey
12. Pfizer - Lee Chin Hoo
13. Pfizer - Tan Meng Tong
14. PowerSeraya - Albert Siah
15. PowerSeraya - Calvin Quek
16. Power System Operator - Kang Cheng Guan
17. Power System Operator - Agnes Tan
18. Sembcorp Cogen - Chua Gwen Heng
19. Sembcorp Cogen - Aeron Hong
20. Sembcorp Power - Geraldine Tan
21. Sembcorp Power - HC Chew
22. Senoko Energy - Eveline How
23. Senoko Energy - Sim Mei Ling
24. Senoko Energy - Eu Pui Sun
25. Senoko Energy - Michelle Lim
26. Seraya Energy - Elaine Syn
27. Seraya Energy - Daniel Lee
28. Singapore Oxygen Air Liquide - Lim Yong Yi
29. SP Power Assets - Chan Hung Kwan
30. SP Power Assets - Ong Sheau Chin
31. SP Services - Lawrence Lee
32. SP Services - Budiman Roesli
33. Tuas Power Generation - Philip Tan
34. Tuas Power Generation - Priscilla Chua
35. Tuas Power Supply - Jazz Feng

As part of my responsibilities, I help to provide training in dispute resolution and the Market Rules for the DMS contacts.

On 16 September 2011, Raymond Chan, an arbitrator on the DRCP, and I conducted a half-day workshop for the DMS contacts. The workshop took place at EMC and was organised and supported by EMC's Market Assessment Unit.

The purpose of this workshop was to give the DMS contacts a refresher on the NEMS Dispute Guide, and an introduction to new arbitration rules proposed by the DRC and drafted by Mr Chan for the market's consideration. These rules have since been adopted as model rules for arbitrations conducted under the NEMS.

DRCP Members

The DRCP members are:

Mediation Panel

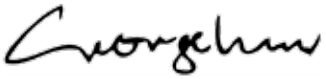
1. Chandra Mohan
2. Daniel John
3. Associate Professor Joel Lee
4. Associate Professor Lim Lei Theng
5. Robert Yu
6. Shirli Kirschner

Arbitration Panel

1. Giam Chin Toon, Senior Counsel
2. Professor Lawrence Boo
3. Phil Harris
4. Raymond Chan
5. Dr Robert Gaitskell, Queen's Counsel
6. Professor Tan Cheng Han, Senior Counsel
7. Sir Tony Fitzgerald

Conclusion

I am happy to report that no disputes were filed with me over the past year. I thank the DRCP members and DMS contacts for their contributions, and look forward to continuing to support the dispute resolution needs of all NEMS market entities in the coming year.

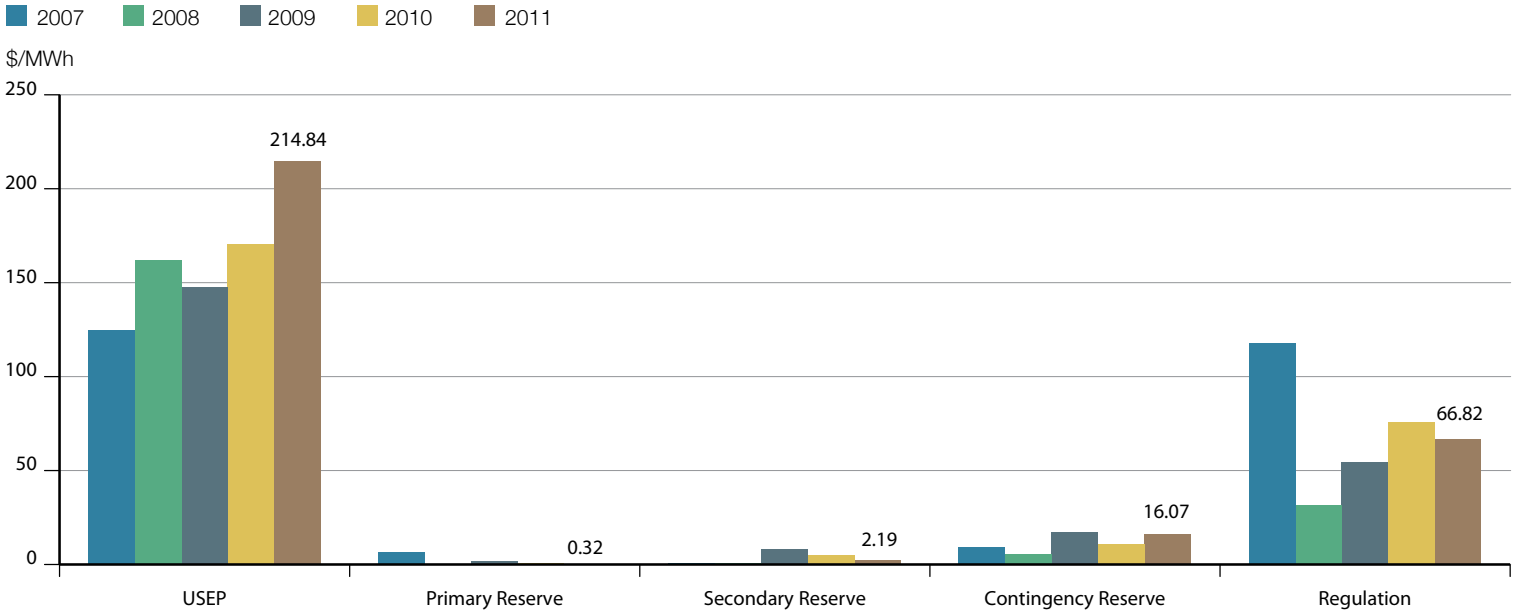


George Lim
Senior Counsel
Dispute Resolution Counsellor

MARKET PERFORMANCE

Market Performance: Overview of the Year

Annual USEP and Ancillary Prices 2007/11



Energy and contingency reserve prices rose, while prices for primary reserve, secondary reserve and regulation fell

Overall, 2011 was a relatively subdued year for the National Electricity Market of Singapore (NEMS) in terms of the number of new entrants into the market and growth in electricity demand. In 2011, electricity demand rose by a modest 1.3 percent. This was the second lowest annual demand growth since the market started. The lowest of 0.4 percent was recorded in 2009.

For 2011, the annual average Uniform Singapore Energy Price (USEP) climbed to a new high of $214.84/MWh, 26.0 percent higher than the USEP in 2010 and 10.2 percent higher than the average vesting contract hedge price (VCHP) of $194.88/MWh. This was the second time since 2004 that the USEP was higher than the VCHP on a yearly average. The first time was in 2009, when the USEP surpassed the VCHP by only 1.3 percent.

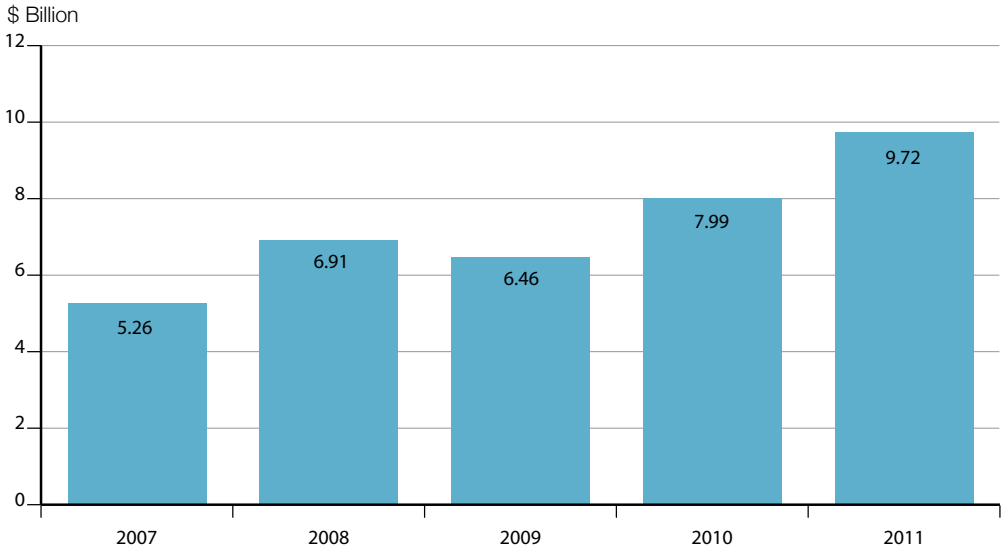
A significant factor behind the higher USEP was more expensive offers corresponding to higher oil prices, which had risen by 39.8[1] percent in 2011, and also the required switch from natural gas to more expensive fuel (diesel and fuel oil) for power generation due to gas supply disruptions.

Primary and secondary reserve prices and regulation prices fell 56.9 percent, 57.4 percent, and 11.8 percent respectively, to $0.32/MWh, $2.19/MWh and $66.82/MWh. Of note was the primary reserve price which saw a record low since the market started. Contingency reserve was the only ancillary service product that saw its price move upwards, registering an increase of 47.0 percent to $16.07/MWh.

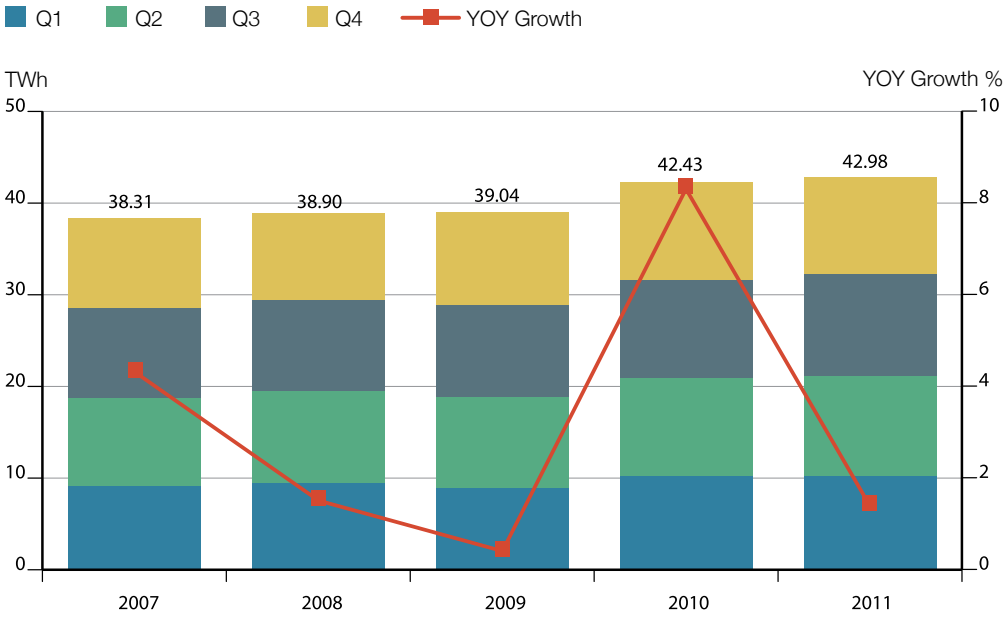
[1]Based on Brent crude oil price which is used as a proxy for fuel price. Brent crude oil price data is from the U.S. Energy Information Administration.

Market Performance: Overview of the Year

Annual Value of Products Traded 2007/11



Annual Electricity Consumption 2007/11



2011 set a new high in total products traded, up by more than $1 billion

The annual value of products traded in the NEMS recorded a new high of $9.7 billion in 2011, surpassing 2010 by more than $1.5 billion. This was attributed to the growth in the energy and reserve markets of 21.4 percent and 0.2 percent respectively, outpacing the fall in the regulation market of 0.1 percent.

For 2011, the energy market accounted for 98.6 percent of all products traded, while the reserve and regulation markets accounted for 0.8 percent and 0.5 percent respectively.

