



Report by Market Surveillance and Compliance Panel

April 2003 to March 2004

20 July 2004

**This is an edited version of a report prepared for
the Energy Market Company Pte Ltd and the Energy Market Authority
in accordance with the Singapore Electricity Market Rules.
The report has been edited to protect confidential information.**

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EXECUTIVE SUMMARY

The Singapore Electricity Market Rules (the “market rules”) provide for the Market Surveillance and Compliance Panel to prepare and submit to the Energy Market Company Pte Ltd annually a report on the conduct of its monitoring and investigation activities. The report is to be provided by the Energy Market Company Pte Ltd to the Energy Market Authority.

This is the second report by the Market Surveillance and Compliance Panel on the wholesale electricity markets of the National Electricity Market of Singapore. It mainly covers the period 1 April 2003 to 31 March 2004.

The market rules require the report to include:

- A summary of routine reports on the conduct of the Market Surveillance and Compliance Panel's monitoring and investigation activities;
- A summary of any reports regarding the possibility of anti-competitive agreements or the abuse of a dominant position contrary to sections 50 or 51 of the Electricity Act;
- A summary of all complaints or referrals filed and investigations commenced;
- A summary of any investigations conducted by the Market Surveillance and Compliance Panel in respect of offers exceeding offer change limits reported by the EMC;
- The Market Surveillance and Compliance Panel's general assessment as to the state of competition and compliance within, and the efficiency of, the wholesale electricity markets.

In assessing the state of competition within and efficiency of the wholesale electricity markets, the Market Surveillance and Compliance Panel considers the following elements to be essential for efficient markets:

- Many sellers who are responsive to price;
- Many buyers who are responsive to price;
- Liquid, efficient and complete marketplaces;
- Resolution of conflicts of interest so that there is equal access to essential facilities; and
- Good regulation of remaining monopolies.

Each of these factors is examined in the context of the wholesale electricity markets of Singapore. The panel also observes that there are several indicators that suggest that a certain degree of efficiency has been achieved in the markets.

In its assessment of the state of compliance within the wholesale electricity markets, the Market Surveillance and Compliance Panel reviews the following areas:

- The obligation to make self-reports or complaints;
- Offers exceeding offer change limits;
- Types of rule breaches; and
- An issue regarding financial penalties.

INTRODUCTION

The Singapore Electricity Market Rules (the “market rules”) provide for the Market Surveillance and Compliance Panel (“MSCP”) to prepare and submit to the Energy Market Company Pte Ltd (“EMC”) annually a report on the conduct of its monitoring and investigation activities. The report is to be provided by the EMC to the Energy Market Authority (“EMA”).

This is the second report by the MSCP on the wholesale electricity markets of the National Electricity Market of Singapore (“NEMS”). It mainly covers the period 1 April 2003 to 31 March 2004. The market rules require the report to include a summary of routine reports on the conduct of the MSCP’s monitoring and investigation activities, including a summary of any reports regarding the possibility of anti-competitive agreements or the abuse of a dominant position contrary to sections 50 or 51 of the Electricity Act. The report also has to include a summary of all complaints or referrals filed and investigations commenced, and a summary of any investigations conducted by the MSCP in respect of offers exceeding offer change limits reported by the EMC.

The market rules require the report to contain the MSCP’s general assessment as to the state of competition and compliance within, and the efficiency of, the wholesale electricity markets.

MARKET SURVEILLANCE AND COMPLIANCE PANEL

The MSCP is an independent body established under the market rules. Its members are appointed by the EMC Board.

The MSCP comprises the following persons:

- (a) Joseph Grimberg SC, Chair;
- (b) Lee Keh Sai;
- (c) Professor Lim Chin; and
- (d) TPB Menon.

