National Electricity Market of Singapore

Market Report 2004

Contents

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2004 Highlights

Market design proved robust

The design of the National Electricity Market of Singapore (NEMS) proved robust in 2004 and the efficiency gains created in the first year of market operation (such as price responsiveness, reserve cost savings and switch to more efficient generation sources) were carried through to 2004.

Introduction of vesting contracts

The introduction of vesting contracts on 1 January 2004 to control market power had a significant impact on wholesale market prices leading to a $10.00 drop in 2004 compared with 2003. Vesting contracts caused the biggest drop in wholesale market prices in the first quarter of 2004 with prices trending upward in the latter part of the year. This upward movement can be attributed to a combination of factors such as a realignment of market contracting, increasing fuel prices and the associated higher vesting contract prices. A comparison between 2003 prices and 2004 prices adjusted for the vesting contract payments and oil price increases shows a 5.15 percent price saving to the market in 2004.

June 29 supply disruption

Following a disruption to the piped gas supply from Indonesia on 29 June 2004 Singapore suffered a partial electricity blackout. In response to high wholesale electricity prices triggered as a result of the shortage of electricity supply, unaffected oil and diesel-fuelled generators responded with higher output to limit the extent and duration of the incident.

Interruptible load

From January 2004, large consumers have been able to compete directly against generators in the reserve market by offering to have their electricity supply interrupted when there is a security event. This interruptible load provides a valuable source of reserve as it is not dependent on a fuel source.

Discontinuation of fast-start ancillary services

In a change from 2003, fast-start capability services were purchased directly from the wholesale market as contingency reserve. This added 400MW of generation capacity to the market supply curve. The saving from this initiative was significant, about $18 million.

Letter from the EMC Chairman

Dear Industry Members,

The National Electricity Market of Singapore (NEMS) plays a vital role in the Nation's economy. The NEMS is the mechanism by which Singapore achieves competitively priced electricity and encourages efficient investment decisions.

The NEMS commenced on 1 January 2003 and has operated smoothly and delivered a number of benefits:

- Wholesale electricity market prices respond efficiently to changes in market fundamentals.

- Competitive pressures have encouraged generators to minimise their operational costs and to make strategic decisions to minimise their costs in the future.

- Large consumers are now able to offer into the reserve market and thereby compete against generators.

- The sophistication of the market scheduling and dispatch process has reduced the need for the Power System Operator (PSO) to intervene in the market and deviate from the economically optimal generation pattern.

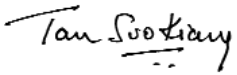
- As a result of a number of initiatives from Energy Market Company (EMC), there has been an increase in information available to market participants, consumers and investors so that market risk can be better managed.

The governance institutions in the NEMS have operated effectively and allowed the regulator to maintain an arm's length role. Since market commencement, the Rules Change Panel has made a significant contribution, supporting over 60 rule changes to ensure that the market continues to evolve and further efficiencies are realised. The EMC Board is particularly gratified that the Rules Change Panel has published its work plan for the 2004-06 period. This initiative, together with the ongoing push to improve the transparency of market information, will provide greater regulatory certainty for stakeholders.

The Market Surveillance and Compliance Panel has diligently monitored compliance with the market rules and issued penalties when necessary.

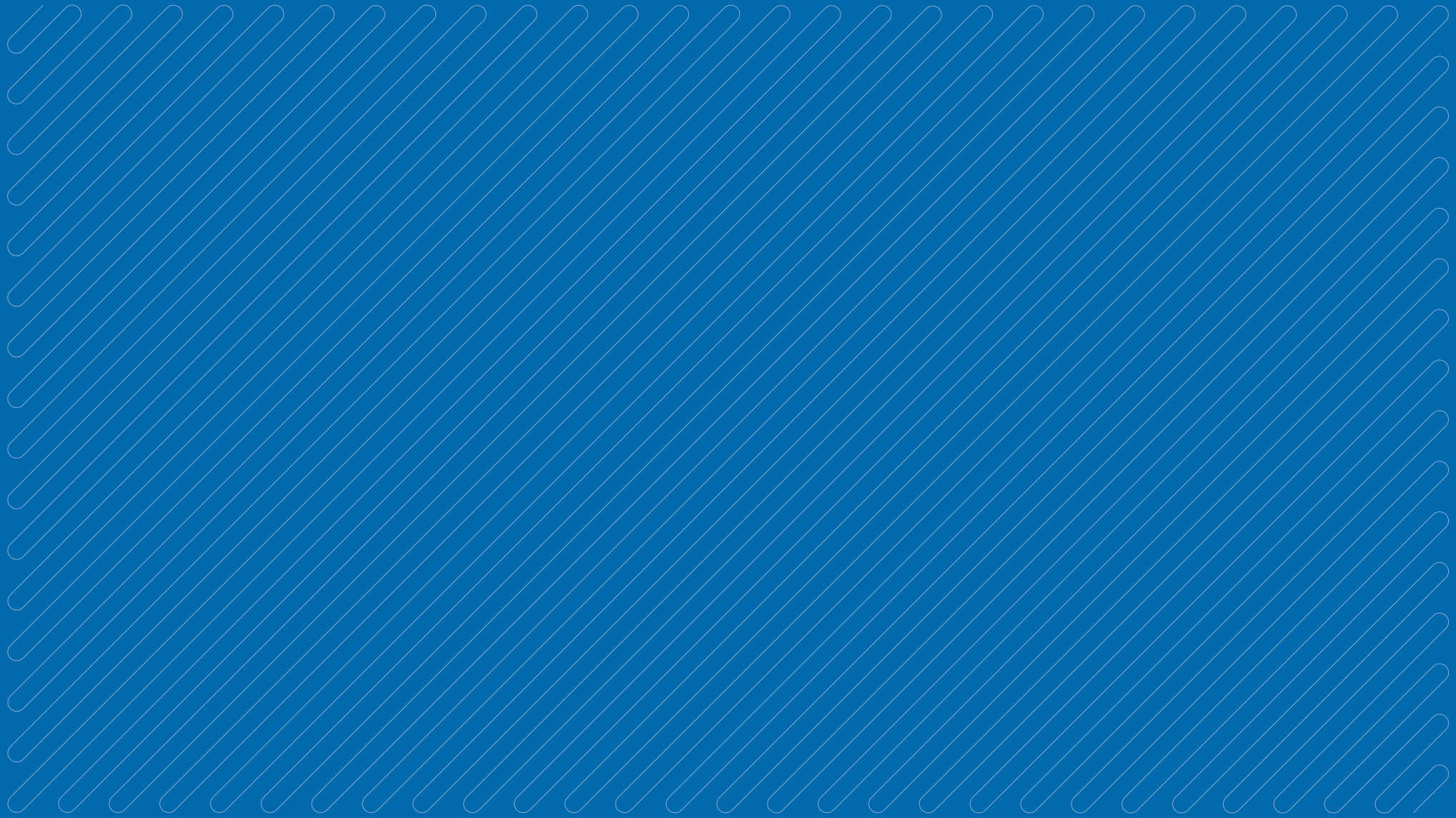
In 2004, the Dispute Resolution Counsellor worked hard on reviewing and further developing the dispute resolution framework so that it is robust and ready for use when required.

The market faced and overcame a number of challenges over the past 12 months. The introduction of the vesting contract regime and the June 29 supply disruption in particular tested commitment to the market framework. I am pleased to note that market participants and service providers worked constructively together to manage issues as they arose and that the key components of our market design and structure proved robust.



Tan Soo Kiang,
Chairman,
Energy Market Company

Market Overview



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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 through liberalisation started in October 1995, when industry assets were corporatised and began to be put on a commercial footing to facilitate competition and as a precursor to eventual privatisation. In 1998, the Singapore Electricity Pool (SEP), a day-ahead cost based 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 at the forefront of an international movement to introduce market mechanisms into the electricity industry as a way of:

- attracting private investment,
- increasing the efficiency of government assets,
- sending accurate price signals to guide production and consumption decisions,
- encouraging innovation, and
- providing consumer choice.

Market Reform Milestones

Corporatisation	1995	Electricity functions of the Public Utilities Board corporatised
		Singapore Power formed as a holding company
	1996	Pool design process began
Singapore Electricity Pool (SEP)	1998	SEP commenced
		PowerGrid is SEP Administrator and the Power System Operator
		Attempted sale of generator Tuas Power
	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 begun
	2001	Electricity industry legislation enacted
		The Energy Market Authority (EMA) established as industry regulator
		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 begun
	2003	NEMS wholesale market trading begun
	2004	Vesting contract regime introduced
		Interruptible loads began to participate in the market for reserves

Industry Structure

Singapore's electricity industry is structured to facilitate competitive wholesale and retail markets. This was achieved by separating the ownership of the contestable parts of the industry from those with natural monopoly characteristics. To promote the entry of new participants, licences have been granted to parties that intend to establish new businesses to participate as electricity generators or as retailers.

NEMS Participants and Service Providers

Active Generators	5	PowerSeraya Senoko Power SembCorp Cogen Tuas Power National Environmental Agency
Active Retailers	5	Keppel Electric Seraya Energy SembCorp Power Senoko Energy Supply Tuas Power Supply
Market Operator	1	Energy Market Company (EMC)
Market Support Services Licensee	1	SP Services
Transmission Licensee	1	SP PowerAssets
Power System Operator	1	Power System Operator (PSO)

The Energy Market Authority (EMA) - The Regulator

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

Energy Market Company (EMC) - The Market Operator

EMC operates the wholesale market. This role includes calculating prices, scheduling generation, clearing and settling market transactions, and procuring ancillary services.

The Power System Operator (PSO)

The PSO (a division of the EMA) is responsible for ensuring the reliable supply of electricity and the secure operation of the power system. The PSO dispatches generation facilities, co-ordinates outages and power system emergency planning, and directs the operation of the high-voltage transmission system.

SP PowerAssets - Transmission Licensee

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

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 the PSO.

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.

SP Services - Market Support Services Licensee

Market Support Services Licensees (MSSLs) provide market support services including meter reading and meter data management. In 2004, SP Services was the only MSSL. SP Services also facilitates access to the wholesale market for contestable consumers and retailers, is responsible for supplying electricity to all non-contestable consumers and is the vesting contract counter-party.

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 or directly from the wholesale market or indirectly from the wholesale market through SP Services. Non-contestable consumers are supplied by SP Services.

Interruptible Loads

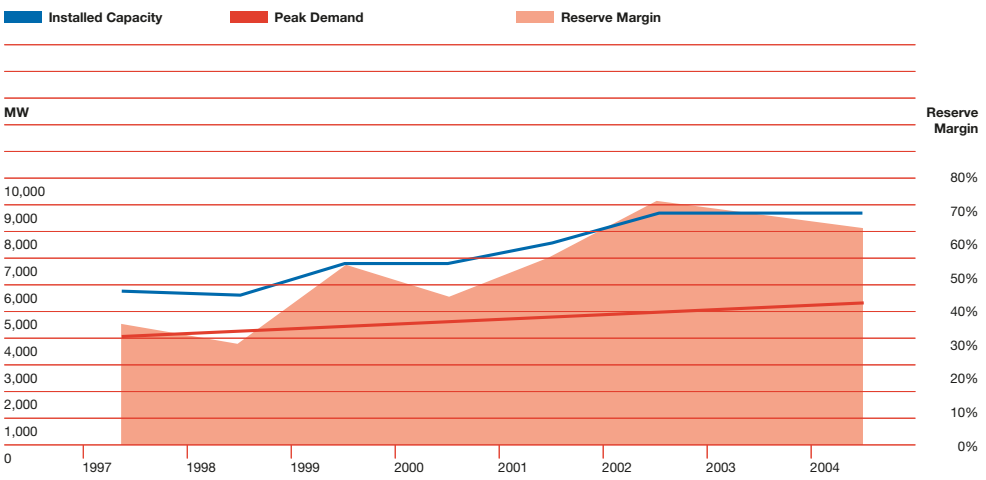
Interruptible loads are contestable consumers of electricity that participate in the wholesale market and allow their supply of electricity to be interrupted in the event of a system disturbance in exchange for payment.

Electricity demand and supply growth trends

The NEMS currently enjoys a healthy reserve margin, with installed generation capacity exceeding peak demand by 65 percent. The level of reserve margin decreased marginally in 2004 as generation capacity remained constant with a 2.7 percent growth in peak demand.

Total system demand was 34.218 terawatt hours (TWh) in 2004, up 5 percent from 2003.

Installed Capacity and Peak Demand



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Market Overview

The generators supplying the National Electricity Market of Singapore (NEMS) use a mix of technology to generate electricity.

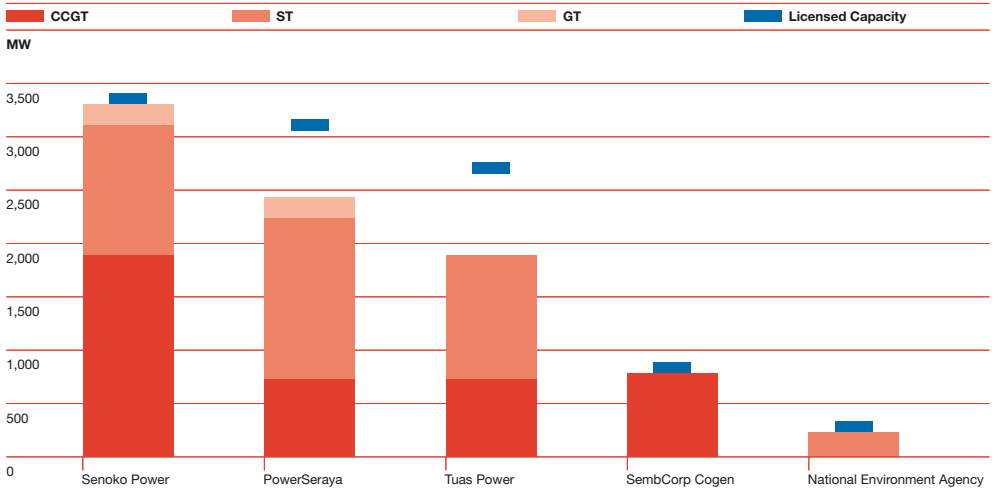
Combined-cycle gas turbine (CCGT) units make up 48 percent of installed capacity and typically use piped natural gas from Indonesia or Malaysia. CCGT units can use diesel as an alternative fuel source.