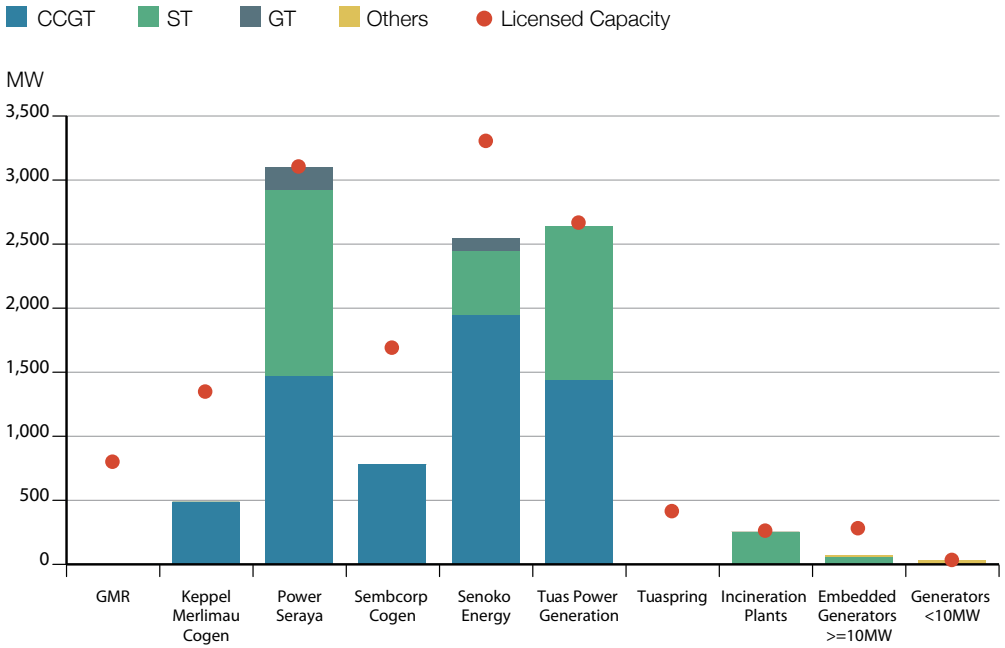
Electricity consumption rose marginally, with the highest increase contributed by third quarter

Electricity purchased by market participants (MPs) is settled using electricity consumption data provided by the Market Support Service Licensee (MSSL).

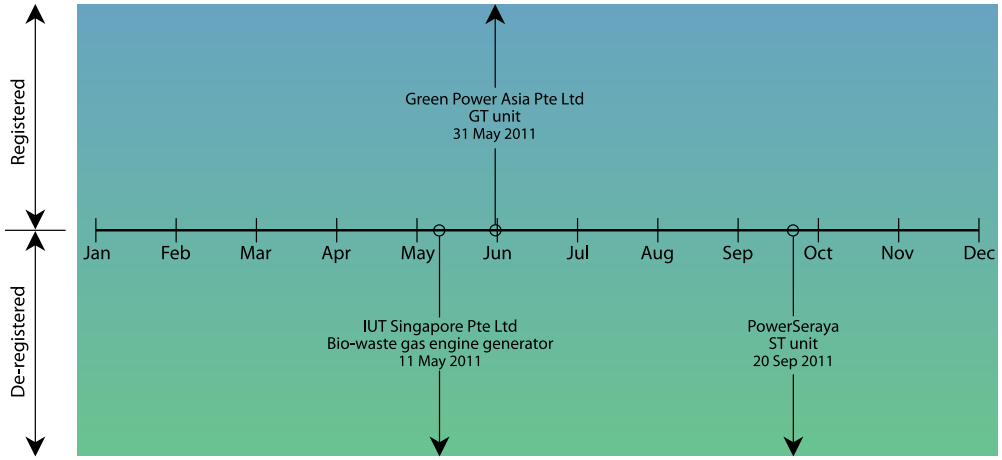
Electricity consumption maintained above the threshold of 42 terawatt hours in 2011, with a small increase of 1.3 percent over 2010. The largest increase was in the third quarter, when electricity consumption rose by 3.5 percent year-on-year (YOY).

Market Performance: Overview of the Year

Generation Capacity 2011: Registered Versus Licensed



Generation Facilities Registered and De-registered in 2011



Potential incoming capacity of 3,446MW by 2014

As of 31 December 2011, the licensed capacity[2] of 13,880MW in the NEMS surpassed the registered capacity of 9,934MW, indicating a potential incoming capacity of 3,446MW by 2014[3]. The registered capacity for Keppel Merlimau Cogen, Sembcorp Cogen and Senoko Energy was below their licensed capacity as of 31 December 2011. This was due to the repowering of two CCGT units by Senoko Energy and other indicative generation plantings.

Most incoming capacity will be for the CCGT plant type, with both Keppel Merlimau Cogen and Sembcorp Cogen being in the process of increasing their CCGT capacity.

Among the new entrants coming into the Singapore electricity market over the next few years – Exxonmobil Asia Pacific, GMR Energy Singapore and Tuaspring – two (GMR Energy Singapore and Tuaspring) have also indicated CCGT generation plantings.

CCGT = Combined-Cycle Gas Turbine
ST = Steam Turbine
GT = Gas Turbine
Embedded generators (EG) = generation units that generate electricity to their onsite load principally for self consumption.
Others = generation units with generation capacity less than 10MW.

[2]Licensed capacity calculated from the Energy Market Authority's (EMA) data and Schedule A published on its website as of 30 January 2012.

[3]The commercial operation date for the remaining 500MW of licensed capacity for Sembcorp Cogen will be confirmed by 31 December 2012.

A small change in overall registered capacity compared with 2010

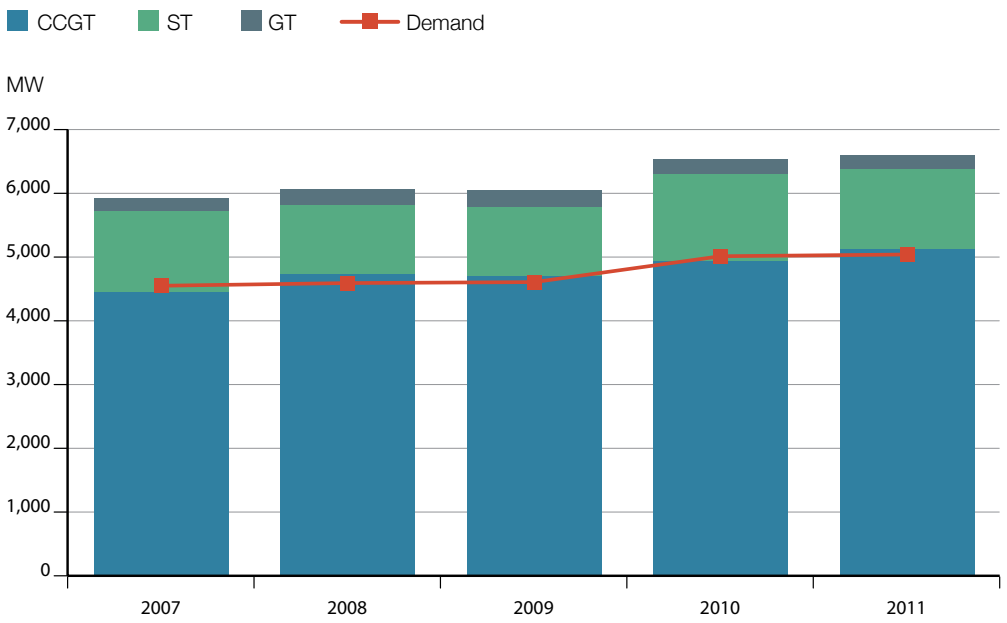
Only one new generation unit was registered with the NEMS in 2011. Green Power Asia registered a 7.96MW gas turbine unit in May, and this was classified as a generation settlement facility (GSF) in the NEMS. This gas turbine unit has the status of embedded generation.

There were two exits from the NEMS in 2011. One was a 250MW steam turbine unit from PowerSeraya and the other, a 2MW gas turbine unit from IUT Singapore.

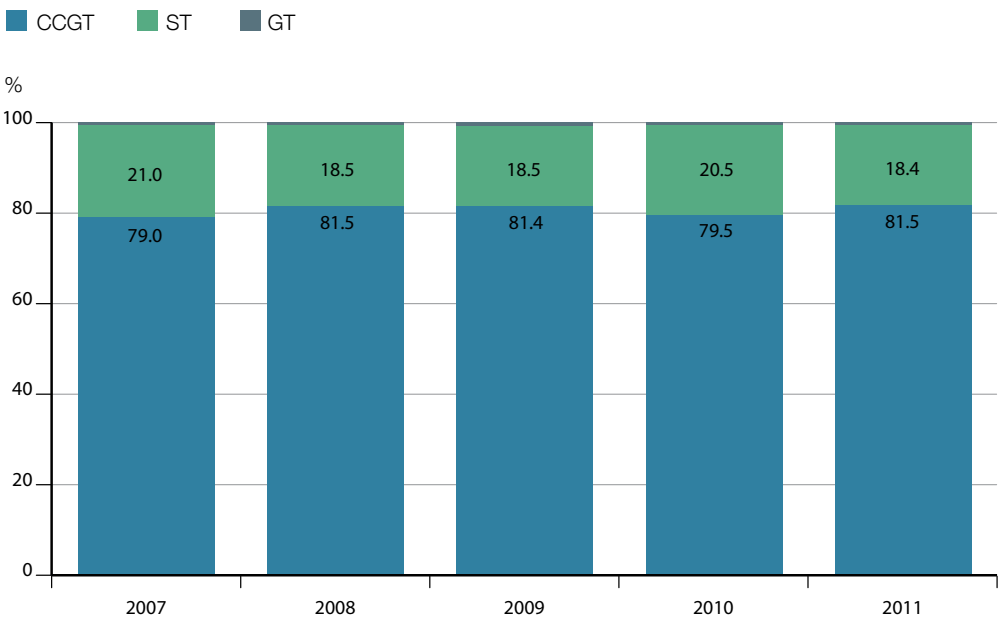
As of 31 December 2011, the total registered capacity in the NEMS stood at 9,934MW, out of which 61.9 percent was CCGT, 35.0 percent was ST and 3.1 percent was GT. The change in registered capacity was -0.8 percent, a much smaller change compared to the previous year's change of -6.8 percent which was due to facilities deregistered for repowering to CCGTs. Of the CCGT registered capacity in 2011, 33.0 percent belonged to co-generation and trigeneration facilities which are able to produce steam and/or chilled water as well on top of electricity.

Market Performance: Overview of the Year

Annual Generation Offer Capacity by Plant Type 2007/11



Annual Market Share by Plant Type 2007/11



Note: The percentages in this chart may not add up to 100% due to rounding.

CCGT offer capacity pulled overall generation capacity up 1 percent

CCGT offer capacity rose in 2011 by 3.7 percent, while ST and GT fell by 6.7 percent and 11.0 percent respectively. The overall generation offer capacity increased by 1.0 percent, as CCGT offer capacity crossed the 5,000MW mark for the first time since the market started.

The offer capacity in general stayed about the same level as last year, as there were no significant market entrances or exits in 2011. For all months except January, May, July and September, CCGT offer capacity was above 5,000MW.

December registered the highest CCGT offer availability on a monthly level, averaging 5,508MW.

Relative to their registered capacities by plant type, CCGT offer capacity was at 83.6 percent, ST at 36.5 percent and GT at 74.9 percent.

CCGT market share rose with CCGT offer availability

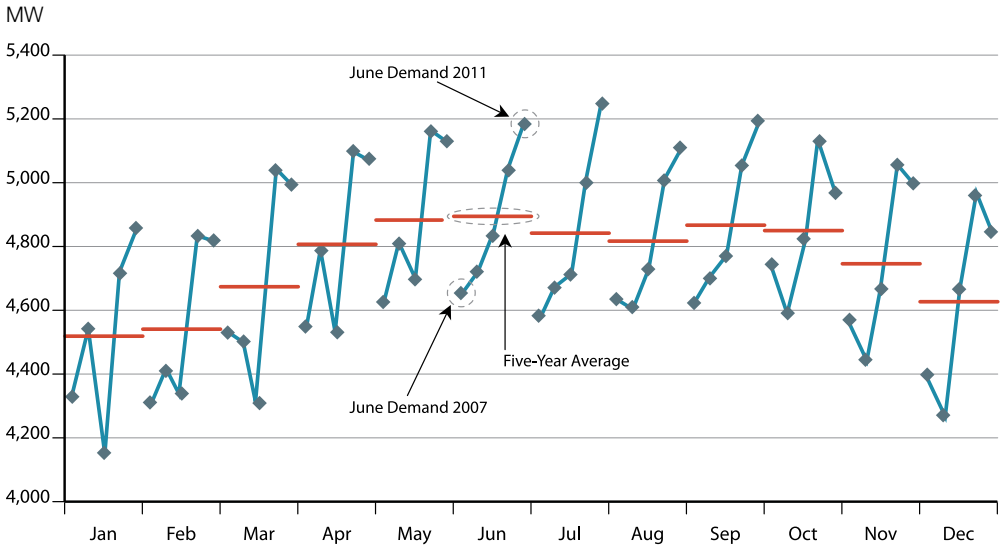
In 2011, the annual market share for CCGT regained above 80 percent. Throughout the year, the CCGT market share maintained above 81 percent except for May, June, July and September, when it ranged between 76.5 percent and 79.5 percent. The CCGT market share was highest in December, at 87.5 percent.

Overall, the increase in CCGT market share was in line with the increase in the CCGT offer availability.