The role of the MSCP is to monitor and investigate activities in the wholesale electricity markets and the conduct of market participants, market support services licensees (“MSSL”), the Power System Operator (“PSO”) and the EMC to:

- (a) identify breaches of the market rules, any market manual or system operation manual;
- (b) assess whether the underlying structure of the wholesale electricity markets is consistent with the efficient and fair operation of a competitive market; and
- (c) recommend remedial actions to mitigate the conduct and inefficiencies referred to above.

More specifically, the market rules provide that the MSCP is to monitor and investigate the conduct of market participants, market support service licensees, the EMC and the PSO and the structure and performance of, and activities in, the wholesale electricity markets of Singapore, including conduct or activities that provide indications of the following phenomena:

- (a) breaches of the market rules, a market manual or system operation manual;
- (b) actual or potential design or other flaws and inefficiencies in the market rules, market manuals, the system operation manual and other rules and procedures of the EMC or the PSO; and
- (c) actual or potential design or other flaws in the overall structure of the wholesale electricity markets.

The market rules also provide for the MSCP to provide assistance to the regulator, the EMA, in carrying out its functions in relation to prohibiting anti-competitive agreements and abuse of a dominant position under sections 50 and 51 of the Electricity Act.

MARKET ASSESSMENT UNIT

The MSCP is supported in its functions by the Market Assessment Unit ("MAU"). The MAU is established by the EMC and composed of full-time EMC staff.

The market rules provide for the MAU to report to and be under the management and administration of the EMC. The market rules also provide for the MAU to report to and take direction from the Chair of the MSCP on all matters pertaining to market monitoring and investigation.

ACTIVITY LEVEL

MSCP members meet as a panel about once a month to review MAU reports, provide supervision and direction to the MAU and perform the functions more specifically referred to above. Panel members also provide their professional contributions to MSCP matters outside of the regular meetings, as may be necessary.

MARKET MONITORING

Catalogue of Data and Catalogue of Monitoring Indices

To effectively carry out monitoring, the market rules provide for the MAU, under the supervision and direction of the MSCP, to develop a catalogue of the data it will acquire and a catalogue of the monitoring indices that it will use to evaluate the data so acquired.

On 29 August 2003, a catalogue of data was adopted by the MSCP after public consultation, after taking into account the comments of market players. The catalogue of data took effect from 1 October 2003. Data is currently being collected according to this catalogue, with the assistance of market players.

Since market start, several monitoring indices have been under consideration, with the aim of identifying those that are appropriate for continual use. On 11 February 2004, a catalogue of monitoring indices proposed by the MSCP and the MAU was published for public comments. The public comments are currently under review by the MSCP and the MAU.

Significant New Initiatives

1. Vesting Contracts from 1 January 2004

Vesting contracts were implemented in the wholesale electricity markets of Singapore by the EMA with effect from 1 January 2004, with a stated objective of mitigating the misuse or possible misuse of market power by certain generation licensees.

Vesting contracts are contracts imposed on certain generation licensees to produce a specified quantity of electricity at a specified price. They are contracts for financial differences made between the generation licensees and the MSSL on behalf of the consumers. Vesting contracts are at present imposed in respect of 65% of total forecast demand. The pre-determined vesting price is set at the long run marginal cost ("LRMC") of the most efficient technology currently available. The LRMC includes the cost of assets, running costs and financing costs of the generation licensees computed based on a formula determined by the EMA. The actual vesting contract hedge price and quantities are calculated by the MSSL on a quarterly basis. The vesting contract hedge price for the first quarter of 2004 was \$94.24/MWh.

Vesting quantities have been allocated to four generation licensees corresponding to the proportion of their respective installed capacity to the total installed capacity of these four generation licensees.

It has been observed that since the implementation of vesting contracts, the Wholesale Electricity Price ("WEP")¹ has dropped about 26% from \$96.57/MWh (volume-weighted average price for April 2003 to December 2003) to \$71.40/MWh (volume-weighted average price for January 2004 to March 2004). During the same period, generation licensees have been observed to make more aggressive bids by offering lower prices to supply electricity in order to meet their obligations under vesting contracts, and this may explain the decline in prices.