On an installed capacity basis, steam turbine (ST) generation units also make up 48 percent of the market. ST units typically run on high sulphur fuel oil but can also run on diesel or Orimulsion (tar and water). The plants operated by the National Environment Agency (NEA) are ST units that convert energy from refuse incineration into electricity.

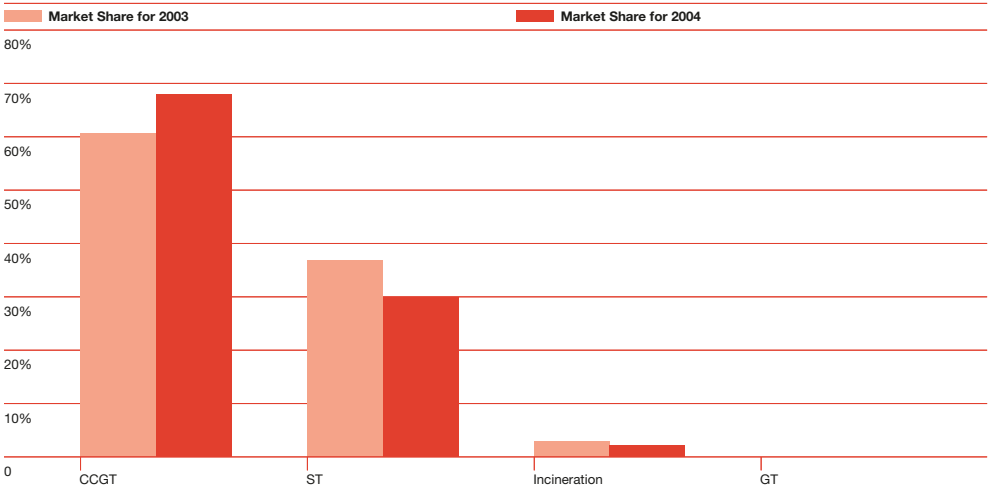
Open-cycle gas turbine (GT) units provide 4 percent of installed capacity and are fuelled by diesel.

Since the commencement of the NEMS in 2003, CCGT units have been the dominant source of generation, whereas in the Singapore Electricity Pool (SEP) they were a secondary source to ST units. CCGT units have proven more competitive in the NEMS due to their superior fuel efficiency, flexibility and environmental performance when compared to ST units.

Registered Installed Capacity 2004



Market Share by Plant Type 2003/04



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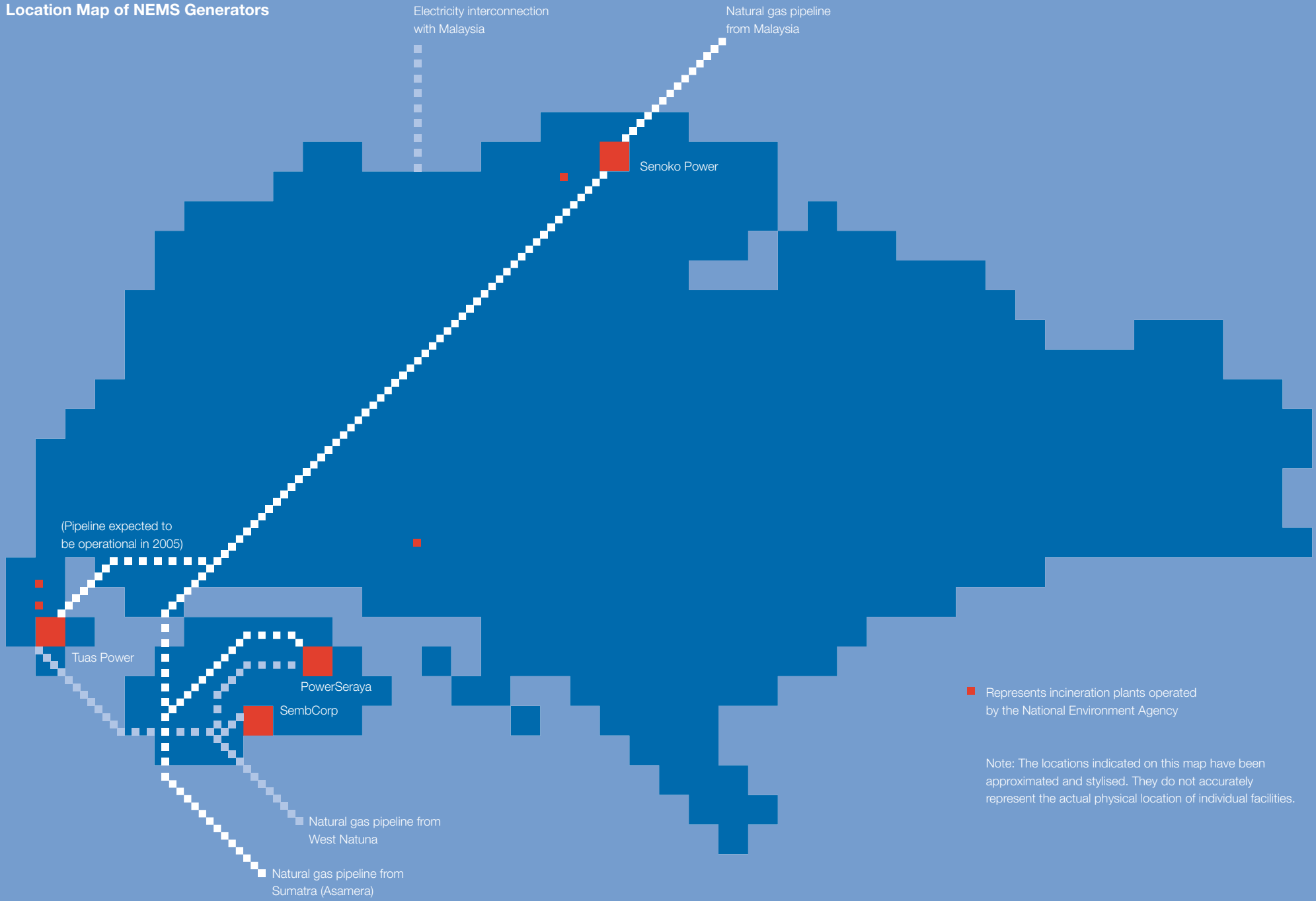
Location Map of NEMS Generators



Note: The locations indicated on this map have been approximated and stylised. They do not accurately represent the actual physical location of individual facilities.

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Market Features

The National Electricity Market of Singapore 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

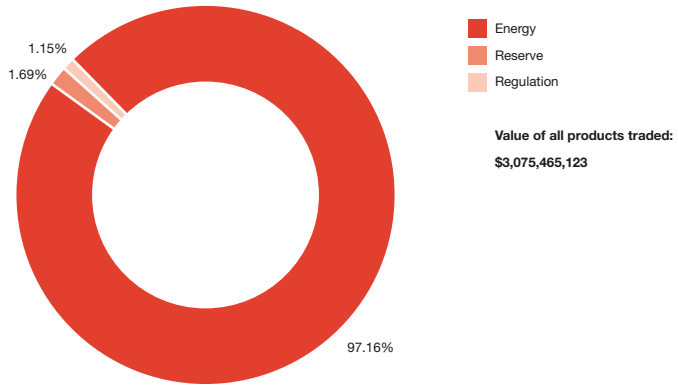
A sophisticated process is used to determine the price and quantity of each product traded. Integral to this process is the concept of co-optimisation where the market clearing engine (MCE) considers the costs and requirements of all products together and then selects the optimal mix of generators to supply the market.

The total value of products traded in the wholesale market in 2004 was $3.075 billion.

Products Traded in Real-Time on the NEMS Wholesale Market

	Description	Purchaser	Seller
Energy	Generated electricity	Retailers	Generators
Reserve	Stand-by capacity that can be drawn on 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) 3. Contingency reserve (10-minute response onwards)	Generators	Generators and Retailers
Regulation	Generation that is on stand-by to fine-tune the match between generation and load	Generators and Retailers	Generators

Share of Products Traded 2004



Market Features

Security-constrained dispatch and nodal pricing

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

- available generation capacity,
- ability of generation capacity to respond (ramping),
- relationship between energy production and reserve and regulation provisions (co-optimisation),
- physical limitations on the flows that can occur in the transmission system,
- power flows in the 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 facility is to produce,
- reserve and regulation capacity each generation facility is required to maintain,
- level of interruptible load 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 physical restrictions on 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 programming to establish demand and supply conditions at multiple locations (nodes) on the network. For each half-hour trading period, the MCE calculates the prices to be received by generators at the 36 injection nodes and the prices to be paid by customers at the 377 withdrawal or off-take nodes. This ensures that market transactions are structured in a way that is physically feasible given the capacity and security requirements of the transmission system. This method of price determination encourages the economically efficient scheduling of generation facilities in the short term, and provides incentives to guide investment into new 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.

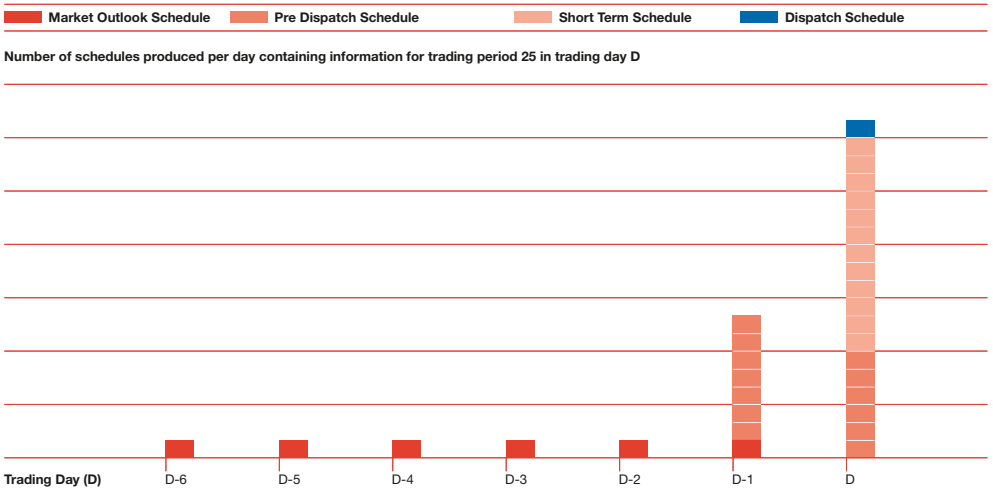
Generators pay for reserve based on the risk they contribute to the system. Regulation is paid for by retailers in proportion to their energy purchase and by dispatched generators up to a ceiling of 5MWh for each trading period.

Near real-time dispatch

Market prices and dispatch quantities for generation, 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 intervention from the Power System Operator (PSO) as possible, and hence a minimal deviation from a competitive market solution.

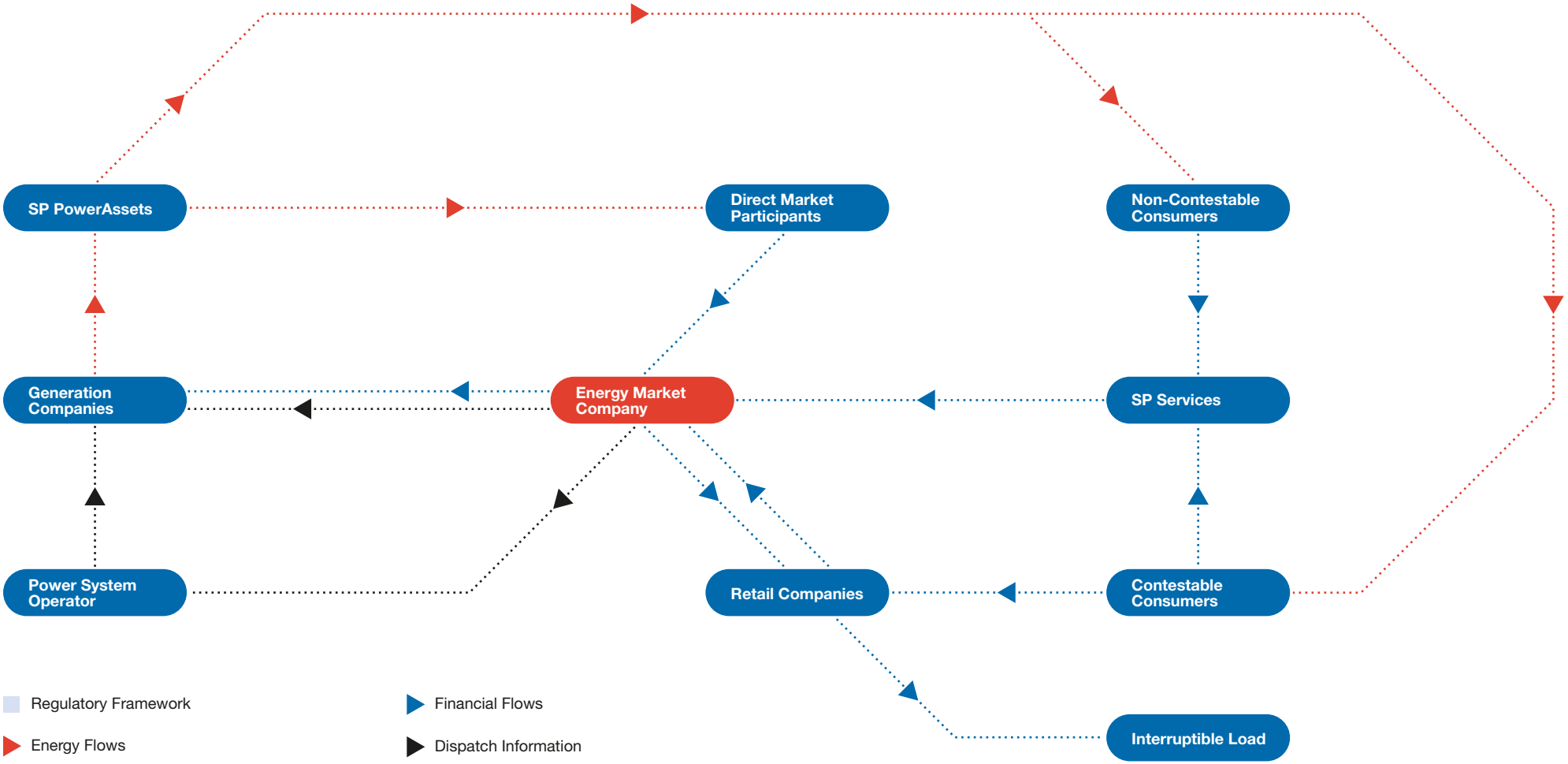
To support near-real time dispatch EMC produces market forecast schedules up to a week ahead of the relevant trading period. These forecast schedules increase in frequency as the trading period approaches to ensure that market participants have the information they need to adjust their trading positions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

Market Trading Schedules



National Electricity Market of Singapore

Electricity Act | Licenses | Market Rules | Market Codes



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Market Governance

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Overview of Governance

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 others:

- 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 market rules). The market rules are a multi-lateral contract between market participants and market service providers.