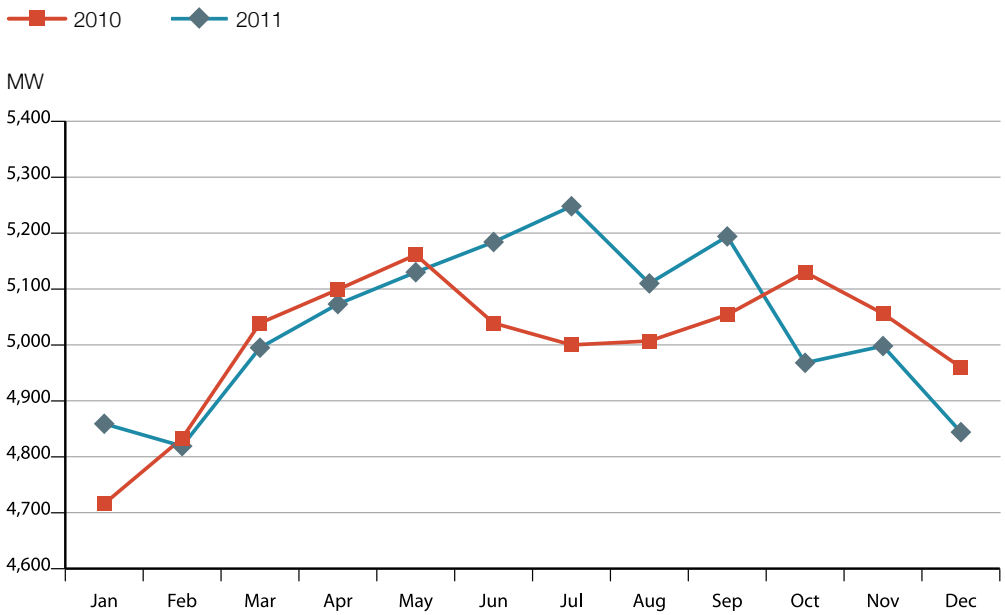
The market share is computed based on scheduled generation. The market share for GT was 0.01 percent in 2007, 2008, 2010 and 2011, and 0.02 percent in 2009.

Market Performance: Energy Demand

Monthly Forecasted Demand 2007/11



Monthly Forecasted Demand Profile 2011 Versus 2010



Demand rise seen in only five of twelve months in 2011

Forecasted demand is the projected electricity consumption in Singapore. The forecast is provided in real-time by the Power System Operator (PSO) and is a key component in determining the USEP.

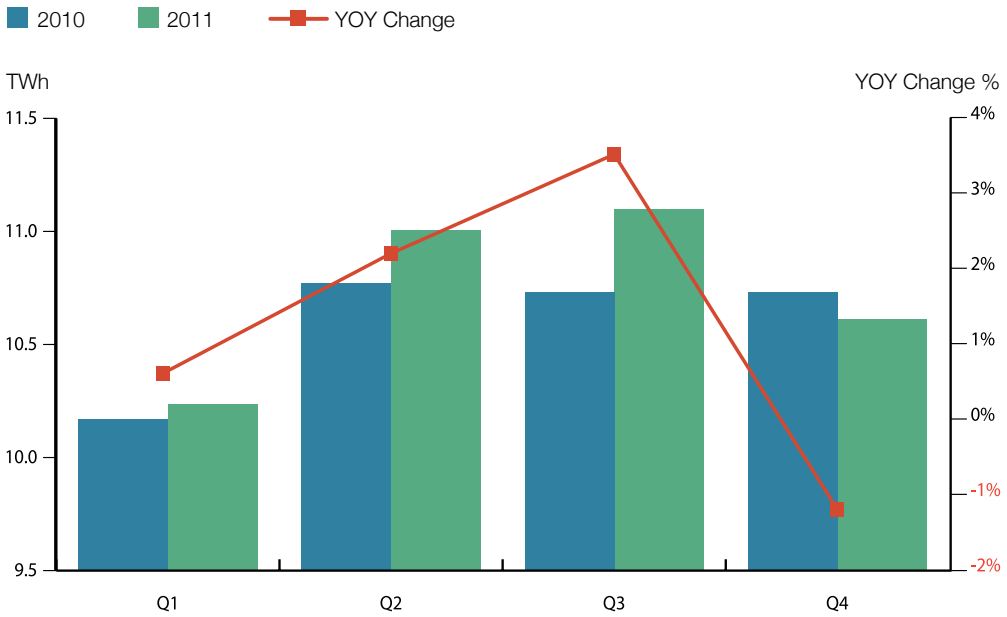
Comparing YOY, demand was lower for seven out of 12 months. The monthly demand profile for 2011 shifted significantly from 2010. The peak months in 2011 were July and September, while in 2010 they were May and October.

There were also no observed troughs that lasted for more than a month in 2011, compared to 2010 when there was a significant 'U' shape between May and October.

The highest monthly average was 5,248MW in July, and peak demand was registered on period 22 of 24 June, at 6,312MW.

Market Performance: Energy Demand

Quarterly Electricity Consumption 2010/11



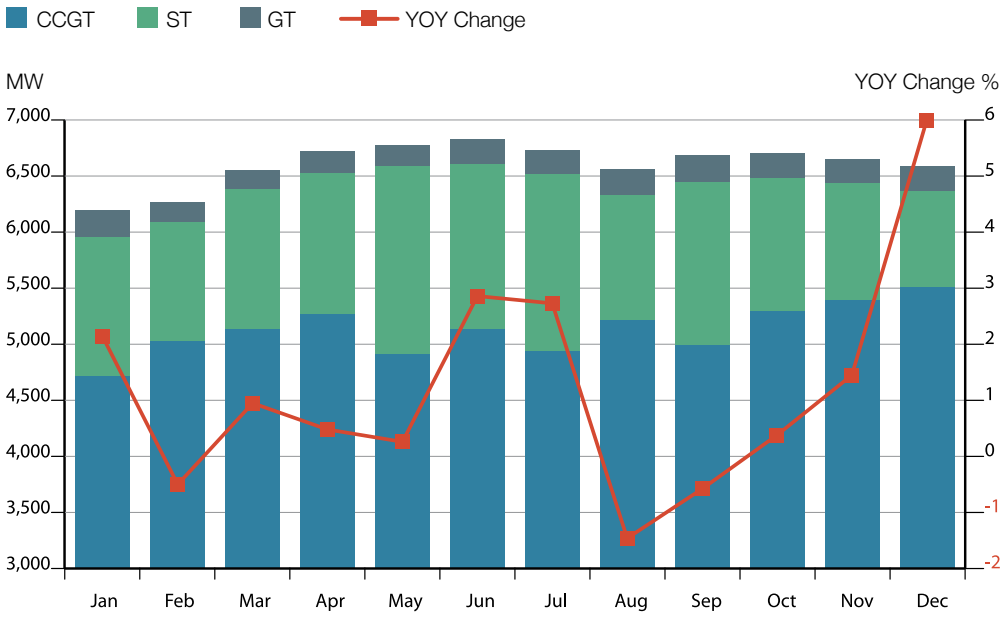
"YOY change" measures the change in quarter compared with the corresponding quarter in the previous year.

Electricity consumption in fourth quarter dragged down overall growth in 2011

Electricity consumption for each of the first three quarters in 2011 surpassed the previous year, registering a positive YOY growth of 0.6 percent, 2.2 percent and 3.5 percent respectively.

In the fourth quarter, electricity consumption fell 1.2 percent compared to the previous year following lower forecast demand for the quarter. October marked the lowest YOY growth for the year, at -2.3 percent.

Monthly Generation Offer Capacity by Plant Type 2011



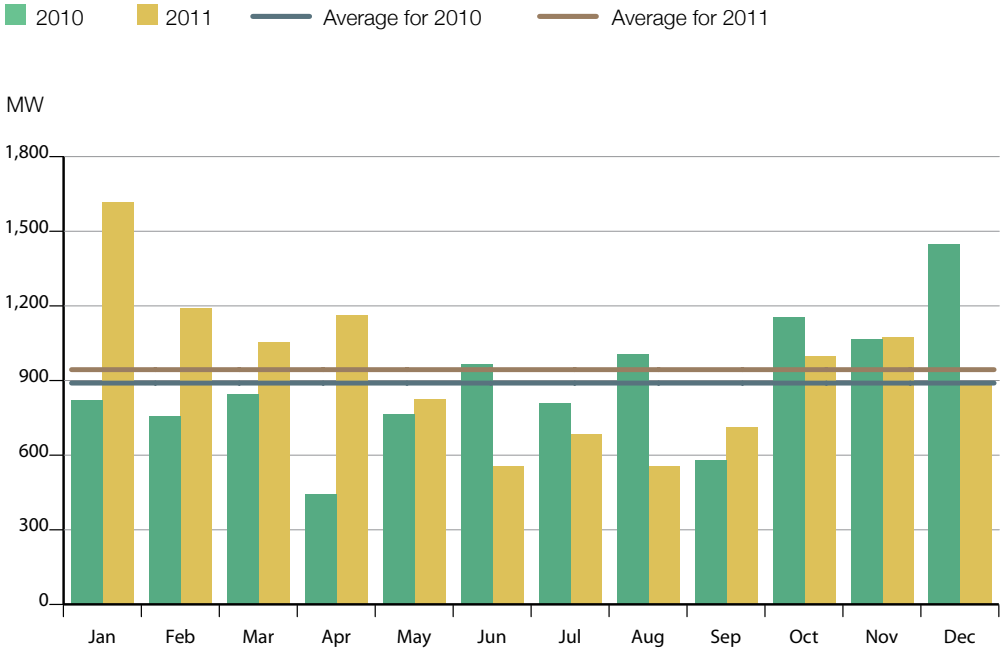
Offer capacity changes led mainly by the CCGT component

The monthly CCGT offer capacity averaged well above the 4,500MW mark in 2011, with a total of eight months where it crossed the 5,000MW mark. The ST offer capacity fluctuated between a low of 854MW in December and a high of 1,678MW in May. The two months with the highest ST offer capacity – May and July when ST offer capacity was at 1,576MW – compensated for CCGT supply that was below 5,000MW during those months.

The YOY change in overall available supply for the year was only 1.0 percent, as there was no significant change in registered capacity. The YOY change in overall supply by month fluctuated between -1.5 percent and 6.0 percent. The supply changes followed CCGT offer capacity changes closely except for February and August, when the ST offer capacity changed in the opposite direction.

Market Performance: Energy Supply

Monthly Generation Maintenance 2010/11



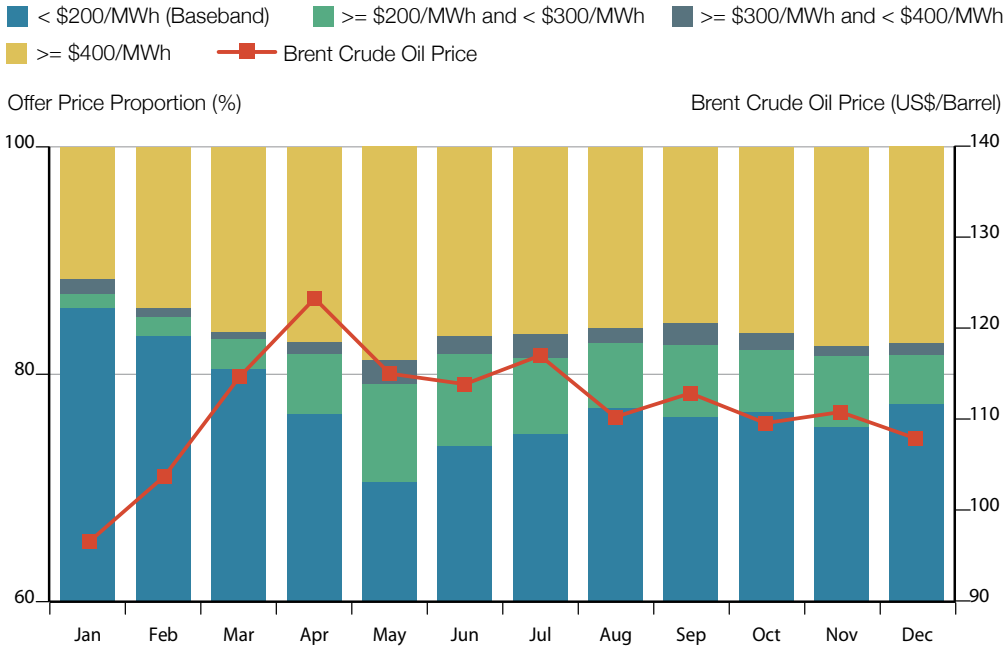
Generation maintenance increased in 2011

Generation maintenance levels[4] increased by 6.1 percent on average in 2011, to 943MW. Compared to 2010, generation maintenance increased for seven months – from January to May, and in September and November. Measuring the consistency of the amount of generation on maintenance each month, the standard deviation of generation maintenance was 306MW in 2011, while it was lower at 266MW in 2010.

The ratio of generation maintenance to registered capacity stood at 9.5 percent in 2011 compared to 8.5 percent in 2010.