The rule-making process is the responsibility of the Rules Change Panel (RCP). Appointed by the Energy Market Company (EMC) Board, the RCP has members representing generators, retailers, the financial community, the Power System Operator (PSO), the market support services licensee, the transmission licensee and EMC to ensure that the interests of the various sectors of the industry are adequately represented.

The rule change process is designed to maximise both transparency and opportunities for public involvement. Rule modifications recommended by the RCP require the support of the EMC Board and the EMA. The EMA is required to consider the interests of consumers when approving changes to the market rules. Each year, the RCP establishes and publishes its work plan to ensure that stakeholders remain informed about the likely evolution path of the market. The work plan can be found at www.emcsg.com.

Market surveillance and compliance

A Market Surveillance and Compliance Panel (MSCP), comprising professionals independent of the market, is responsible for monitoring, investigating and reporting on the behaviour of market participants with a view to identifying inappropriate or anomalous behaviour. In circumstances where the MSCP determines that a market participant is not compliant with the market rules, it may issue a penalty. The MSCP also has the task of monitoring the marketplace in general, in order to detect deficiencies in the market design.

Dispute resolution

The market rules contain a process that facilitates the resolution of disputes. This process is undertaken by the Dispute Resolution Counsellor should a dispute arise between market participants or service providers. The dispute resolution process is designed to be a cost-effective way of managing disputes by avoiding the need to resort to court proceedings.

Letter from the RCP Chairman

Dear Industry Members,

The Singapore Electricity Market Rules govern the wholesale operations of the National Electricity Market of Singapore (NEMS). These rules, and the market framework they represent, are subject to constant evaluation to ensure their relevance and the ongoing efficiency of the NEMS. The Rules Change Panel (RCP) holds a central role in evolving the NEMS, enhancing efficiency and maintaining a level playing field.

After the first year of market operation, the NEMS had matured considerably. Market participants were more familiar with the workings of the market and so the issues became increasingly complex. Hence, the RCP was faced with significantly more challenging matters to deal with in 2004. The matters began to involve design issues that were more detailed, but nevertheless have a profound impact on market efficiency. Many of these issues also increasingly relied on qualitative economic assessment and cost-benefit analysis for resolution. To ensure that the RCP dealt with the most important issue first, the panel undertook a prioritisation exercise, with industry involvement, to create a work plan for 2004 and beyond.

Despite the more demanding environment, I am proud to say that the RCP made good progress in clearing the issues on the RCP work plan. In some cases, it was difficult to achieve complete alignment of diverse views. The RCP members should be complimented for leaving their company hats at the door and working in the best interests of the market. With commitment and perseverance the panel was able to make a number of substantial achievements in 2004. Among others, these include:

- implementing a new short-term market forecast schedule,

- shortening the offer gate closure and tightening the rules around it,

- implementing dynamic load participation factors to improve the accuracy and efficiency of nodal load forecasts and the dispatch process, and

- devising an automated wholesale settlement re-run regime to improve the efficiency of wholesale market settlement to deal with metering errors.

On top of making modifications to the market rules to enhance market efficiency, the RCP has, over the course of the year, engaged in discussions and debates over various aspects of market design. While these have not necessarily resulted in modifications to the market rules, the views and arguments recorded contribute greatly to the thought process underlying the evolution of the wholesale electricity market. RCP papers are available at www.emcsg.com.

I wish to thank the members of the RCP for their diligence and significant contributions to the market evolution process. I must also thank the market participants and service providers for making their staff available to serve on the RCP. On behalf of the panel, we look forward to continuing to evolve the NEMS so that it becomes an even more efficient and transparent marketplace.

Allan Dawson,
Chairman,
Rules Change Panel

Significant Market Evolution Initiatives

Implementation of Short-Term Schedule (STS)

The STS is a new market forecast schedule that improves the suite of information available to market participants and the Power System Operator (PSO) to make trading and operational decisions. It covers 12 trading periods and is run and published every half-hour. It incorporates the most recent dispatch related information, e.g., the half-hourly very-short-term load forecast (VSTLF) supplied by the PSO, most recent grid information and latest offer variations submitted by generators.

Before the introduction of the STS, the most up-to-date forecast schedule was the pre-dispatch schedule (PDS), which is run and published every two hours. As a half-hourly schedule, the STS offers more reliable and accurate information for the next 12 consecutive trading periods immediately following the real-time dispatch period. It enables market participants to make more informed decisions, thereby increasing trading efficiency. It also allows generators and the PSO to manage generating plants more efficiently and securely.

Gate closure

Tighter rules

At market start on 1 January 2003, offers made by generators were required to be firm for four hours prior to the relevant trading period. This meant that offer variations needed to be submitted within a gate closure of four hours before the market was cleared. An exception to this gate closure rule is only granted when an offer change is required to maintain system security. The Market Surveillance and Compliance Panel (MSCP) reviewed over 9,200 cases of possible violation of the gate closure rule in 2003.

The rules have been tightened to give clarity on:

- circumstances under which offer variations after gate closure are permitted,
- forms of permissible offer variations after gate closure, and
- compliance and enforcement of the gate closure rule.

These changes ensure that the rules on gate closure are clear to all participants and reduce the scope for speculation within the gate closure.

Shorter gate closure

Following the implementation of the short-term schedule (STS), the gate closure period was halved to two hours. This reduction was made after balancing the following requirements:

- the benefit of certainty that a reasonable gate closure provides for generators and the PSO,
- potential efficiency enhancement of greater market response to changing conditions, e.g., load forecasts, grid configurations and security constraints,
- the impact on generators with different technological capabilities to respond to changing market conditions, and
- system security requirements.

In view of the efficiency gains that a shorter gate closure could bring, the Rules Change Panel (RCP) also recommended a further review of the gate closure period in the future with a view to shortening it even more. This review is scheduled for July 2005.

Enhancing nodal load forecasts with dynamic LPFs

A new methodology was adopted that improves the calculation of load participation factors (LPFs). LPFs are used to allocate the system-wide non-dispatchable load forecast to individual off-take nodes. Nodal load forecasts are used to calculate nodal prices and a security-constrained dispatch schedule.

The nodal load forecast for a node is the expected load consumption at that node for that trading period. Every nodal load forecast is calculated by multiplying the LPF of each node by the forecast of total non-dispatchable load for each period. Hence, for nodal load forecasts to be accurate, LPFs should reflect load consumption occurring at various nodes at various times.

Before, the methodology for the calculation of LPFs was static. It was based on historical data that may have been up to three months old. The new methodology uses the most recent data from the network status file, which is dynamic and captures changes in real-time load distribution in the power system.

Significant Market Evolution Initiatives

The advantages of the new method are:

• LPFs now reflect dynamic changes in transmission network connectivity that affect load distribution.

• Incidents of high prices resulting from the inability of the old static LPF methodology to capture load shifting (which led to constraint violation penalties being invoked, resulting in price spikes) are eliminated.

• LPFs now enable a more efficient price discovery process by using the most recent and relevant information.

The move to dynamic LPFs has reduced the number of instances that market prices are required to be revised and hence increases price certainty.

An automated wholesale settlement re-run regime

Wholesale settlement re-runs are necessitated by metering errors that are reported to Energy Market Company (EMC) after final settlement statements have been issued. However, the wholesale settlement system was not designed to perform these re-runs and the rules for conducting them were unclear. Before, re-runs had to be performed offline and manually. They also had to be performed on an as needed rather than systematic basis, i.e., as and when corrected meter data was submitted by SP Services.

The old arrangement created, among others, the following inefficiencies and risks:

• Multiple adjustments for the same trading day resulted from the ad hoc nature of metering errors.

• Market participant invoices that did not require quantity changes also had to be adjusted because of changes in rates of administrative charges. In essence, all invoices had to be adjusted.

• Changes in retailer invoices affected customers. Re-invoicing put the integrity of the settlement process at risk.

• Because re-runs were performed offline and manually the risk of human error was introduced.

Offline re-runs were unsustainable and created risks. Retailers also had to cope with the inefficiencies and administrative costs of frequent and unpredictable invoice corrections. Customers who were not affected by metering errors found it difficult to understand why rates charged to them could change.

In June 2003, EMA tasked EMC to form and chair a task force on settlement re-runs to find a solution to the issues surrounding metering error adjustment. The task force deliberated on the issues for several months but a consensus could not be reached. Finally, it agreed that an appropriate solution should be tabled by EMC to the RCP.

After a detailed analysis, the RCP voted for the adoption of an automated partial wholesale settlement re-run with nominated days regime. Important features of this regime are:

• Only the energy portion is re-run, i.e., rates of administrative charges will not be recomputed. Hence, only invoices containing metering errors are adjusted.

• Nominated days, i.e., cut-off dates are used to accumulate metering errors pertaining to a trading day. This enables net metering errors pertaining to a day to have a single adjustment. This eliminates multiple adjustments for one trading day.

• Re-runs are performed automatically after every nominated day, providing a clean and auditable process for financial integrity.

• The second nominated day, which is about one year from a trading day, represents an effective wholesale settlement closure date for trades relating to a particular trading day.

This new wholesale settlement re-run regime will take effect from 1 April 2005 and is an appropriate long-term solution to the issues surrounding financial adjustment for metering errors. It solves most of the problems associated with offline re-runs.

Letter from the MSCP Chairman

Dear Industry Members,

In 2004, the Market Surveillance and Compliance Panel (MSCP) continued to steer the relatively uncharted waters of electricity market surveillance in the National Electricity Market of Singapore.

General observations

It is heartening to note that there have not been any major rule breaches in the wholesale electricity markets during the year. Despite the few occasions of high prices, the MSCP was happy to see that wholesale electricity prices were generally stable.

Catalogue of monitoring indices

Since market start, several monitoring indices have been under observation by the MSCP and Market Assessment Unit (MAU). The purpose was to identify those that would be appropriate for continued use in evaluating the data collected as part of the monitoring process.

Based on this work, in 2004 the MSCP and MAU proposed a catalogue of monitoring indices for consideration by the industry. After responding to issues raised in the consultation process, the MSCP adopted a catalogue of monitoring indices which took effect from 1 August 2004. Market data is now evaluated according to these indices.

Annual report

In July 2004, the MSCP issued its Annual Report for the period April 2003 to March 2004. This is the first report of the panel covering a full year of activities. As required under the market rules, the report also included the MSCP's assessment as to competition, efficiency and compliance within the wholesale electricity markets.

The MSCP noted that on the supply side of electricity, the industry is concentrated, and on the demand side, the price elasticity of demand is very small. These two features generally point toward a potential for high prices and inefficiency of markets. However, the MSCP concluded that there are several indicators that suggest that a certain degree of efficiency has been achieved in the wholesale electricity markets. The panel's report also reviewed various matters relating to rule compliance, including the types of breaches encountered.

MSCP statements

In the course of the year, the MSCP considered that there were situations which warranted the issue of statements to remedy conduct observed in the markets.

There were occasions when a market participant, having made an offer of energy, reserve and/or regulation and was scheduled by the market clearing engine in the real-time dispatch schedule, but was subsequently unable to comply with the schedule. The relevant offers were sometimes made at very high prices.

The MSCP informed the industry that it took a serious view of cases where non-compliance with the dispatch schedule undermined system security, or the fair and efficient operation of the wholesale electricity markets, and that such cases would be dealt with in accordance with the market rules.

Since the issue of the statement, the MAU has not come across cases of offers at high prices followed by subsequent inability to comply with dispatch instructions.

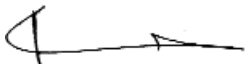
Another area relates to market participants making offer variations or revising standing offers after gate closure. The MSCP noticed that such variations were sometimes not made on grounds permitted under the market rules. There were also cases where the variations involved price changes. This is generally not permitted under the market rules.

On 25 November 2004, the MSCP issued a statement indicating that offer variations or revised standing offers of the above nature would be treated as potential breaches of the market rules.

The MSCP and MAU continue to closely scrutinise market participant behaviour in this area.

Conclusion

Effective market monitoring and investigation benefits the market, and market players generally recognise this fact and support the process. On behalf of the MSCP, I thank market players for their co-operation with the MSCP and MAU in discharging their responsibilities.



Joseph Grimberg,
Chairman,
Market Surveillance and Compliance Panel

Compliance activity for 2004

Referrals or complaints received	21
Determinations by the MSCP	15
MSCP meetings	11
Gate closure revisions considered	6,289
Financial penalties imposed	None
Costs imposed on party in breach	$9,000
Total cost of the MSCP	$142,340

Letter from the Dispute Resolution Counsellor

Dear Industry Members,

I am happy to report that no disputes were referred to me in the second year of the operation of the market. This allowed me time and opportunity to focus on proposing improvements to the current dispute resolution process.

Review of the dispute resolution process

As part of the exercise of reviewing our dispute resolution process, a comparative study of the dispute resolution framework in other electricity markets such as Ontario, Pennsylvania–Jersey–Maryland (PJM), California, New England and Australia was undertaken with the assistance of the Market Assessment Unit (MAU).

Proposal for improving dispute resolution framework

On 12 June 2004, I met with CEOs and managers from the market and industry, and presented to them a proposal for improving the current dispute resolution framework. The main thrust of the proposal was to create a fair, efficient and cost-effective dispute resolution process which benefits market players. Key aspects of the proposal are as follows:

Adopting a comprehensive and holistic approach to dispute resolution

Parties in dispute are first encouraged to resolve disputes by themselves through negotiation and if this fails, to attempt to resolve the dispute through mediation. Disputes are resolved through arbitration as a last resort.

Making mediation an integral part of the process

Parties commit to resolve the dispute amicably right from the beginning. Mediation is a process that saves time and costs for the parties who are in dispute. Mediation helps parties to work out a solution to their dispute that serves their mutual interest. It also helps to preserve business relationships in the small electricity community.

Providing parties with a one-stop centre for dispute resolution

Currently, it is mandatory for disputes involving the market operator, Energy Market Company (EMC), and the Power System Operator (PSO), under the market rules and manuals to be resolved under the dispute resolution process in the market rules. However, it is not the case for other disputes. The proposal is for the market to have a one-stop centre for dispute resolution by extending the coverage of the dispute resolution process.

Defining the role of the Dispute Resolution Counsellor more clearly

The proposal is for the Dispute Resolution Counsellor to act as a case manager in the dispute resolution process, i.e., he monitors disputes from the start and guides the parties through the dispute resolution process. He will not be involved in mediating or arbitrating the dispute but will help market players set up their dispute management systems and provide training in negotiation and mediation.

Creating separate Mediation and Arbitration Panels, with participation from foreign experts

The proposal is to appoint a Mediation Panel comprising five members and an Arbitration Panel comprising ten members, including foreign arbitrators who are experienced in arbitrating electricity market issues. This is to give market players an adequate choice of independent and experienced arbitrators. These panel members will be paid by disputing parties for their services only when such services are utilised.

Feedback

Based on the feedback received from the June session, I worked with the MAU to re-draft the market rules relating to dispute resolution.

The proposed amended rules were then circulated to the industry on 1 September 2004 for further comments and feedback.

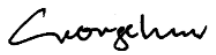
This was followed by a detailed response to all comments received.

Rule change proposal

Based on the comments received from the industry, a rule change proposal was formally submitted to the Rules Change Panel on 1 October 2004.

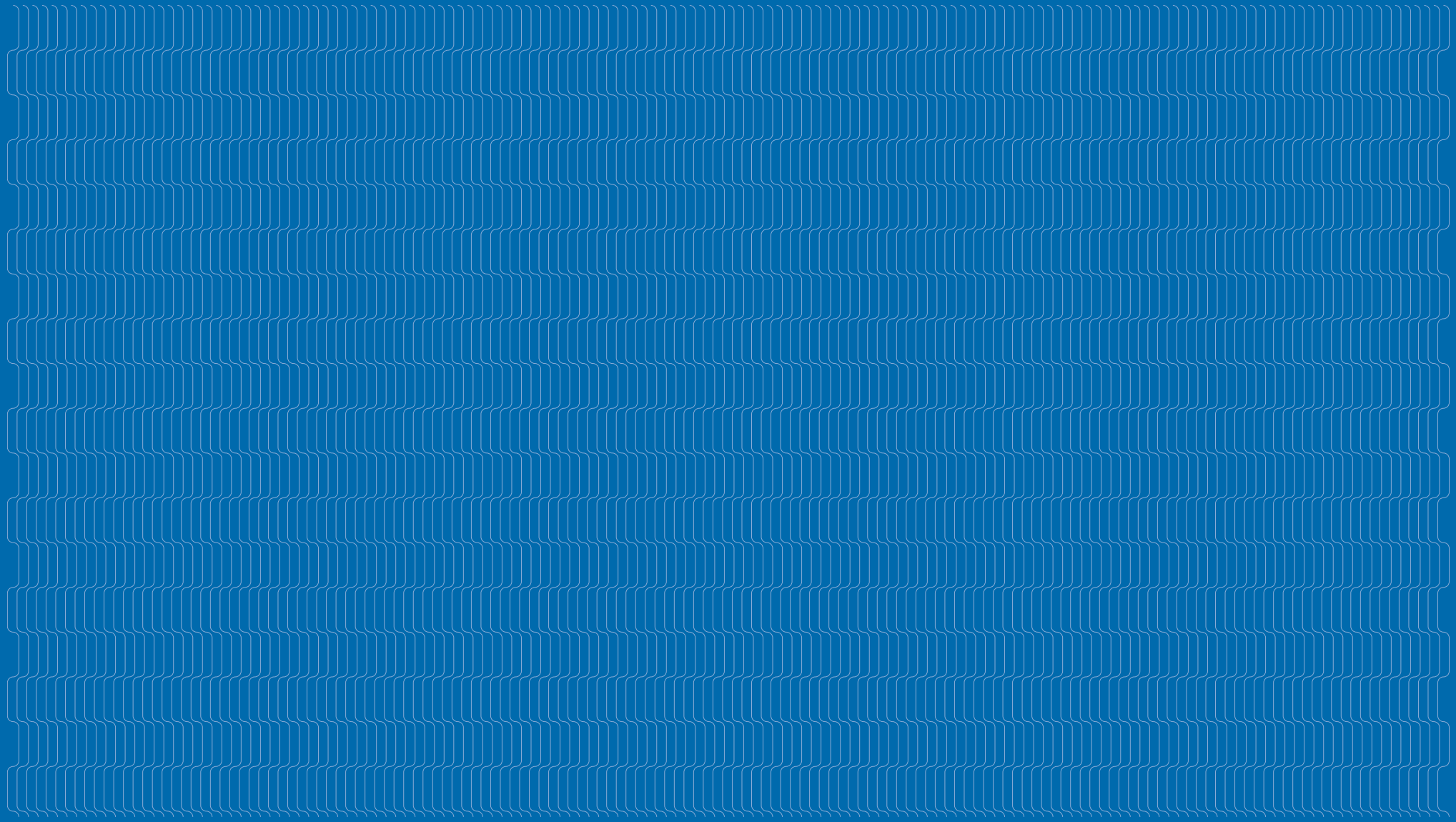
I understand that the principles of the rules change proposal are largely supported by the Rules Change Panel. The detailed rules will be placed before the Panel for consideration in May 2005.

Once the new rules are approved by the Energy Market Authority (EMA), I will work on their implementation immediately to effectively put in place the new proposals.



George Lim,
Dispute Resolution Counsellor

Market Performance



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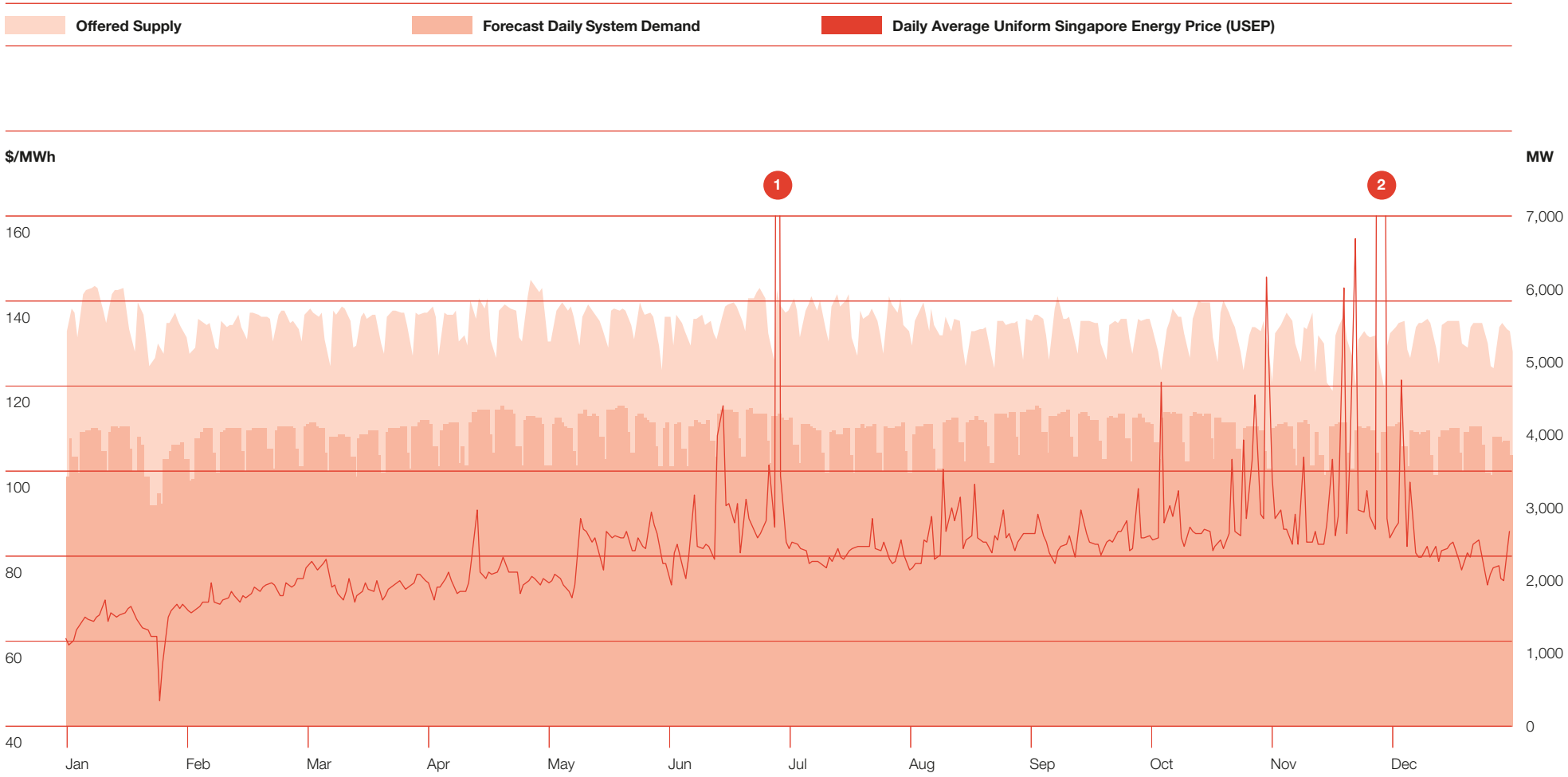
Energy Prices

USEP, System Demand and Offered Capacity 2004



1. On 29 June 2004, USEP rose to the $4,500 per MWh price ceiling for three trading periods. These prices accompanied a partial electricity blackout due to an unplanned disruption to the piped gas supply from Indonesia. The average USEP for 29 June was $360.04 per MWh.

2. On 28 and 29 November, daily average USEP rose to $353.60 per MWh and $240.46 per MWh respectively. These prices reflected extremely tight supply conditions, particularly in the primary reserve market, due to a combination of planned and unplanned generation outages.

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Energy Prices

The price that a generator receives from the wholesale market for the production of energy is influenced by its location on the transmission network. The price reflects the market clearing price and the costs associated with transmitting the energy from the generation facility to where it will be consumed. This is known as the locational marginal price, or nodal price.

Retailers pay for electricity purchased from the wholesale market at the quantity-weighted average of all nodal prices in a particular trading period, known as the Uniform Singapore Energy Price (USEP). All retailers pay the same price.

In the National Electricity Market of Singapore (NEMS), generators compete to supply the forecast system demand over the next half-hour trading period.

System demand fluctuates on account of the following factors:

- The daily demand profile varies in accordance with business hours, with peak demand typically 10.00 am – 5.00 pm.

- The weekly demand profile also varies in accordance with business days, with Sunday typically being the lightest load day.

- Public holidays (especially over the Chinese New Year period) are also typically accompanied by low demand.

- There are some observed seasonal demand trends with March to October being peak months. This reflects both the economic business cycle as well as the influence of the weather. It has been observed that temperature has an impact on air-conditioning related load, with one degree Celsius above normal levels increasing island-wide demand by approximately 70MWh.

- Over the longer term, economic growth is the main determinant of growth in system demand.

The amount of generation capacity available to the market in any trading period will depend on a mixture of operational and economic factors:

- A generator may not be operationally able to bring capacity online to serve the market if it is undergoing maintenance or otherwise not prepared for operation, e.g., cold units.

- A generator may choose not to offer capacity into the market if it is not economically viable to operate at the prevailing market price.

- The level of generation capacity available to the market over the longer term reflects the decisions of generators to invest in additional capacity or, alternatively, to retire assets that are no longer economically viable.