[4]Generation maintenance levels are calculated based on the annual overhaul programme of generating units (AGOP) provided by the PSO.

Energy Offer Price Proportion and Brent Crude Oil Price 2011



Offer price pattern moved with trend in oil price

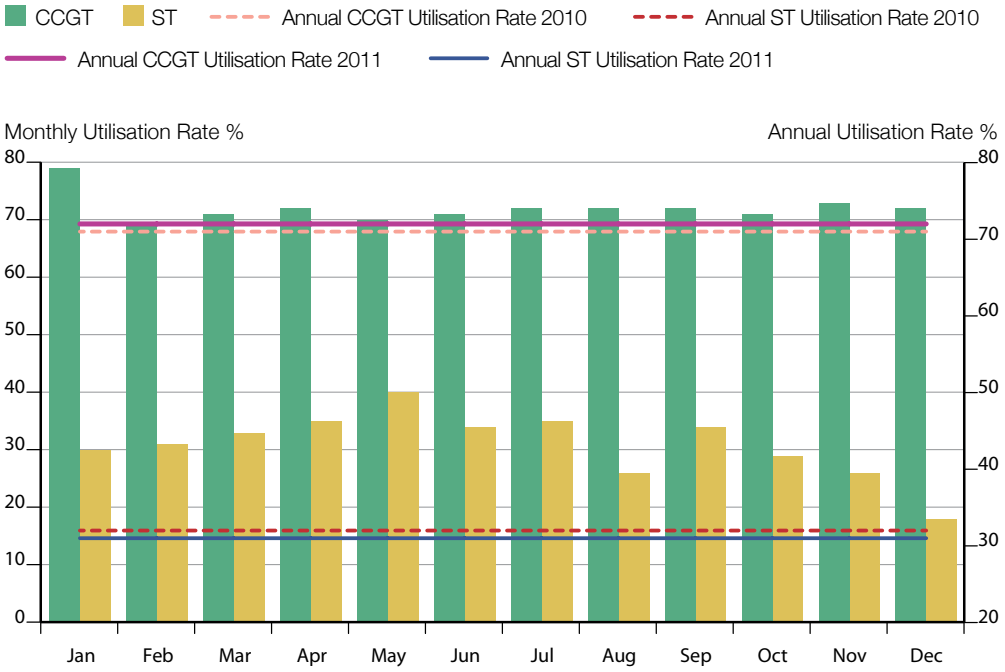
Higher Brent crude oil prices[5] tend to depress cheaper energy supply (the proportion of offers within the baseband, i.e. energy offers below $200/MWh) and vice versa. For most months in 2011 except January, May and July, the energy offer price pattern moved with the Brent crude oil price trend. This negative relationship between the Brent crude oil price and cheaper energy supply is substantiated by a negative correlation[6] of -0.7 between the baseband and Brent crude oil prices.

Overall, the Brent crude oil price averaged US$111.26 per barrel (bbl) in 2011, up 39.8 percent from 2010. It varied more within 2011 as well, with the standard deviation for monthly Brent crude oil price having increased to 6.8 from 5.4 in 2010.

[5]Brent crude oil price is used as a proxy for fuel price.

[6]A perfect negative correlation between any two parameters is -1.

Monthly Utilisation Rate by Plant Type 2011



The GT utilisation rate averaged 0.1 percent in 2011, similar to 2010.

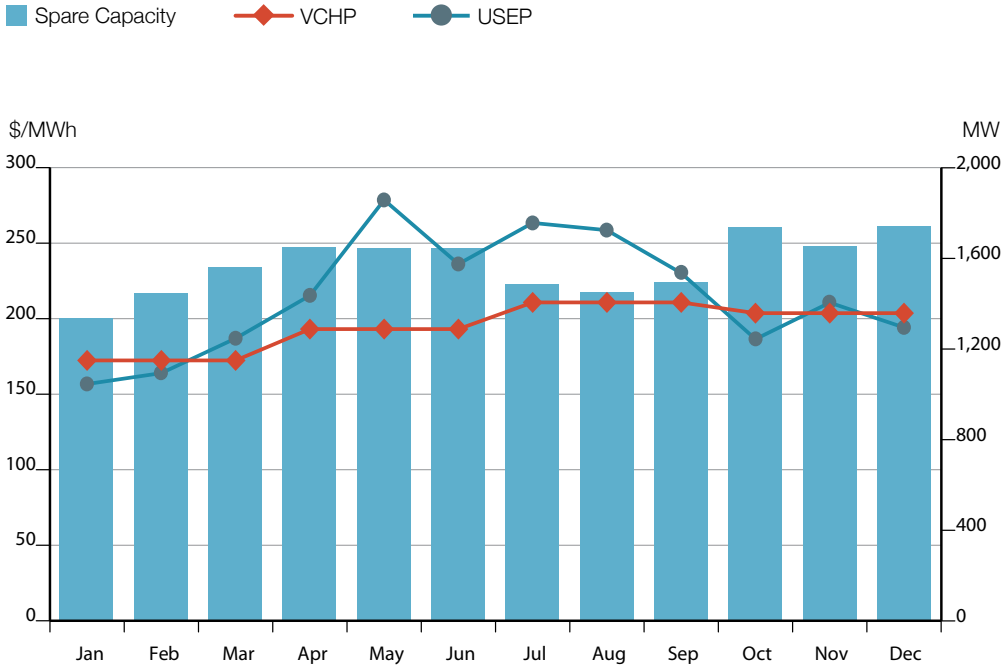
Utilisation rate improved for CCGT plant type

The utilisation rate measures the scheduled energy as a percentage of registered capacity net of maintenance.

2011 saw the CCGT utilisation rate increase by 1.2 percent to 72.1 percent, with January registering the highest monthly utilisation rate. The ST utilisation rate, however, fell by 0.4 percent in 2011, to 31.2 percent. The highest monthly ST utilisation rate was in May.

The overall utilisation rate increased due to slightly higher demand in 2011 and a higher level of maintenance.

Monthly USEP, VCHP and Spare Capacity 2011



USEP stayed above VCHP for most months

During the year, the VCHP varied between $172/MWh to $211/MWh. The gap between the highest and lowest USEP was larger, with the monthly average USEP varying between $157/MWh and $279/MWh. For most months – March to September, and in November – the USEP stayed above the VCHP.

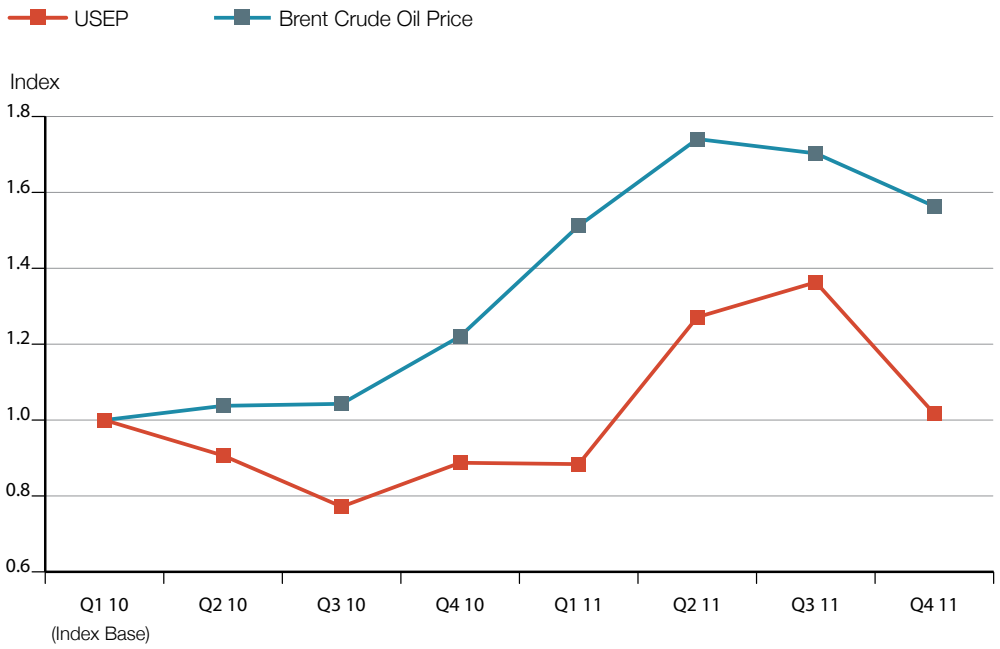
The largest gap between the USEP and the VCHP occurred in May, when the ST utilisation rate was the highest. The higher USEP during this month was due to a lower CCGT offer availability as a result of maintenance of two CCGTs in the first two weeks of May. This led the USEP to average at $279/MWh, with seven days when it rose above $320/MWh. More details on the price spikes in May are covered under Point A in the 'Daily USEP, System Demand and Offer Capacity 2011' section. Overall, May to September marked the five months when the USEP was the highest.

Throughout each month in 2011, spare capacity stayed above 1,330MW and averaged at 1,570MW. The annual average spare capacity increased by 3.3 percent from 2010, owing to a greater increase in supply (1.0 percent) compared to the increase in demand (0.6 percent).

On average, the USEP rose by 26.0 percent to $215/MWh in 2011 and was higher than the VCHP. The opposite was true in 2010 when the VCHP was higher than the USEP. The vesting contract level (VCL) increased from 55 percent in 2010, to 60 percent in 2011. As the VCHP was lower than the USEP in 2011, more demand benefited from the relatively lower hedge price compared to the year before.

Market Performance: Energy Prices

USEP and Brent Crude Oil Price Movements Q1 2010 to Q4 2011



USEP movements mostly in line with oil prices[7]

The quarterly USEP followed the movements in Brent crude oil price[8] most of the time between 2010 and 2011.

In 2011, the increase in the USEP in the second quarter and the decrease in the fourth quarter were in line with the rise and fall of Brent crude oil prices in those quarters. In the first quarter of 2011, the USEP fell despite an increase in Brent crude oil price and more expensive offers. This was due to a higher supply cushion (0.7 percent) arising from lower demand (-3.1 percent). In the third quarter, the USEP increased despite a fall in oil prices due to the gas disruptions in July, August and September.

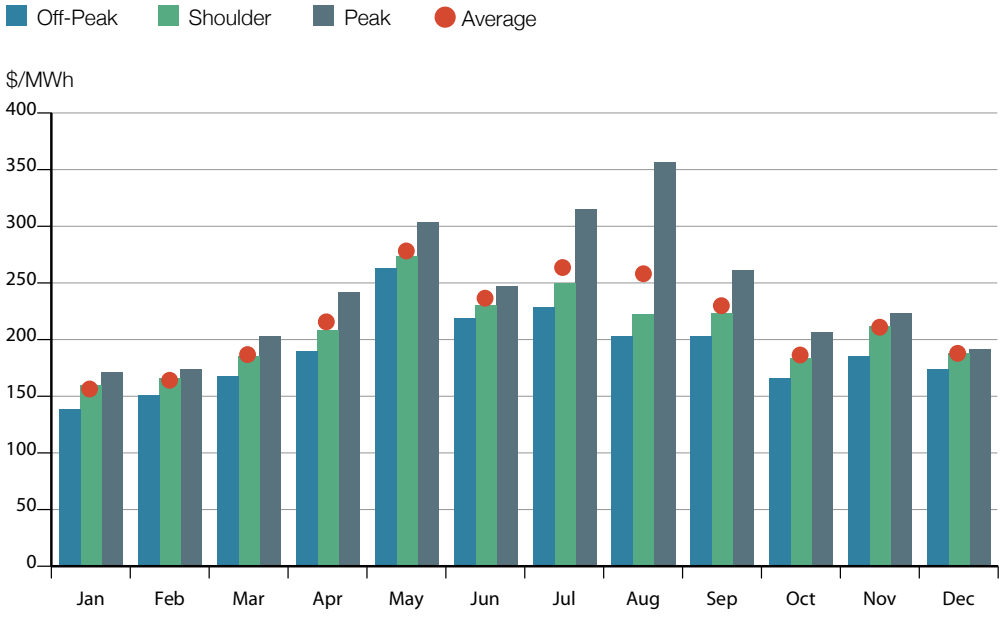
Overall, the increase in oil price was greater than the increase in the USEP in the last two years. As referenced to the first quarter of 2010, the USEP rose 1.4 times only compared to the 1.7 times increase in oil price.

[7]The index is computed using Q1 2010 as the index base. For instance, the index for USEP in Q1 2010 is 1 as it is based on itself. The index for USEP in Q2 2010 is 0.9 ($174/MWh divided by $191/MWh).

[8]Brent crude oil price is used as a proxy for fuel price.