Market prices are influenced by the interaction of both demand and supply factors. From trading period to trading period there are system events that may cause temporary price fluctuations. These include forced outages and unanticipated fluctuations in demand.

Forced outages of generation or transmission equipment may cause a temporary shortage in the market. The shortage will trigger a price signal to encourage additional generation capacity to be made available to the market and hence relieve the shortage.

Unanticipated fluctuations in demand are rare as Singapore's demand patterns tend to be uniform and predictable.

Key price trends

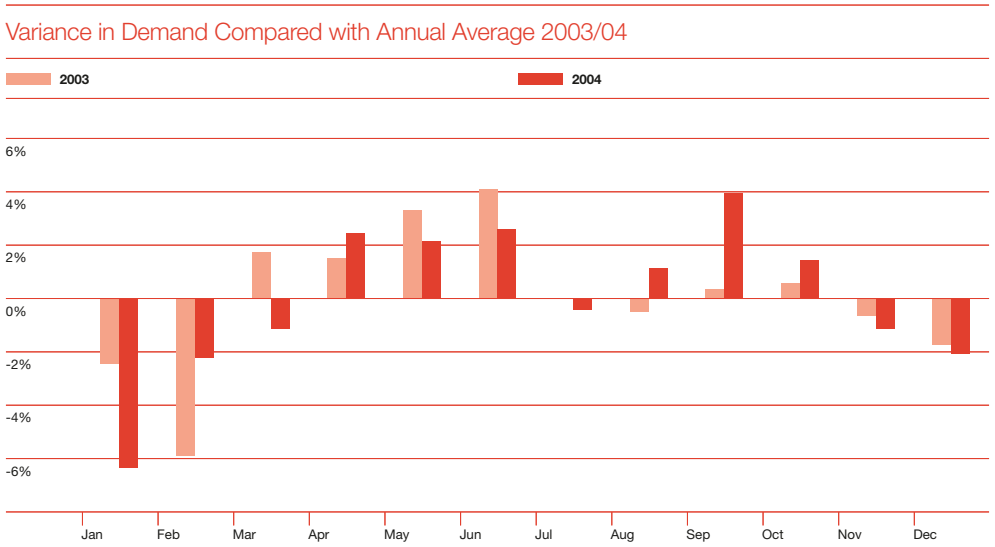
The introduction of vesting contracts on 1 January 2004 had a significant effect on energy prices.

After the initial shock of vesting, prices rose gradually throughout the year in response to higher fuel costs.

On 29 June 2004, the piped natural gas supply from Indonesia was disrupted. This had a knock-on effect to the electricity supply as some gas-fuelled generators were unsuccessful in switching to alternative fuel sources. Some parts of Singapore experienced a temporary loss of supply. Wholesale electricity prices spiked, reflecting the shortage, and additional supply responded.

There was increasing price volatility in the last quarter of the year. This was in response to tight market conditions where lower than typical capacity was made available to the market and daily peak demand topped 5,000MW in 190 trading periods. In these tight conditions, the market became increasingly price sensitive to disruptions such as forced generation outages.

Variance in Demand Compared with Annual Average 2003/04



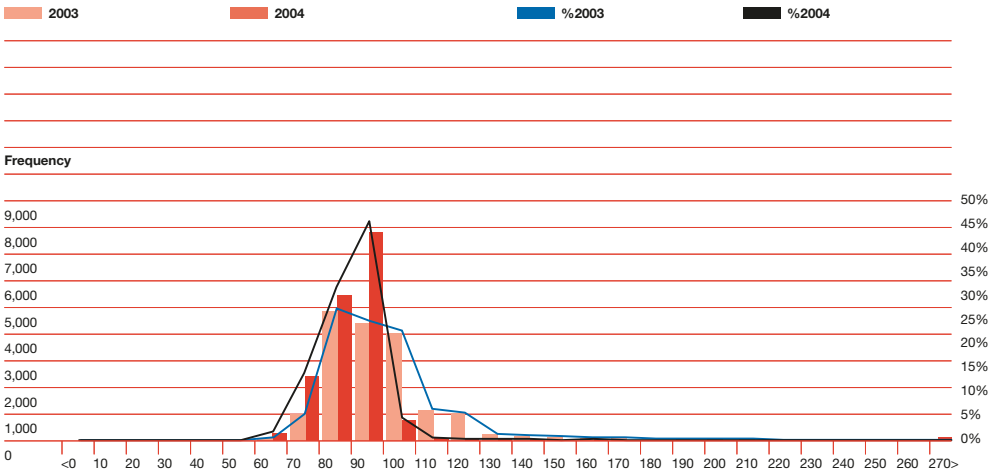
Price Volatility

The distribution of USEP by trading period for 2004 centred on a mean of $82.35 per MWh with a standard deviation of $70.30. This compares with a USEP mean of $92.35 per MWh and standard deviation of $88.15 in 2003.

The reduced price volatility in 2004 is attributable to the subduing effect of vesting contracts and a fall in the number of incidents that caused price disruptions.

In 2004, energy prices were between $50.00 and $200.00 per MWh in 99.20 percent of trading periods, lower than $50.00 per MWh in 0.10 percent of trading periods and greater than $200.00 per MWh in 0.70 percent of trading periods.

Price Frequency Histogram: USEP by Trading Period 2003/04



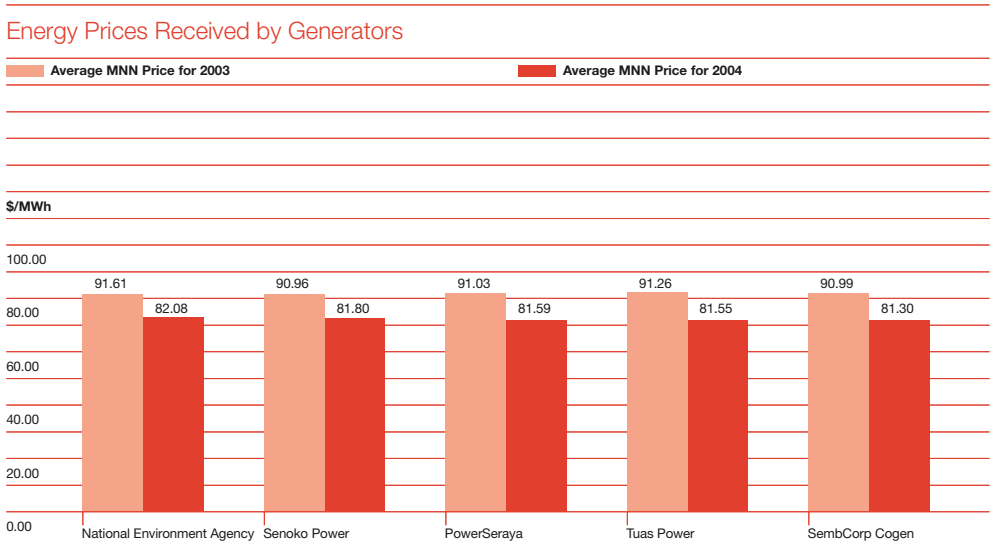
Nodal Price Differences

The National Electricity Market of Singapore (NEMS) uses a location based model to determine a security-constrained dispatch and establish nodal prices. As a result, prices are different at different locations on the network, called market network nodes (MNNs). The differences are due to the cost of transporting electricity to the different locations. These transport costs arise because of transmission losses and are also occasionally influenced by line constraints. As a rule of thumb, the load point closest to a generation source will have the cheapest nodal price.

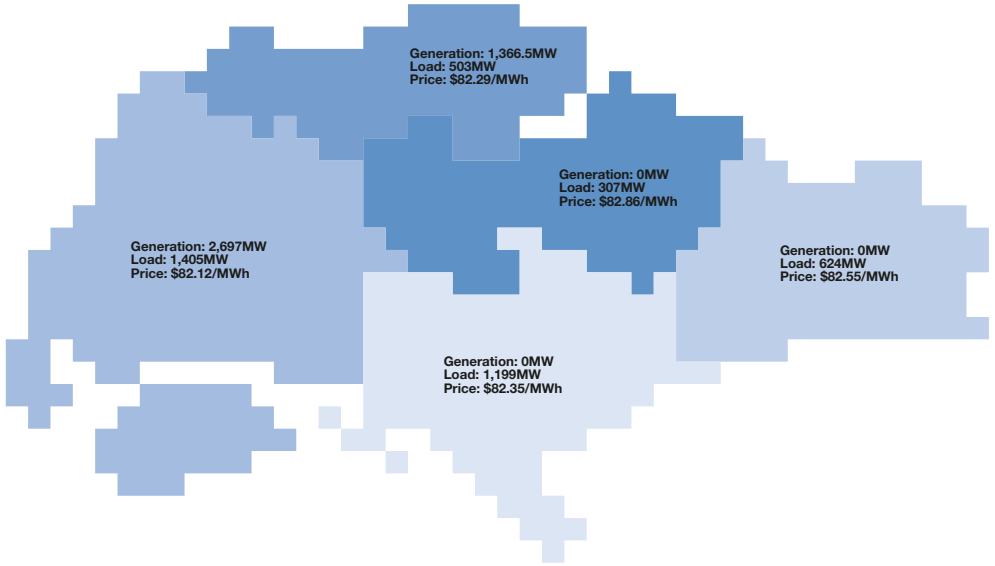
As the Singapore network is small and uses underground cables, it experiences a very low level of transmission loss. In addition, the Singapore network has a very robust lattice configuration and hence is generally a constraint free system. The result of this is minimal divergence of prices across the network.

In 2004, there were no instances of physical grid congestion and only one incident of significant load shedding (on 29 June). The nodal price differences observed in 2004 are generally lower than those observed in 2003 due to an improvement in the way the market clearing engine (MCE) models load distribution dynamically.

Energy Prices Received by Generators



Comparison of Price by Location – Average Generation, Load and Nodal Price for 2004



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Vesting Contracts

The introduction of vesting contracts on 1 January 2004 had a significant impact on wholesale market prices. There was a $10.00 drop in average Uniform Singapore Energy Price (USEP) in 2004 compared with 2003.

Vesting contracts are imposed on generators by the Energy Market Authority (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.

Vesting contracts are structured like a typical contract-for-difference as follows:

- About 65 percent of demand is vested in mandatory contracts between generators and SP Services (on behalf of consumers).
- The vesting contract hedge price is based on a long-run marginal cost (LRMC) of the most efficient generation facility with the most economic generating technology in operation in Singapore.
- The vesting contract hedge price is recalculated by the EMA on a quarterly basis, mainly to reflect changes in fuel prices.
- The reference price for vesting contracts is the wholesale market nodal price received by generators.
- When the reference price is higher or lower than the hedge price SP Services refunds the difference to or recovers the difference from electricity retailers and contestable electricity consumers buying from the wholesale market. In 2004, the reference price was on average 15.06 percent below the hedge price.

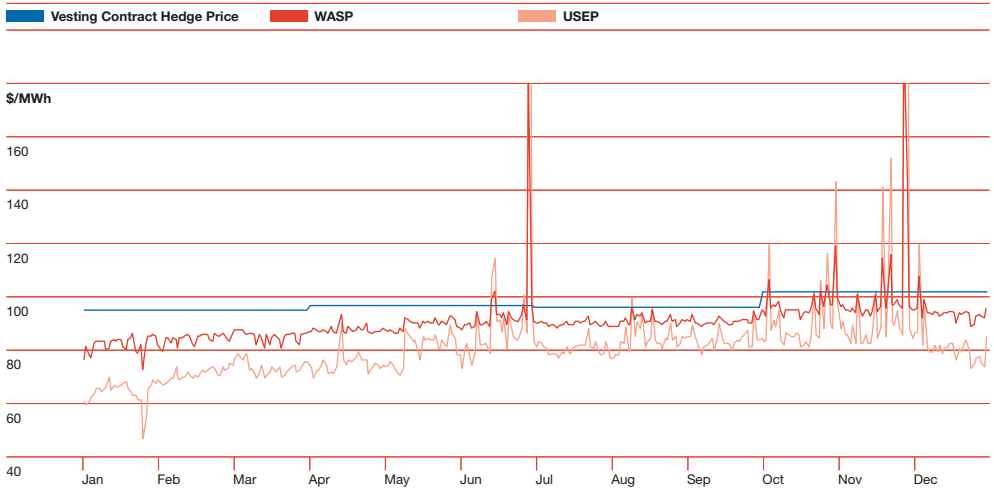
The introduction of vesting contracts means that the USEP no longer completely reflects the sum of prices received by generators for supplying energy to the wholesale market. The weighted average settlement price (WASP) provides a better indication of this. It takes into account the 65 percent of the energy market that is vested at the vesting contract hedge price and the remaining 35 percent of volume that is settled at the wholesale market energy price.

WASP = (Vested quantity * Quarterly Vesting Contract Hedge Price) + (Non-Vested quantity * USEP)

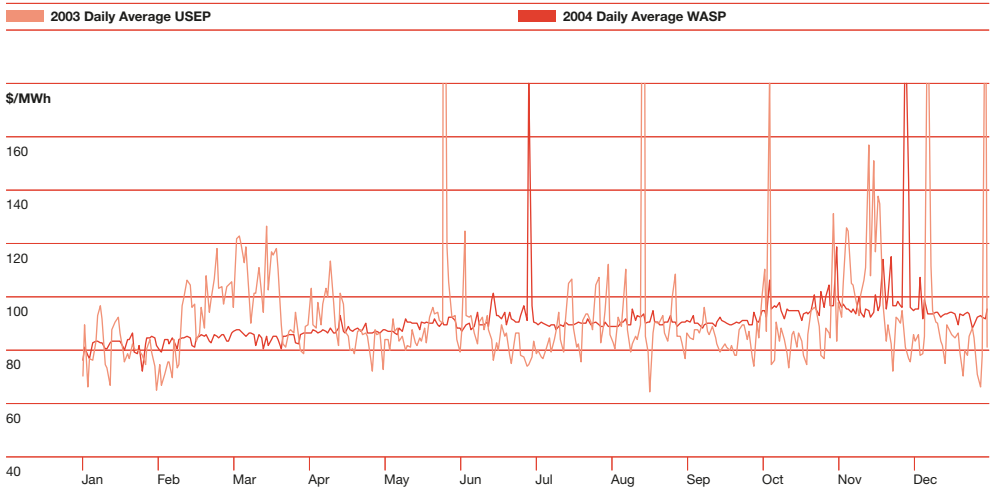
The impact of vesting contracts had its biggest influence in the first quarter of 2004, with prices trending upward in the latter part of the year. This upward movement can be attributed to a combination of factors such as a realignment of market contracting, increasing fuel prices and the associated higher vesting contract strike prices.

A comparison between 2003 average USEP and 2004 average WASP shows a decline of 1.2 percent from $92.35 per MWh to $91.24 per MWh. When the influence of the 8.33 percent increase in HSFO oil prices is taken into account, the energy price saving is 5.15 percent.

Weighted Average Settlement Price (WASP) 2004



USEP 2003 vs WASP 2004

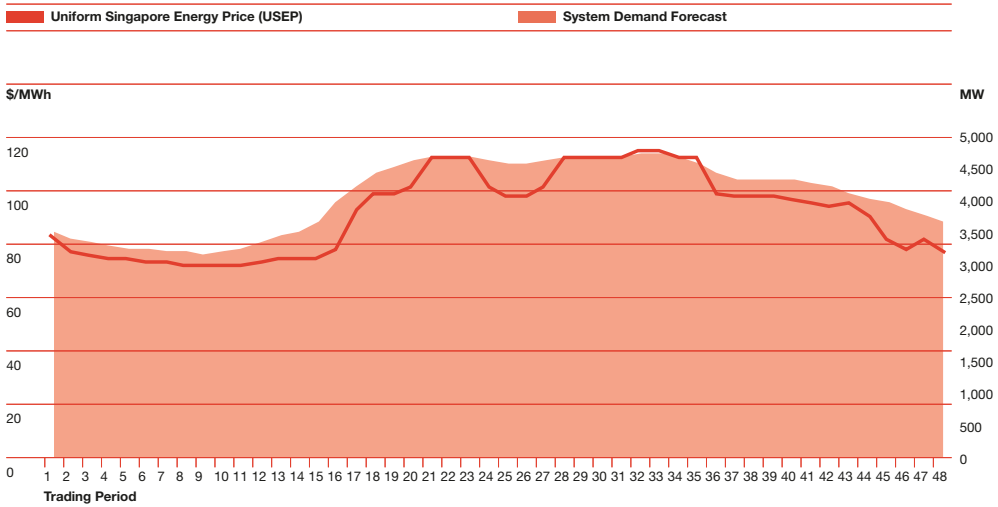


Vesting Contracts

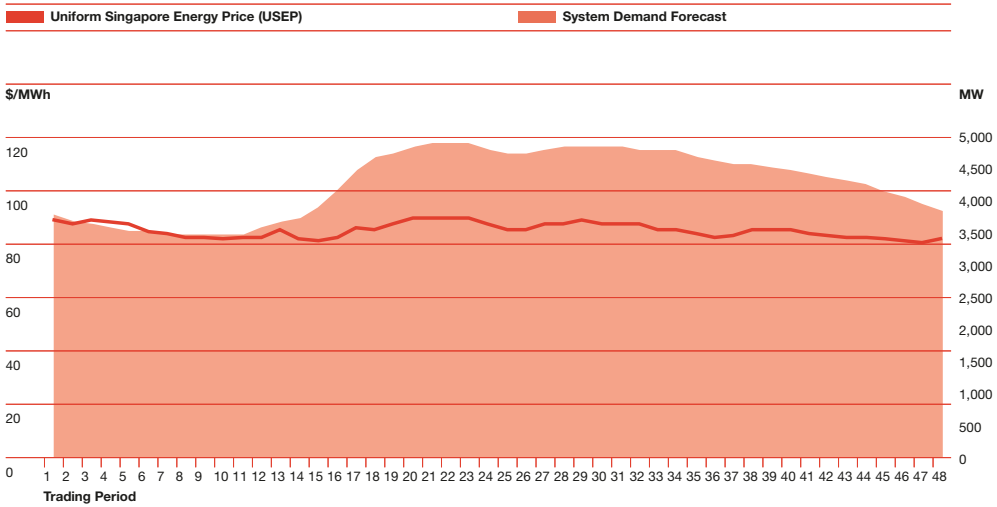
The introduction of vesting contracts also affected the daily price profile. In 2004, energy prices were not as responsive to changes in load throughout the day as they were in 2003.

For the graphs below, days were selected as they reflect normal market conditions during a Wednesday in September.

Price Profile for a Typical Day (Wednesday, 24 September 2003)



Price Profile for a Typical Day (Wednesday, 2 September 2004)



Oil Prices

Fuel costs make up a significant proportion of running costs for the thermal generators that make up 96 percent of Singapore's generation capacity. Hence, changes in fuel input costs, such as the price of fuel oil or natural gas, have a significant influence on electricity prices. This means that the bulk of costs of production for Singapore generation assets is either directly or indirectly (through the pegging of natural gas prices to an oil benchmark) determined by international oil prices.

Global crude oil prices grew strongly in 2004, peaking in late October and the 2004 average was 33 per cent higher than the 2003 average and 60 percent higher than 2002. However, this input price growth was not directly transmitted into increases in energy prices. This can be explained by the following factors:

- The introduction of vesting contracts subdued energy prices, particularly in the first quarter of 2004.

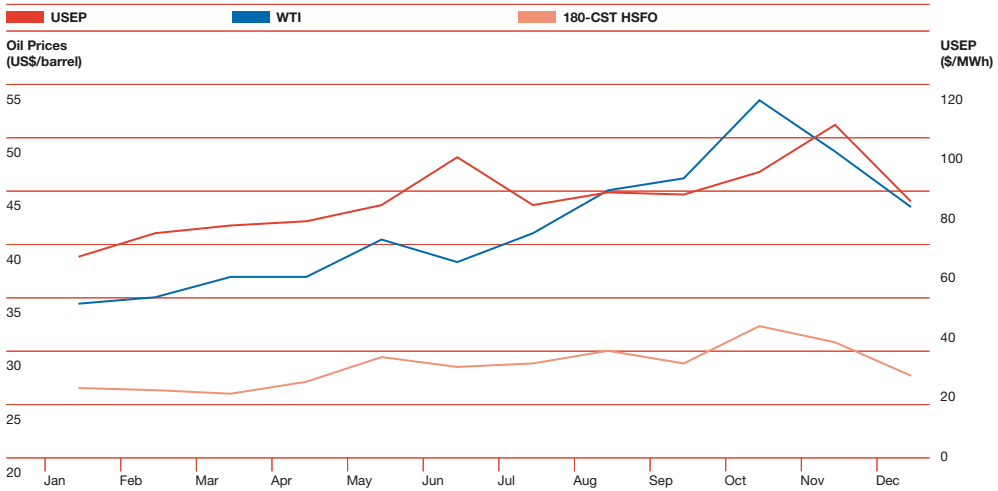
- The most relevant oil benchmark for the Singapore electricity industry is 180-centistoke high sulphur fuel oil (180-CST HSFO). HSFO prices did not experience the same degree of price growth as the WTI or Brent benchmarks in 2004. The average HSFO price for 2004 was 8.33 percent higher than 2003.

- Wholesale energy prices were also influenced by the increasing dominance of combined-cycle gas turbine (CCGT) units over steam turbine (ST) units. As the price of fuel oil increased in 2004, oil-fired plants were increasingly displaced from dispatch by the more efficient gas-fired units.

- Several generators undertook corporate restructuring in 2004 to become more efficient and competitive.

In summary, high oil prices had a muted effect on energy prices due to a combination of actions undertaken by the Energy Market Authority (EMA) to control market power and the competitive environment brought about by market liberalisation. Market liberalisation has sharpened competition between generators, leading to better decision-making about resource allocation. Consequently, prices are more reflective of costs, cheaper generation is dispatched ahead of more expensive generation and generation is increasingly efficient.

Monthly Oil Prices and USEP 2004



29 June Blackout

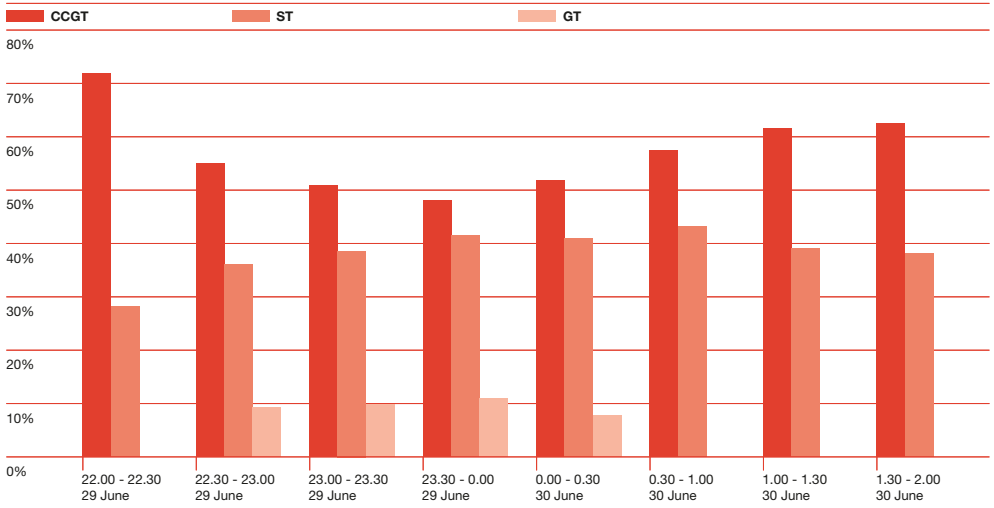
Following an unplanned disruption to the piped gas supply from Indonesia on 29 June 2004 Singapore suffered a partial electricity blackout. In response to the loss of some gas-fired units, there was an increase in the output from fuel oil plants, unaffected gas plants and four diesel gas turbine (GT) plants that are not typically used. This can be seen in the graph below.

The increase in output from oil and diesel plants was an appropriate market response to the high wholesale electricity prices, which were triggered as a result of the shortage of electricity supply caused by the gas disruption.

As a result of the shortage of electricity supply, prices in the National Electricity Market of Singapore (NEMS) peaked at the ceiling price of $4,500 per MWh for 1.5 hours starting from 10.30 pm on 29 June 2004.

The average wholesale electricity price for the day of 29 June 2004 was $300 per MWh. This compares to the monthly average of $96 per MWh for June 2004 (inclusive of the period of gas disruption). Wholesale electricity prices normalised to below $90 per MWh by 1.00 am on 30 June 2004.

Market Shares Before/During/After Gas Disruption by Generation Type



Reserve and Regulation Prices

Reserve capacity is procured from the market to ensure that there is stand-by system capacity that can be drawn on when there is an unforeseen disruption of supply, e.g., an equipment outage. Regulation is generation capacity that is purchased from the market and used by the Power System Operator (PSO) in real time to fine-tune the match between generation and load. The regulating generator ramps up and down in response to small fluctuations in demand and the output of other generators.

Reserve and regulation prices are highly influenced by energy price trends as a result of co-optimisation:

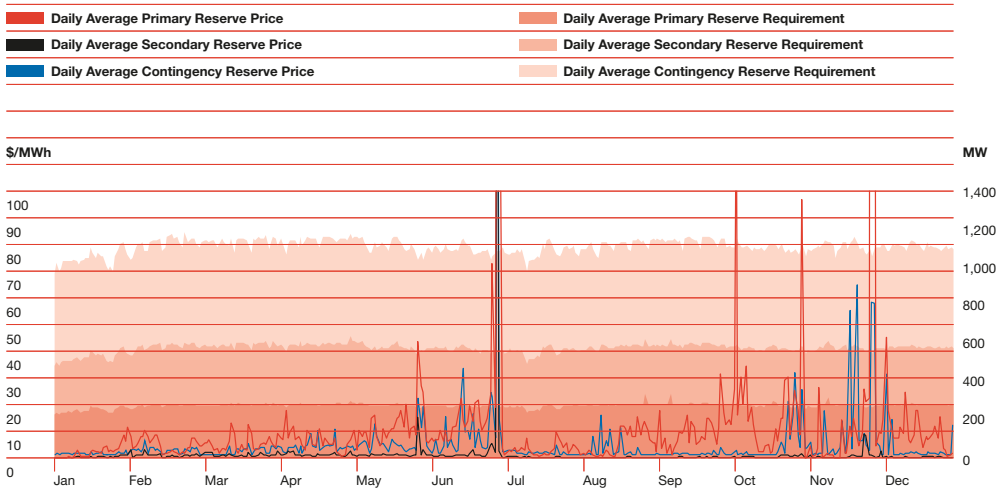
- The primary reserve class is used to procure 8-second reserve. The average primary reserve price for 2004 was $12.52 per MWh.

- The secondary reserve class is used to procure 30-second reserve. The average secondary reserve price for 2004 was $1.40 per MWh.