Market Performance: Energy Prices

Monthly USEP 2011
(Categorised by Average, Peak, Shoulder and Off-Peak)



Larger gap for USEP comparing peak and other periods in July, August and September

The following periods are categorised by the MSSL as peak, shoulder and off-peak:

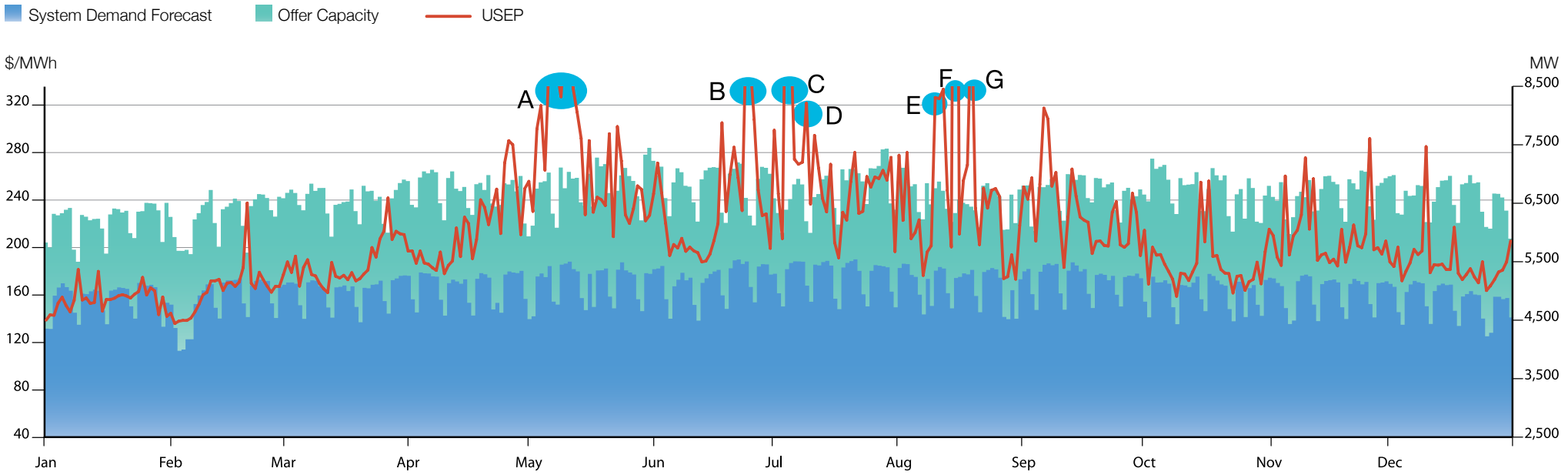
Day type	Peak	Shoulder	Off-peak
Weekday	P18-41	P15-17, P42-48	P1-14
Saturday	-	P1, P17-48	P2-16
Sunday/Public Holiday	-	P22-34, P38-47	P1-21, P35-37, 48

The peak period USEP deviated strongly from the USEP in the shoulder and off-peak periods in the months of July, August and September. This was because gas disruptions in these three months resulted in prolonged price spikes during the peak periods.

During those periods, prices were generally driven higher due to the requirement to run the more expensive ST. Occasionally, GT was run and CCGT was asked to run as well using diesel which was also more costly.

Market Performance: Energy Prices

Daily USEP, System Demand and Offer Capacity 2011



Price spikes resulted from lower spare capacity and lower CCGT offer availability

The key observations on the USEP fluctuations in 2011 are as follows:

Point A:

Between 6 and 12 May, the daily USEP averaged between $333/MWh and $401/MWh. In general, the price spikes were caused by higher demand (comparing the same days of the previous week for 6 May and 9 to 12 May, when demand increased between 2 to 19 percent) and lower CCGT offer availability. The lower CCGT offer availability was due to two CCGT units being out on maintenance.

On 8 and 11 May, there were four periods when the USEP recorded above $500/MWh. In those four periods, the supply cushion was between 16.1 percent and 18.4 percent. At the period when the supply cushion was 16.1 percent, GT was scheduled.

Point B:

On 24 and 25 June, the daily USEP averaged between $354/MWh and $382/MWh. The USEP rose above $500/MWh for 15 periods over the two days when the supply cushion ranged between 8.7 percent and 12.9 percent. GT was scheduled for all 15 periods when the USEP exceeded $500/MWh.

On both days, the price spikes were caused by a lower supply cushion. This in turn was caused by a combination of higher demand (comparing the same days of the previous week with a demand increase of 3 percent for 24 and 25 June), disruption in gas supply due to planned shutdown of a gas onshore receiving facility, and two CCGT units being out on maintenance.

Point C:

On 4 and 5 July, the daily USEP averaged between $388/MWh and $491/MWh. There were 28 periods when the USEP registered above $500/MWh when the supply cushion was between 7.5 to 13.9 percent. GT was scheduled for 21 of those 28 periods, when the supply cushion was 12.7 percent or less.

On 4 July, the price spikes were due to lower offer availability across all plant types (comparing the same day the previous week). When two GT forced outages occurred in period 22, the USEP was driven above $1,000/MWh for two periods – to $3,531/MWh in period 23 and $2,027/MWh in period 24. In addition, the forced outages caused a regulation deficit for period 23.

The 5 July price spikes were due to lower offer availability resulting from one CCGT unit being out on maintenance over the two days.

Point D:

On 9 July, the daily USEP averaged $320/MWh. There were a total of three periods when the USEP registered above $500/MWh due to a lower supply cushion of between 14.6 percent and 17.0 percent following a CCGT forced outage. Two CCGT units were out on maintenance that day and GT was scheduled for all three periods.

Point E:

Between 10 and 12 August, the daily USEP averaged between $325/MWh and $333/MWh. There were a total of 28 periods when the USEP registered above $500/MWh due to a lower supply cushion of between 13.6 percent and 19.1 percent for all but one period. GT was scheduled for 20 of the 28 periods, when the supply cushion was 17.2 percent or less.

On 10 August, the lower supply cushion arose from lower CCGT offer availability, while on 11 August, it was due to higher demand. On 12 August, a combination of higher demand and lower CCGT and ST offer availability led to the lower supply cushion.

In addition, on 11 August, one CCGT forced outage contributed to one of the price spikes. On 12 August, another CCGT forced outage led to another price spike that lasted for one period, although the supply cushion was at 22.2 percent (above 20 percent) for that period.

Point F:

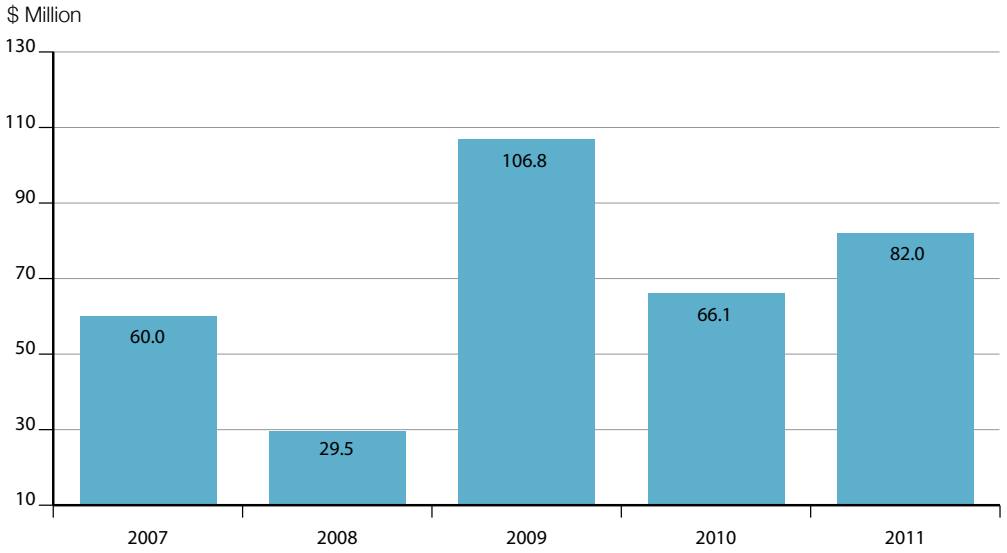
On 15 Aug, the daily USEP averaged $855/MWh, and there was an energy deficit due to reduction in gas supply for six periods following the forced outage of a gas onshore receiving facility. The USEP was above $500/MWh for a total of 11 periods. Of these, the USEP registered $3,885/MWh for one period and $4,500/MWh for six periods. The price spikes were caused by a low supply cushion of between -1.4 percent and 12.6 percent for the affected periods, contributed by three CCGT forced outages. CCGT offer availability was also lower as one CCGT unit was on maintenance that day. GT was scheduled for all 11 periods.

Point G:

On 19 Aug, the daily USEP averaged $403/MWh. There were 14 periods when the USEP registered above $500/MWh, when the supply cushion ranged between 10.2 percent and 14.9 percent. GT was scheduled for 11 of the 14 periods when the supply cushion was 12.6 percent or less. Contributing to the price spikes was the combination of two CCGT forced outages and offer changes. One CCGT unit was also out on maintenance that day.

Market Performance: Ancillary Markets

Annual Reserve Cost 2007/11



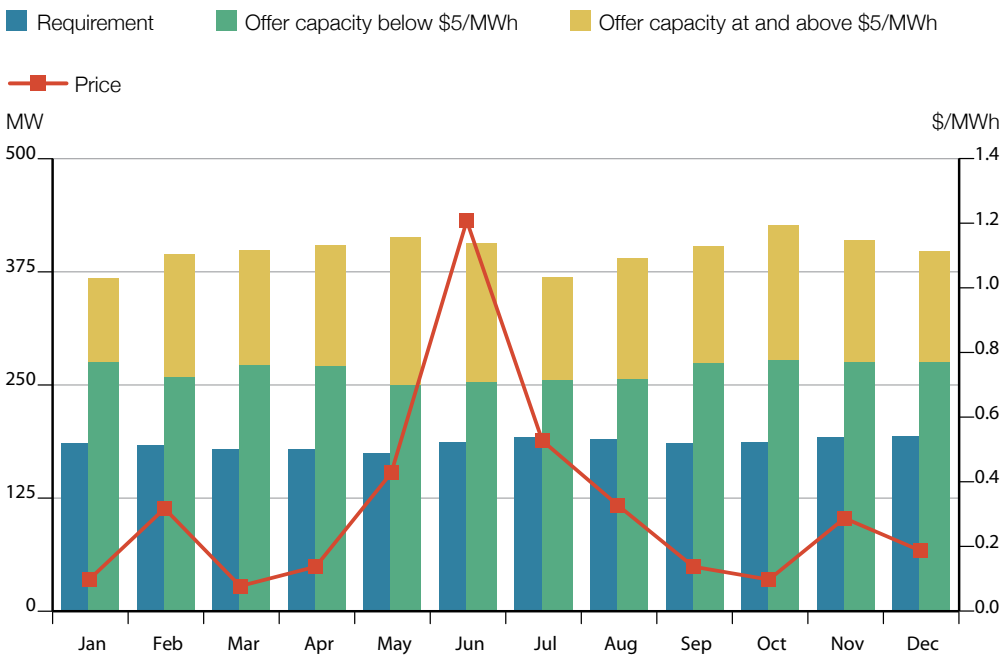
Reserve costs higher in 2011, aided by rise in contingency reserve price

Reserve costs increased 24.1 percent to $82.0 million in 2011. This was aided by the rise in the contingency reserve price, which far surpassed the fall in primary and secondary reserve prices.

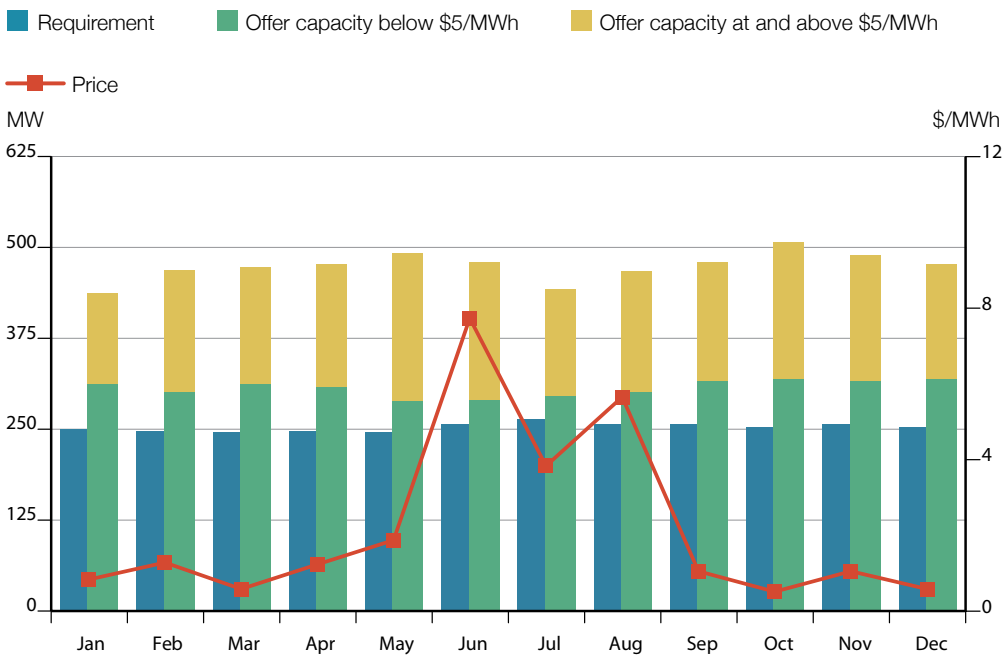
Over the year, the highest reserve costs occurred from May to September, when monthly reserve costs exceeded $7 million. Reserve costs peaked in September at $20.2 million, when the monthly average contingency reserve price was the highest. Reserve costs in 2011 ranked the fourth highest since the market started.