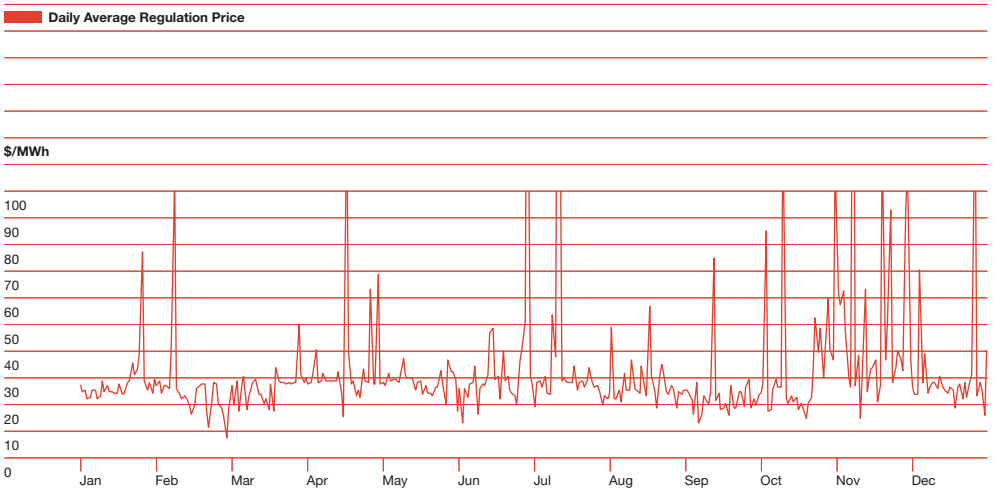
- The contingency reserve class is used to procure 10-minute reserve. The average contingency reserve price for 2004 was $3.90 per MWh.

- The regulation requirement is set by the PSO at a standard level of 100MW. The average regulation price for 2004 was $32.60 per MWh.

Reserve Prices and Requirements 2004



Regulation Price 2004



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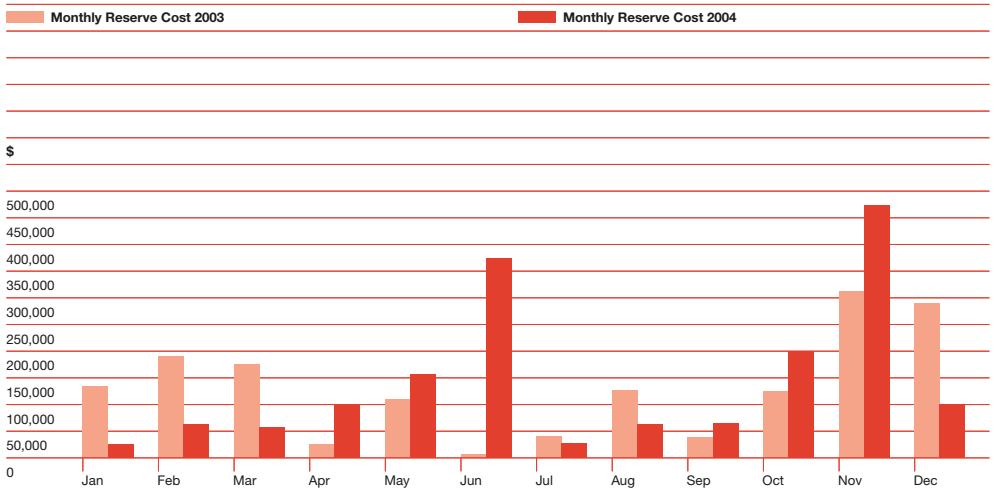
Reserve Costs

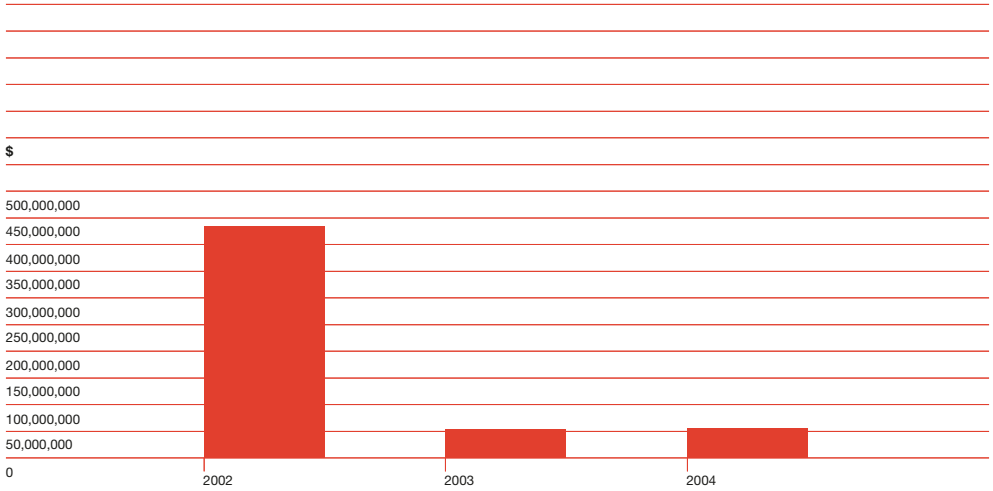
One of the biggest benefits of the introduction of the National Electricity Market of Singapore (NEMS) in 2003 was a dramatic reduction in the cost of the daily average reserve from $1.20 million in the Singapore Electricity Pool (SEP) to $0.13 million in the NEMS, providing an annual savings of over $390 million. In 2004, these savings persisted with a daily average cost of $0.14 million.

The small increase in reserve costs in 2004 over 2003 is the result of the decision to trade fast-start ancillary services competitively on the wholesale market as contingency reserve rather than contract for it separately. The overall annual savings to the market from this decision is substantial, as the cost of the separate fast-start ancillary service contract in 2003 was $24.18 million.

Monthly Reserve Costs 2003/04



Annual Reserve Costs 2002/04



Interruptible Load

In 2004, a milestone was achieved in developing demand-side participation in the NEMS wholesale market. Under the Interruptible Load (IL) regime, a load facility can offer to have its power interrupted in the event of a power system disturbance. The load facility can choose to offer its IL through a retailer or as a direct wholesale market participant. In return for offering to have its power supply interrupted, a load facility receives a payment for every half-hour that its offer is accepted in the reserve market.

IL facilities are allowed to participate in all three classes of reserve market within the NEMS – primary, secondary and contingency reserve. IL provides a high quality source of reserve, as it is not dependent on a fuel source. Hence, unlike generation facilities, IL is unaffected by fuel supply disruptions.

A large consumer from the chemical industry began offering IL into the reserve market from 1 July 2004. This participant made available 6.7MW of capacity in each of the three reserve markets and was able to capture between 1 and 2 percent of the reserve market share.

Participation by load facilities in the reserve market marks an important milestone in the evolution of the NEMS. Previously, reserve could only be provided by stand-by generators. Now large consumers can compete head-to-head against generators in the reserve market. This development signals an evolution towards a more balanced and efficient electricity market. Participation by large consumers increases competition in the reserve market and will bring about significant savings and efficiency gains for the electricity industry and the Singapore economy.

Competition in the Generation Market

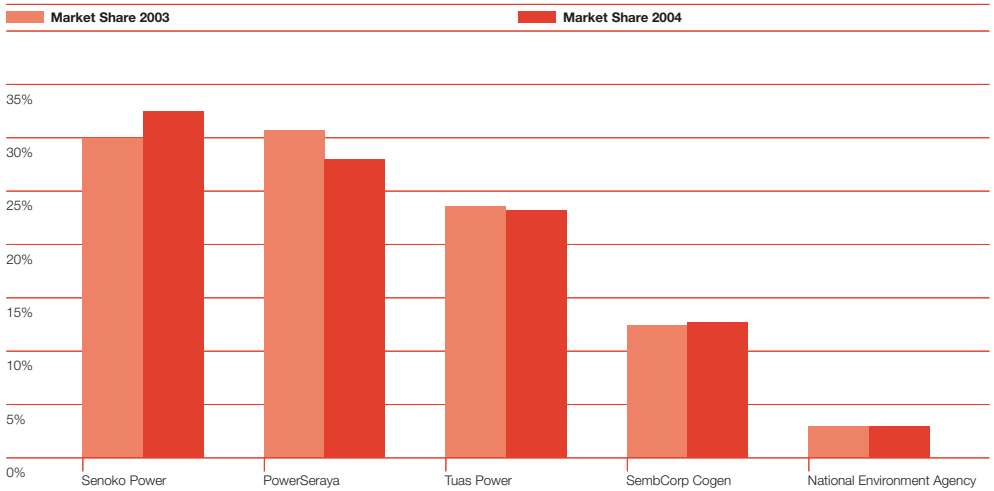
Energy market revenue was won by generators broadly in proportion to their share of total installed generation capacity. However, SembCorp Cogen won a 13 percent energy market share despite holding only 9 percent of the total installed capacity. Importantly, SembCorp's capacity consists solely of combined-cycle gas turbine (CCGT) technology, providing a competitive edge over the other generators that have mixed technology portfolios. In addition, SembCorp uses a cogeneration process to produce both electricity and steam. The requirement to maintain a supply of steam to its commercial customers may also explain the high level of plant utilisation.

In 2004, Senoko Power made a 2 percent gain in share of energy market revenue over 2003. This is largely the result of Senoko Power commissioning 900MW of new CCGT capacity in 2004 and hence rebalancing its generation portfolio in favour of this more efficient technology.

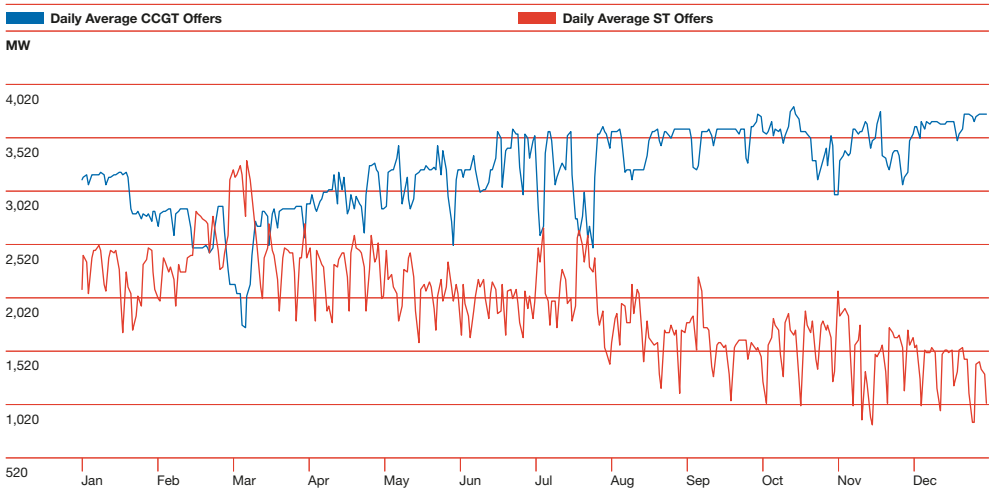
It is also worth noting that PowerSeraya had three steam turbine (ST) units unavailable to the market in 2004 as they were undergoing modification so that they can be fuelled by Orimulsion.

From a whole of market perspective, the importance of CCGT generation in determining market share can be seen in the increasing amount of CCGT capacity offered into the market.

Market Share by Generator 2003/04 (based on scheduled generation)



Comparison of Offered CCGT and ST Capacity 2004



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Competition in the Retail Market

Retail contestability is being introduced into the National Electricity Market of Singapore (NEMS) in stages. From July 2001, the 250 largest consumers have had the freedom to choose their supplier from among the five active retailers.

By the end of 2004, 7,000 additional consumers were free to choose their suppliers, opening about 75 percent of the market to retail contestability.

Under Singapore's approach to contestability, contestable customers can choose to buy electricity from a retailer, directly from the wholesale market, or indirectly through SP Services.

SP Services is not allowed to engage in competitive retailing and is required to pass through wholesale prices and administrative charges to contestable consumers that choose to buy electricity through them. Retail companies can entice consumers to switch by offering competitive packages and services to suit consumer needs.

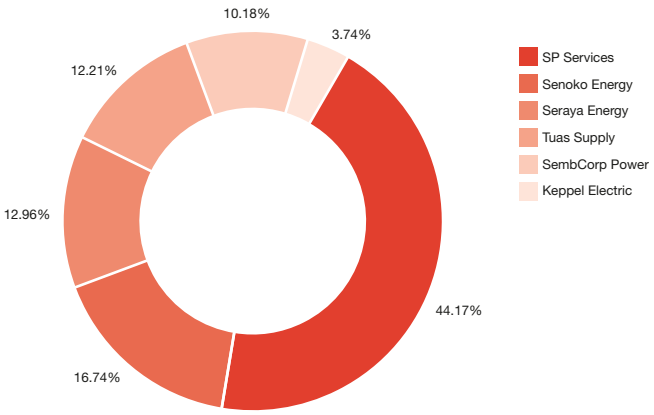
The consumers that are not yet contestable continue to be serviced by SP Services at regulated tariffs. The timing for bringing these remaining customers into the competitive retail supply model is currently under consideration by the Government.

A comparison of market shares in the retail market at the end of 2003 and at the end of 2004 shows:

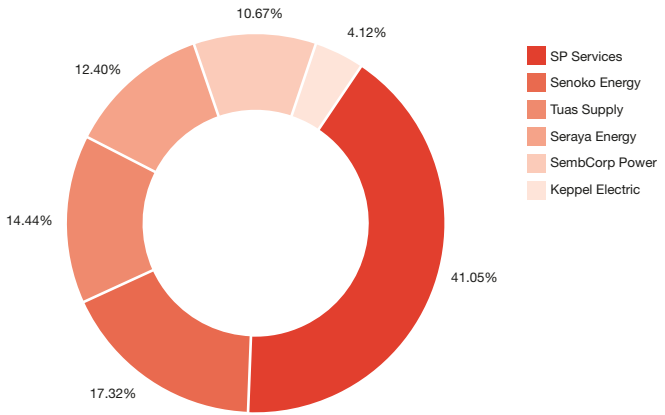
- The percentage of consumers buying electricity from the wholesale market through SP Services remained constant indicating that few of the newly contestable consumers have opted to switch to buying electricity from retail companies.