Market Performance: Ancillary Markets

Monthly Primary Reserve Price, Requirement and Offer Capacity 2011



Monthly Secondary Reserve Price, Requirement and Offer Capacity 2011



Primary reserve prices low, with most months below $0.40/MWh

Throughout the year, the monthly primary reserve price stayed mostly below $0.40/MWh, except for May, June and July.

The primary reserve price rose along with the higher USEP in May and peaked at $1.21/MWh in June. The primary reserve moved upwards from May to June due to a fall in primary reserve supplies and an increase in primary reserve requirements.

In July, the primary reserve price fell against the USEP due to cheaper offers for primary reserves.

Overall, the primary reserve supplies rose by 8.0 percent while requirement fell 0.9 percent. This resulted in the primary reserve price falling by 56.9 percent in 2011, to average at $0.32/MWh.

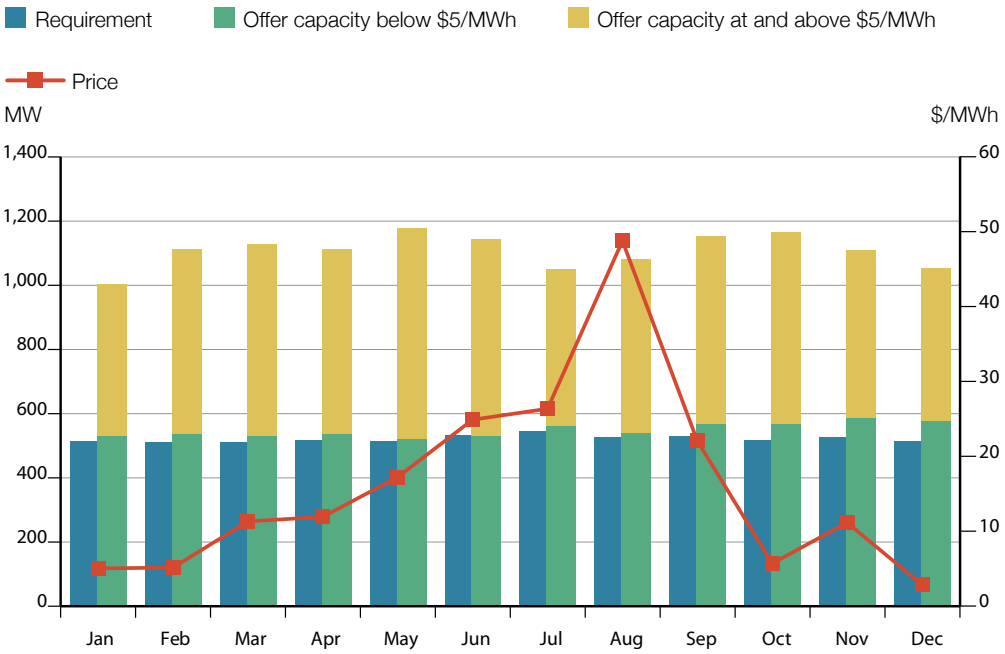
Secondary reserve prices mostly below $2/MWh

The monthly secondary reserve price stayed below $2/MWh for the most of the year. There were only two months – June and August – when the secondary reserve price registered above $5/MWh. In June, the highest secondary reserve price was attributed to the increase in secondary reserve requirement and the decrease in secondary reserve supplies.

In August, the secondary reserve price averaged higher due to an outlier on 15 August (refer to chart on 'Daily USEP, System Demand and Offer Capacity 2011', Point F); otherwise, the average secondary reserve price would only have been $1.26/MWh.

Overall, the secondary reserve supplies rose by 8.3 percent while requirement fell 0.7 percent. This resulted in the secondary reserve price falling by 57.4 percent in 2011, to average at $2.19/MWh.

Monthly Contingency Reserve Price, Requirement and Offer Capacity 2011



Contingency reserve price moved along with higher USEP

For four months between June to September, the contingency reserve price registered above $20/MWh. The higher contingency reserve price arose mainly due to co-optimisation when overall supplies were tight.

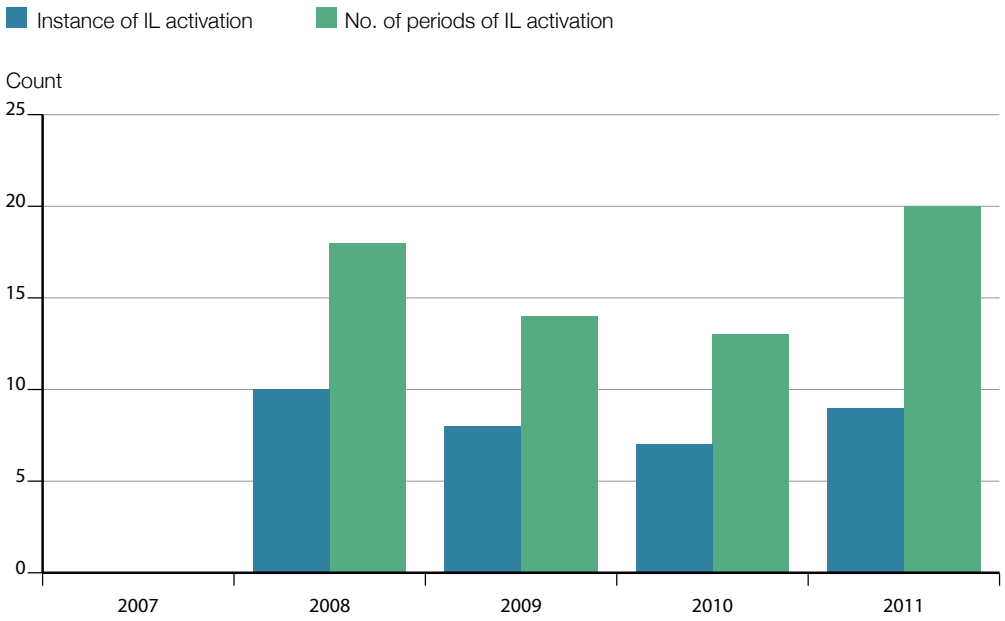
In June, the contingency reserve price rose despite the USEP dropping from May. This was due to a combination of a fall in contingency reserve supplies and a higher contingency reserve requirement for that month. From July to September, the higher contingency reserve price occurred when the overall system supply was also tighter due to gas supply disruptions.

The highest contingency reserve price for the year was registered in August, as a result of more expensive offers and tight supply conditions on 15 August which led the contingency reserve price to reach the cap of $3,250/MWh for seven periods. The effects of the offer changes counteracted the increase in contingency reserve supplies and the fall in contingency reserve requirement that month.

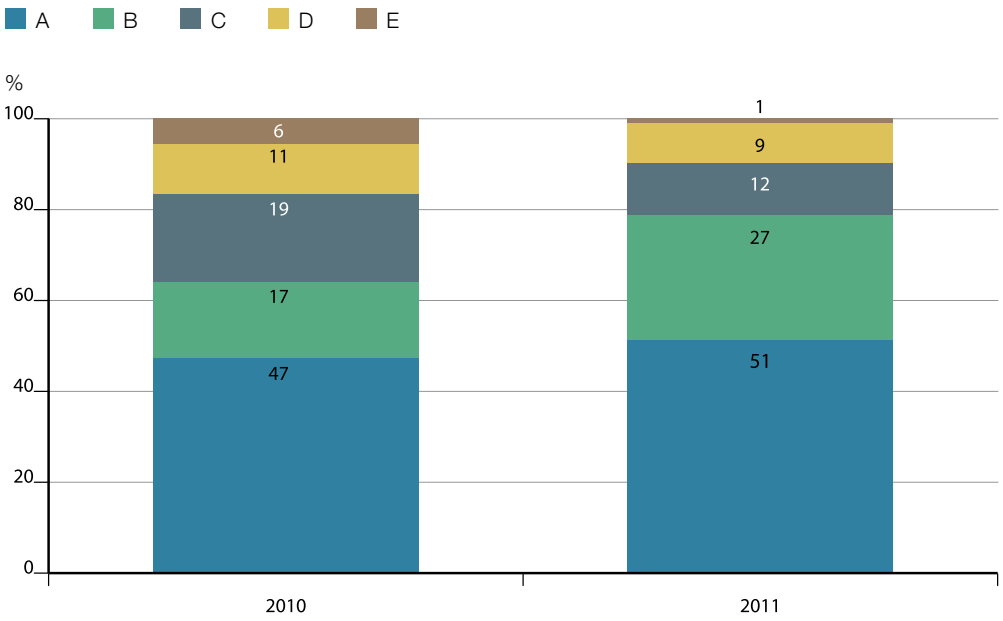
It is noteworthy that the seven periods of capped contingency reserve price marked the highest on both a daily and yearly basis, since the market started. The last time the contingency reserve price hit $3,250/MWh was in 2009.

Overall for the year, there were minimal changes to the average requirement and supplies for contingency reserve. The contingency reserve price, however, averaged higher. It was pulled up by the June to September prices, and increased by 47.0 percent to $16.07/MWh in 2011. Of the three reserve types, the contingency reserve price remained the highest.

Annual Interruptible Load (IL) Activations for Contingency Reserve Market 2007/11



Quarterly Reserve Provider Group Effectiveness for Primary and Secondary Reserve Classes (Aggregate) 2011 Versus 2010



Number of periods of IL activation largest since start of market, IL activated for secondary reserve for the first time

As of 31 December 2011, the total registered capacity for interruptible load (IL) was 21MW for each class of reserve. The percentage of registered capacity by IL for reserves in 2011 was 2.4 percent for the primary reserve, 2.1 percent for the secondary reserve and 1.0 percent for the contingency reserve.

In 2011, the number of IL activations for contingency reserve increased by 28.6 percent to nine. Typically, each instance of IL activation for contingency reserve lasted for two periods in 2011.

In addition, for the first time since the market started, IL was activated once for secondary reserve. This lasted for two periods, bringing the total number of IL activations by period to 22.

There was no IL activation for primary reserve.

Overall, payment to IL totalled $0.8 million in 2011, down by 26.4 percent from $1.1 million in 2010.

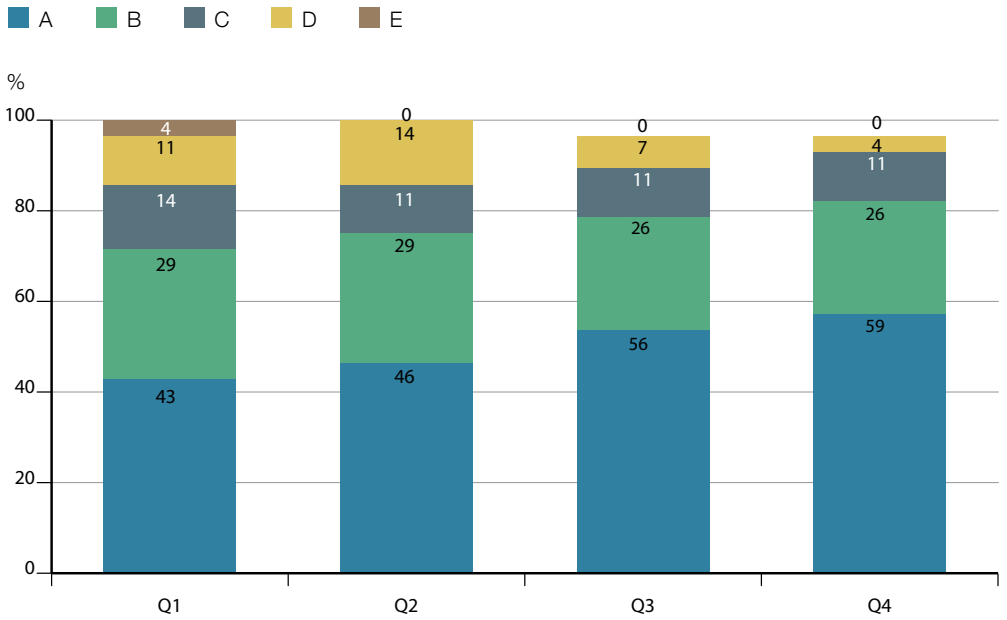
Reserve providers moved into Groups A and B, from C, D and E

Reserve providers in the NEMS are clustered into five groups, with Group A reflecting reserve providers with the highest level of responsiveness and Group E reflecting those with the lowest level of responsiveness.

As in 2010, 2011 continued to see the largest group of reserve providers categorised under Group A. The overall level of responsiveness improved in 2011, as apparent from the increase in the percentages of reserve providers in Groups A and B, by 3.8 percent and 10.7 percent respectively.

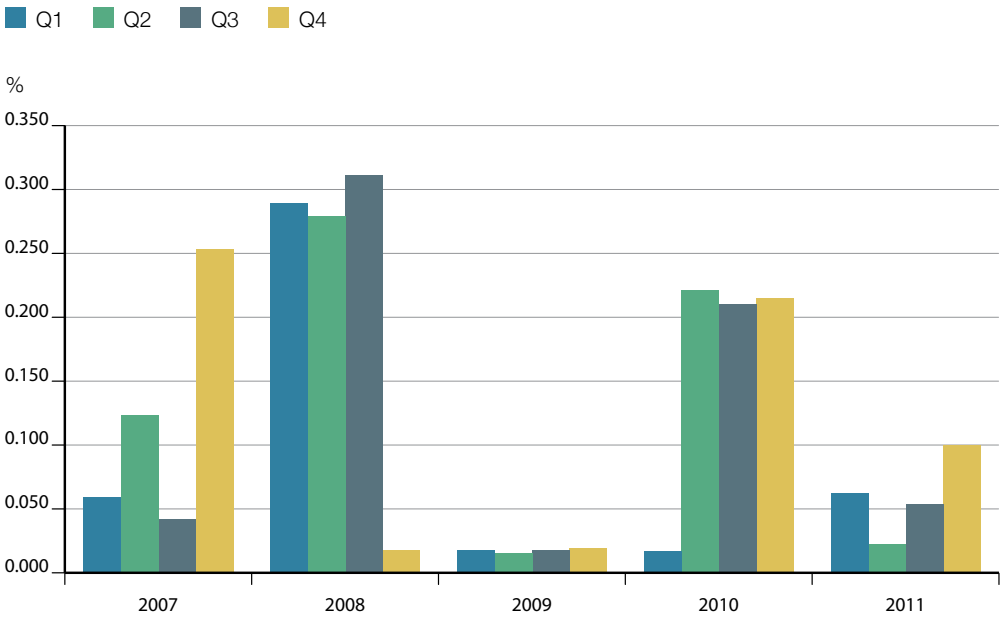
Market Performance: Ancillary Markets

Quarterly Reserve Provider Group Effectiveness for Primary and Secondary Reserve Classes (Aggregate) 2011



Note: The percentages in this chart may not add up to 100% due to rounding.

Quarterly Average Failure Probability 2007/11



Percentage of Group A reserve providers increased every quarter

Within 2011, the percentage of reserve providers in Group A grew every quarter, increasing from 43 percent in the first quarter to 59 percent in the fourth quarter.

CCGT failure probability dropped, overall failure probability lower than 2010

The probability of failure for a generation registered facility (GRF) is the probability that after being dispatched by the Power System Operator for a settlement interval, the GRF will cease operating, disconnect from the transmission system, or both during that settlement interval, even if no other GRF fails. A generation unit with a lower failure probability will be allocated less reserve cost compared to one with a higher failure probability.

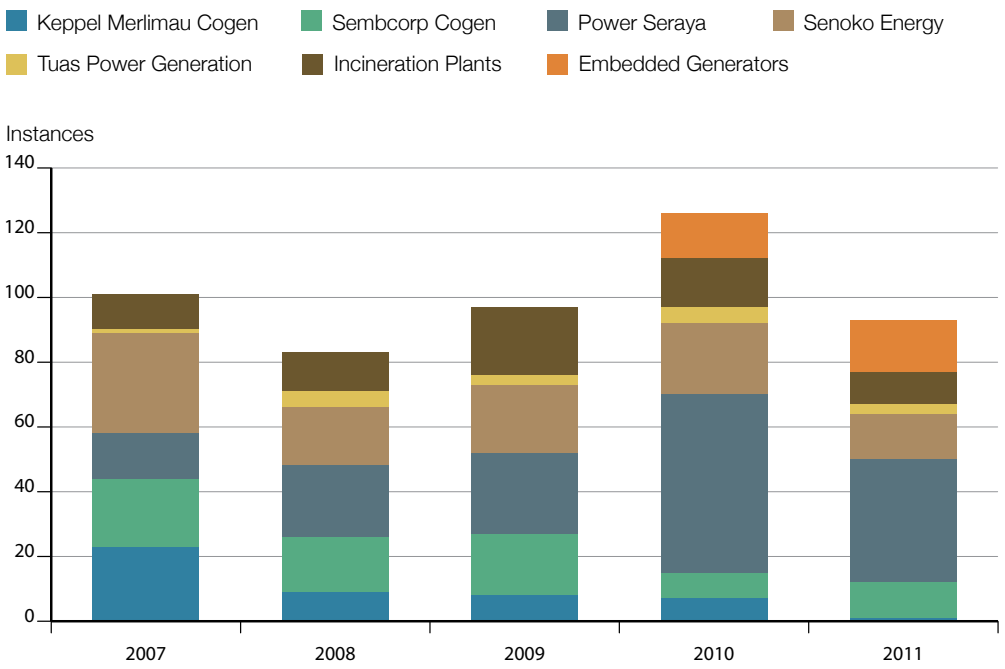
Comparing against the previous year, the average failure probability dropped in the second, third and fourth quarters of 2011.

The failure probability in the first quarter was higher in 2011, as it averaged between 0.045 to 0.062 percent.

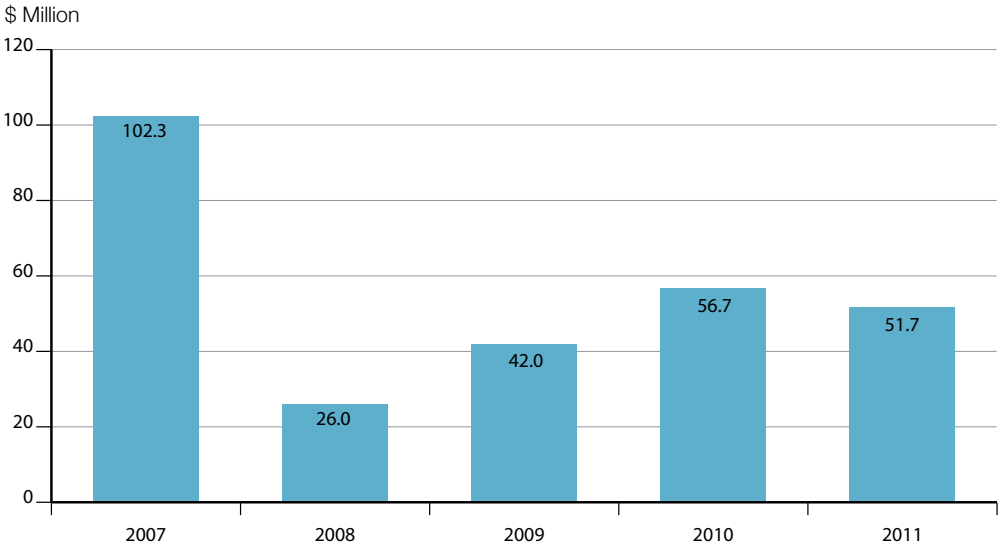
Overall, the failure probability was lower in 2011, as the yearly average failure probability dropped by 0.059 percent. CCGT also performed better in 2011 against 2010, as the average failure probability for CCGT fell from 0.047 percent to 0.026 percent. This was due to the higher average injection quantity by the CCGT units in 2011 and a fall in the average number of CCGT forced outages by 1.4 percent.

Market Performance: Ancillary Markets

Annual Forced Outages by Generation Companies 2007/11



Annual Regulation Payment 2007/11



Second lowest number of forced outages since start of the market

The fall in failure probability in 2011 was in line with less generation forced outages occurring during the year. The total number of generation forced outages totalled 93, the second lowest since the market started.

Notably, there were no forced outages in October. Comparing against the previous year, most generation companies saw a drop in the instances of forced outages.

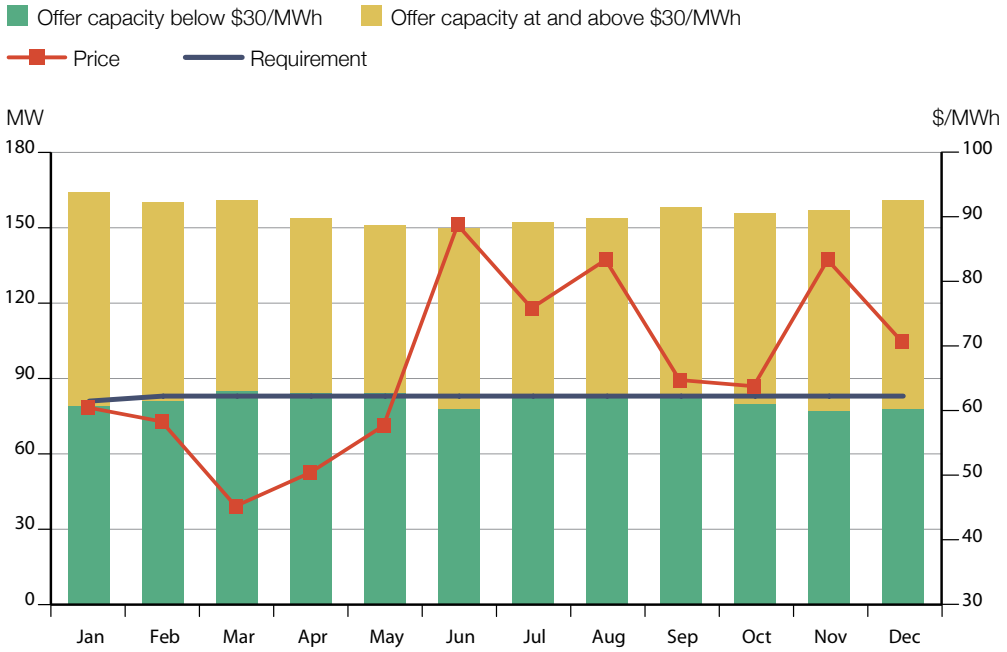
Regulation payment down from 2010

Following a fall in regulation prices from 2010 to 2011, the regulation payment fell by 8.8 percent to $51.7 million.

Comparing to the previous years, the regulation payment amount was in the mid-range, with four years on each end being higher and lower than the amount in 2011.

Market Performance: Ancillary Markets

Monthly Regulation Price, Requirement and Offer Capacity 2011



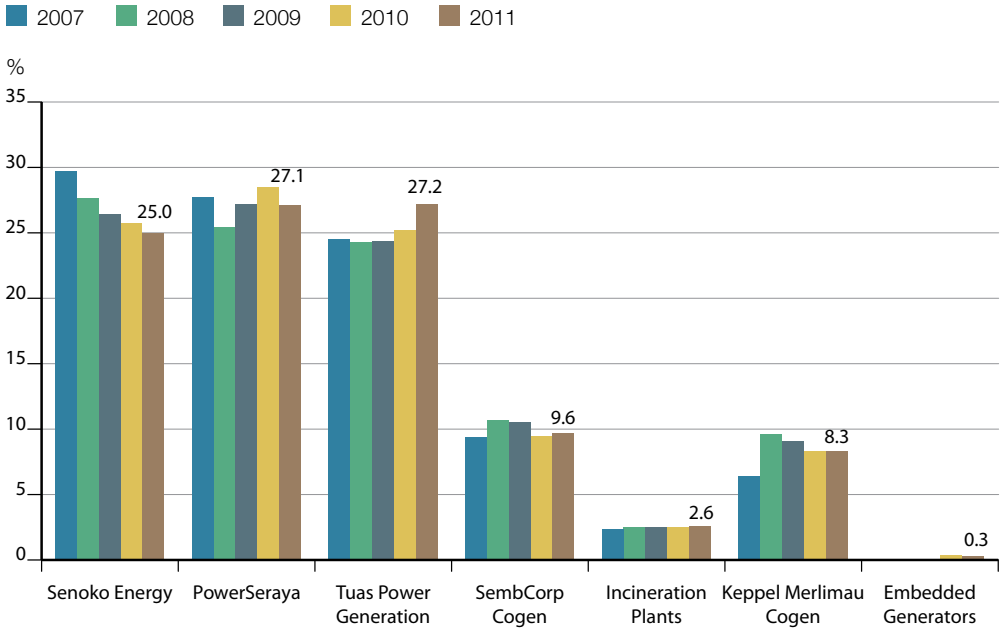
Regulation prices fell as supplies rose more than requirement

The monthly regulation price stayed below $90/MWh throughout 2011. Overall, the regulation supplies increased by 7.5 percent to 157MW, outpacing the increase in regulation requirement which rose by 2.5 percent to 83MW.