- There has been some change in the market shares of the five retail companies indicating active competition in the retail market.

Market Share of Retailers and SP Services 2003



Market Share of Retailers and SP Services 2004



Settlement and Prudential Management

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

- energy,
- three classes of reserve (primary, secondary and contingency),
- regulation,
- bilateral contracts,
- vesting contracts,
- contracted ancillary services (black-start services), and
- fee recovery for EMC and the Power System Operator (PSO).

The settlement system uses the energy prices determined by the market clearing engine and the metering data provided by the Market Support Services Licensee (MSSL) to settle energy transactions. Reserve and regulation transactions are settled based on the price and quantities determined by the market clearing engine.

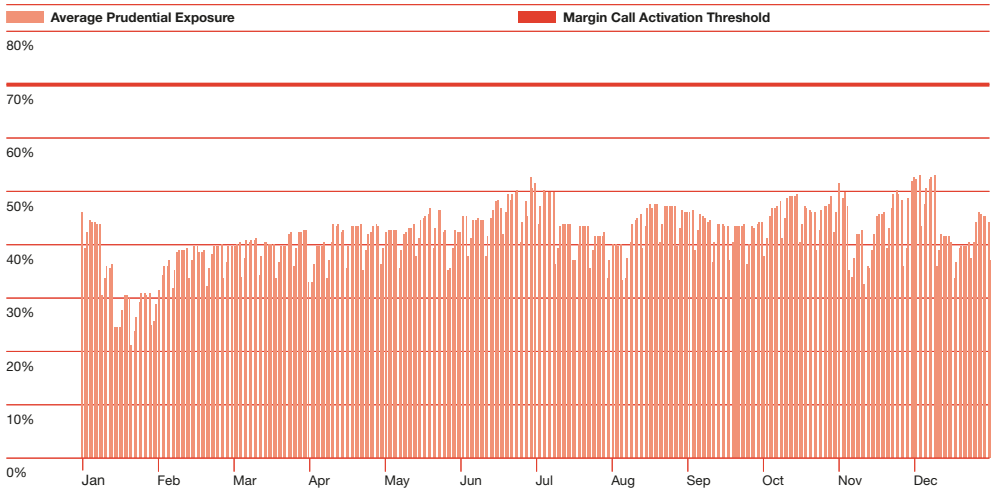
Settlement is carried out daily in the wholesale market. Twenty days after the trading day (D+20), a debtor (retailer or direct market participant) has to pay EMC for the transactions on trading day D. A creditor (generator) for a trading day D is paid by EMC on day D+21. These timings are subject to the business day convention.

To cover the 20-day exposure of a debtor and the time required to manage a default, all retailers must provide EMC with on-going collateral (credit support) covering 30 days of trading. This prudential cover protects EMC and other market participants from payment defaults. EMC reviews the adequacy of prudential cover daily.

A margin call is issued when a retailer's estimated 20-day exposure reaches a value equal to or greater than 70 percent of the level of its credit support. When issued with a margin call, a market participant has two business days to make payment. In 2004, the market was well secured; EMC issued only two margin calls. These calls were met within the half-day time frame.

The chart below shows that the average level of prudential exposure for the market as a whole remained well below the 70 percent threshold for margin call activation.

Prudential Cover Adequacy 2004



Settlement Statistics	Figures for 2004
Value of total retail settlement payments	$2,402,384,272
Settlement statements issued	9,490
Settlement errors	0
Value of credit support at 31 December 2004	$270,100,000

Contracted Ancillary Services

As required by its electricity license and the market rules, EMC, on behalf of the Power System Operator (PSO), negotiates and enters into regulatory contracts to ensure the reliable operation of Singapore's power system. If these services are unable to be procured competitively, prices are regulated.

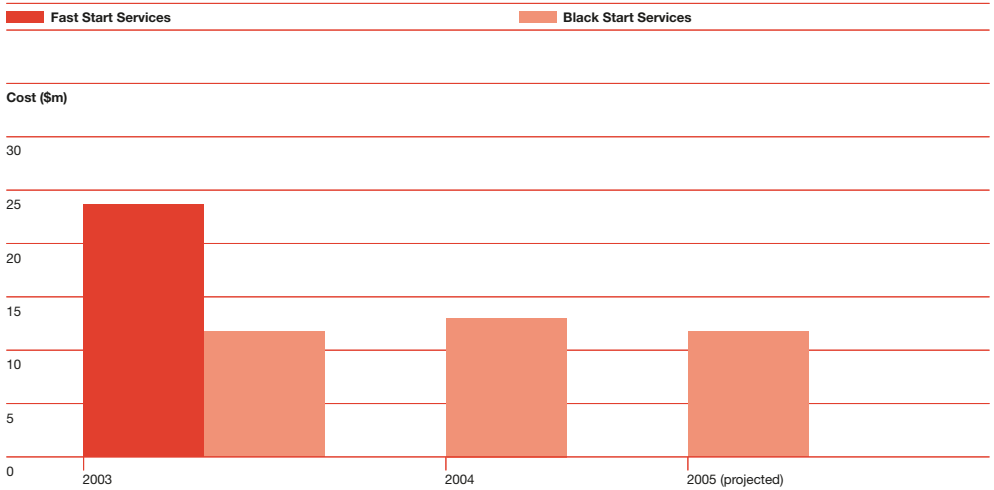
In 2004, the only contracted ancillary service required was black-start capability. Based on the PSO's operational requirements, EMC procured 69MW of black-start services at a cost of $12.2 million. The capability was sourced from PowerSeraya, Senoko Power and Tuas Power.

Black-start services ensure that there is initial generation to supply electric power for system restoration during complete blackouts. These initiating generating units must be able to self-start without any off-site electrical power source within 30 minutes. The black-start units must also have sufficient capacity to power auxiliary equipment and remain in stable operation for the entire process of start-up.

In a change from 2003, fast-start capability services were incorporated into the contingency reserve class requirements and therefore purchased directly from the wholesale market. This change follows the philosophy of procuring services from the market in a competitive manner when possible. The discontinuation of dedicated fast-start services made an additional 400MW of gas turbine (GT) generation capacity available, adding a further tier to the market supply curve.

The direct cost savings from this initiative is significant as the cost of fast-start service contracts in 2003 was $24.2 million. These savings were offset by a $4.2 million increase in the total annual cost of reserve products traded on the wholesale market between 2003 and 2004.

Contracted Ancillary Services



Market Fees

The costs associated with the wholesale functions of the National Electricity Market of Singapore (NEMS) are recovered directly from the wholesale market or from market participants and consumers.

Energy Market Company (EMC) and the Power System Operator (PSO) fees are recovered from both generator and retailer class market participants based on the quantity of energy that they trade.

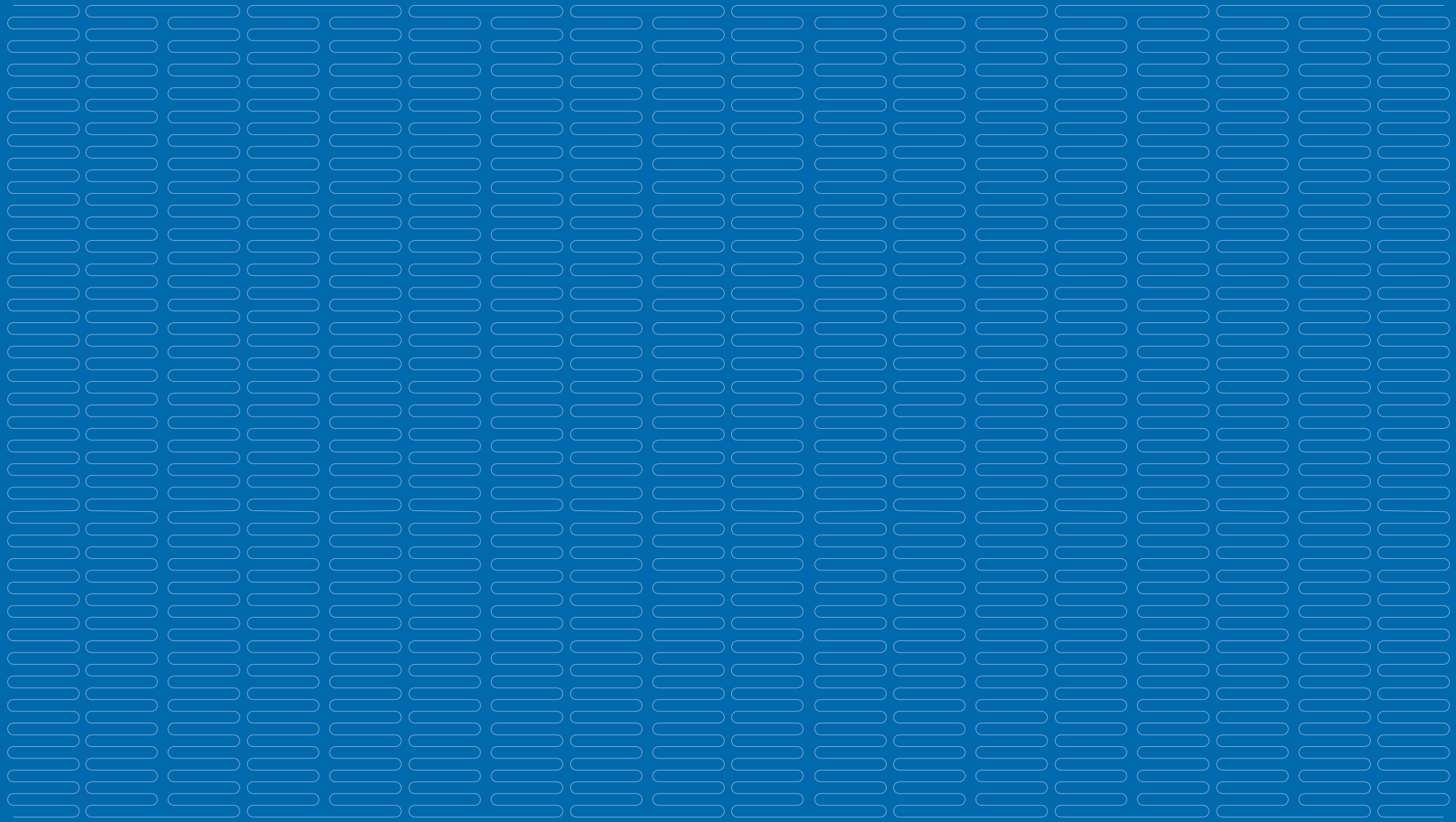
EMC and the PSO Fees Recovered Directly from the Wholesale Market 2003-2006

		Budget	Fee
1 January 2003 to 31 March 2003 (actual for 3 months)	EMC PSO Total	$8.43 million $4.44 million $12.87 million	$0.53/MWh $0.28/MWh $0.81/MWh
1 April 2003 to 31 March 2004 (actual)	EMC PSO Total	$25.71 million $16.96 million $42.67 million	$0.39/MWh $0.26/MWh $0.65/MWh
1 April 2004 to 31 March 2005 (budget)	EMC PSO Total	$29.59 million $15.78 million $45.37 million	$0.46/MWh $0.25/MWh $0.71/MWh
1 April 2005 to 31 March 2006 (budget)	EMC PSO Total	$28.60 million $17.19 million $45.79 million	$0.39/MWh $0.23/MWh $0.62/MWh

Fees Recovered Directly from Market Participants and Consumers

Supplier	Service	Method of Recovery
SP Services (MSSL)	Fees associated with meter reading and data management	Levied on a per meter basis
SP Power Assets	Transmission charges	Levied based on actual usage

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 procured by Energy Market Company (EMC) on contract based on regulated prices.

Black-start ancillary service
A service to ensure that there is initial generation to supply electricity for system restoration during complete blackouts.

Contestable consumers
Those 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 (SP Services). Consumers qualify to be contestable based on the level of their electricity consumption.

Co-optimisation
The process used by the market clearing engine (MCE) to ensure that the cheapest 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 (MCE) every half-hour as the basis for the supply of energy, reserve and regulation in the market.

Energy
The flow of electricity.

Fast-start ancillary service
A generation facility that is able to synchronise with the power system and begin generation at a defined level within a specified time.

Full retail competition (FRC)
A situation in the retail market where all consumers are contestable consumers, i.e., have 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 Market Support Services Licensee (SP Services).

Load
The consumption of electricity.

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

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

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 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 Market Support Services Licensee (SP Services).

Regulation
Generation that is on stand-by to fine-tune the match between generation and load.

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

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

Terawatt (TW)
A measure of electrical power equal to one million megawatts.

USEP
Uniform Singapore energy price is the weighted-average of the nodal prices at all off-take nodes.

Vesting contracts
Vesting contracts are a regulatory instrument imposed on generators by the Energy Market Authority (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.

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

Market Participant Contact Details

Active Generator Licensees	PowerSeraya SembCorp Cogen Senoko Power Tuas Power National Environmental Agency	www.powerseraya.com.sg www.sembcorp.com.sg www.senokopower.com.sg www.tuaspower.com.sg www.nea.gov.sg
Active Retailer Licensees	Keppel Electric SembCorp Power Senoko Energy Supply Seraya Energy Tuas Power Supply	www.keppelenergy.com www.sembpower.com www.senokopower.com.sg www.serayaenergy.com.sg www.tpsupply.com.sg
Market Operator	Energy Market Company (EMC)	www.emcsg.com
Market Support Services Licensee (MSSL)	SP Services	www.spservices.com.sg
Transmission Licensee	SP PowerAssets	www.sppowerassets.com.sg
Power System Operator	Power System Operator (PSO)	www.ema.gov.sg

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