This contrast led the annual average regulation price to decrease 11.8 percent to $66.82/MWh.

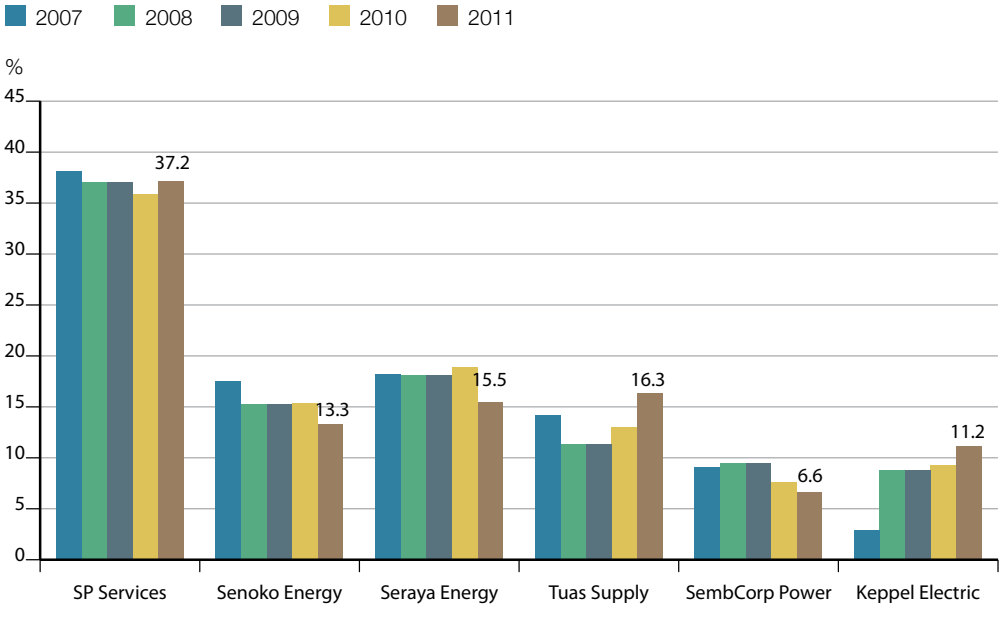
Market Performance: Competition in the Generation and Retail Markets

Annual Market Share by Generator 2007/11 (Based On Scheduled Generation)



Note: The percentages in this chart may not add up to 100% due to rounding.

Annual Market Share of Market Support Services Licencee and Retailers 2007/11 (Based on WEQ)



Note: The percentages in this chart may not add up to 100% due to rounding.

Market share of three generators improved while that of four others fell

The market share of three generators improved in 2011, while that of four others fell. Most significantly, Tuas Power Generation attained a 1.9 percent gain whilst PowerSeraya lost 1.4 percent.

The other market share changes were of a smaller scale: SembCorp Cogen and incineration plants gained less than 0.2 percent, whilst Keppel Merlimau Cogen and embedded generators lost less than 0.1 percent in market share.

More keen competition seen for retailers

The shifts in market share in the retail market were more marked than the ones in the generation market. Gainers in 2011 were Tuas Supply and Keppel Electric, each obtaining an extra 3.4 percent and 1.9 percent respectively.

Seraya Energy, Senoko Energy and SembCorp Power, however, experienced a drop in their market share, by 3.4 percent, 2.1 percent and 1.1 percent respectively.

Market Performance: Settlement and Prudential Management

Energy Market Company (EMC) is the financial clearing house for the wholesale market and settles the following transactions:

- energy;
- ancillary market products - three classes of reserve (primary, secondary and contingency) and regulation;
- bilateral and vesting contracts;
- uplift charges;
- financial adjustments;
- fee recovery of EMC and the PSO administration costs; and
- contracted ancillary services not provided through the ancillary market (black-start services).

The market is well secured. To cover the exposure of a debtor and the time required to manage a default, all retailers must provide on-going collateral to EMC. This credit support protects EMC and other market participants (MPs) from payment defaults. EMC reviews the risk exposure of MPs on a daily basis.

A margin call is issued when a retailer's estimated exposure reaches a value equal to or greater than 70 percent of the level of its credit support. In 2011, EMC issued 24 margin calls, out of which all except one[9] were met within the required time frame of two business days.

In 2011, the value of total retail settlement payments (excluding bilateral contracts between MPs) was $3.691 billion and the value of credit support on 31 December 2011 was $427.45 million.

[9]The one margin call that did not meet the required time frame was only slightly late.

Market Performance: Contracted Ancillary Services

Contracted Ancillary Services 1 April 2011 to 31 March 2012

	Cost incl. GST (million)	Quantity (MW)
Black-start Service	$10.15	68.848

In addition to the co-optimised reserve and regulation markets, EMC negotiates and enters into ancillary services contracts on behalf of the PSO, to ensure the reliable operation of Singapore's power system. If these services are unable to be procured competitively, for example, due to a limited number of available suppliers, their prices are regulated.

From 1 April 2011 to 31 March 2012, the only contracted ancillary service required was black-start capability. Black-start service ensures that there is initial generation to supply electric power for system restoration following a complete blackout.

Based on the PSO's operational requirements, EMC procured 68.848MW of black-start service at a cost of $10.15 million. The capability was sourced from PowerSeraya, Senoko Energy and Tuas Power Generation.

Market Performance: Market Fees

The costs associated with the wholesale functions of the NEMS are recovered directly from the wholesale market or from MPs and consumers.

EMC and PSO fees are recovered from both generator and retailer class MPs in proportion to the quantity of energy that they trade.

EMC Net Fees and PSO Fees Recovered Directly from the NEMS – 1 April 2011 to 31 March 2012

	Total Fees $'000	Fees/MWh* $
EMC Net Fees	28,726	0.3240
PSO Fees	18,470	0.2083
Total Fees	47,196	0.5323

*The volume is estimated at 44,325MWh based on actual volumes up to September 2011 being annualised.

Fees Recovered Directly from MPs and Consumers

Supplier	Service	Method of Assesment
SP PowerAssets	Transmission charges	Levied based on actual usage
SP Services (MSSL)	Meter reading and data management	Levied on a per meter basis

ADDITIONAL INFORMATION

Additional Information: Glossary

ancillary services
The additional services necessary to ensure the security and reliability of the power system. The ancillary services traded competitively on the wholesale market are regulation and the three classes of reserve. The black-start ancillary service is contracted by Energy Market Company (EMC) on an annual basis.

black-start ancillary service
A service to ensure that there is initial generation for system restoration following a complete blackout.

contestable consumers
Consumers that have the right to choose to purchase electricity from a retail supplier, directly from the wholesale market, or indirectly from the wholesale market through the Market Support Services Licensee (MSSL), SP Services. Consumers qualify to be contestable based on their level of electricity consumption.

co-optimisation
The process used by the market clearing engine to ensure that the most inexpensive mix of energy, reserve and regulation is purchased from the market to meet electricity demand in each dispatch period.

dispatch schedule
A schedule produced by the market clearing engine every half-hour that is the basis for the supply of energy, reserve and regulation in the market.

embedded generators (EG)
Generation units that generate electricity to their onsite load principally for self consumption.

energy
The flow of electricity.

gigawatt (GW)
A measure of electrical power equivalent to one thousand megawatts. Gigawatt hour (GWh) represents the number of gigawatts produced or consumed in an hour.

interruptible load (IL)
A contestable consumer of electricity that participates in the wholesale market and allows its supply of electricity to be interrupted in the event of a system disturbance in exchange for reserve payment.

load
The consumption of electricity.

market clearing engine (MCE)
The linear computer programme used to calculate the spot market quantities and prices.

market participant (MP)
A person who has an electricity licence issued by the Energy Market Authority (EMA) and has been registered with EMC as a market participant.

megawatt (M)

A measure of electrical power equivalent to one million watts. Megawatt hour (MWh) represents the number of megawatts produced or consumed in an hour.

metered demand
Metered demand is the electricity consumption which is proxied by the withdrawal energy quantity (WEQ).

net treatment of non-reserve charges for embedded generators
With effect from June 2011, non-reserve charges (EMC fees, Power System Operator fees and Monthly Energy Uplift Charges) for embedded generation facilities will be administered based on their amount of net withdrawal (consumption) from, or net injection (generation) into the grid. To qualify for this treatment, an embedded generation facility requires approval from the EMA and registration with EMC as an embedded generation facility.

nodal pricing
A market structure in which prices are calculated at specific locations, or nodes, in the power system to reflect the demand and supply characteristics of each location. Nodal pricing is also commonly referred to as locational marginal pricing.

non-contestable consumers
Consumers that are supplied by the MSSL, SP Services, at a regulated tariff. These consumers have not been given the right to choose to purchase electricity from either a retail supplier, directly from the wholesale market or indirectly from the wholesale market through the MSSL, SP Services.

regulation
Generation that is on standby to fine-tune the match between generation and load.

reserve
Stand-by generation capacity or interruptible load that can be drawn upon when there is an unforeseen disruption of supply.

retail market
The transactions made between retail companies and end consumers.

Additional Information: Glossary

supply cushion
The supply cushion measures the percentage of total supply available after matching off demand.

terawatt (TW)
A measure of electrical power equivalent to one million megawatts. Terawatt hour (TWh) represents the number of terawatts produced or consumed in an hour.

Uniform Singapore Energy Price (USEP)
The USEP is the weighted-average of the nodal prices at all off-take nodes.

vesting contract
A vesting contract is a regulatory instrument imposed on some generators by the EMA, with the objective of mitigating the potential exercise of market power when the supply side of the industry is concentrated among a small number of generators. A vesting contract requires these generators to produce a specified quantity of electricity (vesting contract level) at a specified price (vesting contract hedge price).

vesting contract hedge price (VCHP)
The VCHP is calculated by the MSSL every three months. It is determined using the long-run marginal cost (LRMC) of the most efficient generation technology in the Singapore power system, i.e., the combined-cycle gas turbine (CCGT). EMC's settlement system uses the VCHP to settle the vesting quantity between the MSSL and the generation companies.

withdrawal energy quantity (WEQ)
Withdrawal energy quantity (in MWh) refers to the amount of electricity withdrawn by load facilities. It is provided by the MSSL.

wholesale market
The transactions made between generation companies and retail companies.

Additional Information: Market Entities' Contact Details

Active Generator Licensees	Keppel Merlimau Cogen	www.keppelenergy.com
	Keppel Seghers Tuas Waste-To-Energy Plant (in its capacity as Trustee of Tuas DBOO Trust)	www.kie.com.sg
	National Environment Agency	www.nea.gov.sg
	PowerSeraya	www.powerseraya.com.sg
	Sembcorp Cogen	www.sembcorp.com
	Senoko Energy	www.senokoenergy.com.sg
	Senoko Waste-To-Energy (in its capacity as Trustee of Senoko Trust)	www.kie.com.sg
	Shell Eastern Petroleum	www.shell.com.sg
	Tuas Power Generation	www.tuaspower.com.sg
Active Retailer Licensees	Keppel Electric	www.keppelenergy.com
	Sembcorp Power	www.sembcorp.com
	Senoko Energy Supply	www.senokoenergy.com.sg
	Seraya Energy	www.serayaenergy.com.sg
	Tuas Power Supply	www.tpsupply.com.sg
Wholesale Market Traders	Air Products Singapore	www.airproducts.com.sg
	Banyan Utilities	www.banyan-utilities.com
	Diamond Energy	www.diamond-energy.com.sg
	Green Power Asia	www.greenpowerasia.com
	ISK Singapore	www.isktuas.com
	IUT Singapore[1]	www.iutglobal.com
	MSD International GmbH (Singapore Branch)	www.msd-singapore-ltd.com
	Pfizer Asia Pacific	www.pfizer-pappl-sg.com
	Singapore Oxygen Air Liquide	www.soxal.com
Market Operator	Energy Market Company	www.emcsg.com
Market Support Services Licensee	SP Services	www.spservices.com.sg
Power System Operator	Power System Operator	www.ema.gov.sg
Transmission Licensee	SP PowerAssets	www.sppowerassets.com.sg

[1]IUT Singapore withdrew as a market participant with effect from 11 May 2011.

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Energy
Market
Company

Energy Market Company Pte Ltd
238A Thomson Road
#11-01 Novena Square Tower A
Singapore 307684
T: +65 6779 3000
F: +65 6779 3030
www.emcsg.com

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