As vesting contracts were implemented only on 1 January 2004, a period of time will be needed to observe their impact on the wholesale electricity markets. This subject is currently under review by the MSCP.

2. Interruptible Load from 1 January 2004

Interruptible load was also implemented with effect from 1 January 2004.

Interruptible load for reserve is a load which can be voluntarily interrupted for a limited duration to enable the power system to return to its normal operating state. Interruptible load can be offered in any or all of the existing primary, secondary and contingency reserve markets. It was introduced to enable load (consumer) side participation. With the introduction of interruptible load, a retailer or a direct market participant may offer to have its supply of electricity interrupted when the system frequency drops below a pre-defined threshold level, thereby contributing to the reserve pool in the system.

On 1 July 2004, the EMC registered the first interruptible load participant.

¹ The Wholesale Electricity Price comprises the Uniform Singapore Energy Price ("USEP"), the Allocated Regulation Price ("AFP"), Hourly Energy Uplift Charge ("HEUC"), Monthly Energy Uplift Charge ("MEUC"), EMC administrative costs and PSO administrative costs.

3. Short-Term Schedules from 2 March 2004

On 2 March 2004, short-term schedules were implemented in the wholesale electricity markets. Pre-dispatch schedules are updated every 2-hours covering a time horizon of between 12 to 36 hours after the period in which the relevant pre-dispatch schedule is published. Short-term schedules are updated every half-hour to cover a time horizon of 6 hours after the period in which the relevant short-term schedule is published. Short-term schedules provide enhanced information to market participants and enable market participants to make more informed and timely decisions.

Events Affecting the Markets

1. High WEP Due to Gas Interruption

On 14 November 2003, a leak in a sub-sea pipeline for natural gas was discovered. The leakage caused the supply of natural gas from West Natuna in Indonesia to be disrupted. The supply of natural gas was fully restored on 4 December 2003.

During the relevant period, the combined cycle gas turbine facilities ("CCGT") of three generation licensees were affected and higher cost diesel oil was used as a substitute to run the CCGTs. But the use of diesel oil also caused a higher frequency of forced outage of CCGTs. During that period, the PSO issued 17 advisory notices of generation facility forced outage. At the same time, steam turbine generation facilities, which generally have higher marginal costs than CCGTs, offered greater quantities to meet system demand.

As a result, higher WEPs were observed during the period. Between 14 November and 4 December 2003, there were 35 occasions when WEP exceeded \$200/MWh.

2. Registration of Contracted Ancillary Service Facilities as Generation Registered Facilities

With effect from 1 January 2004, the PSO no longer required EMC to procure fast start service as a form of contracted ancillary service. The existing four fast start units (open cycle gas turbine plants with a total installed capacity of 408 MW) are now registered as generation registered facilities which can offer to provide energy and contingency reserve.

Indicators of Market Performance

Since market start in January 2003, the MAU has been submitting regular monitoring updates to the MSCP. The monitoring updates have included observations of certain indicators of market performance. The indicators can be broadly classified into supply, demand and price indices as detailed below. The commentary and charts are prepared based on market monitoring carried out over the past year. Rerun data which was not available as at 20 April 2004 is not taken into account.

1. **Supply Indices**

1.1 **Capacity ratio of generation registered facilities i.e. ratio of scheduled generation output to maximum generation capacity of generation registered facilities**

This index measures the scheduled (by the market clearing engine) output of energy, reserve and regulation as a ratio of a generation registered facility's maximum generation capacity at a given time.

Chart 1.1 illustrates the capacity ratio for each facility type i.e. combined cycle facilities ("CCGT"), steam turbine facilities ("ST"), open cycle gas turbine ("OCGT") and other facilities ("OT") for the period April 2003 to March 2004. The ratios were computed taking into account the total scheduled generation output and total maximum generation capacity of each type of facility for each month.

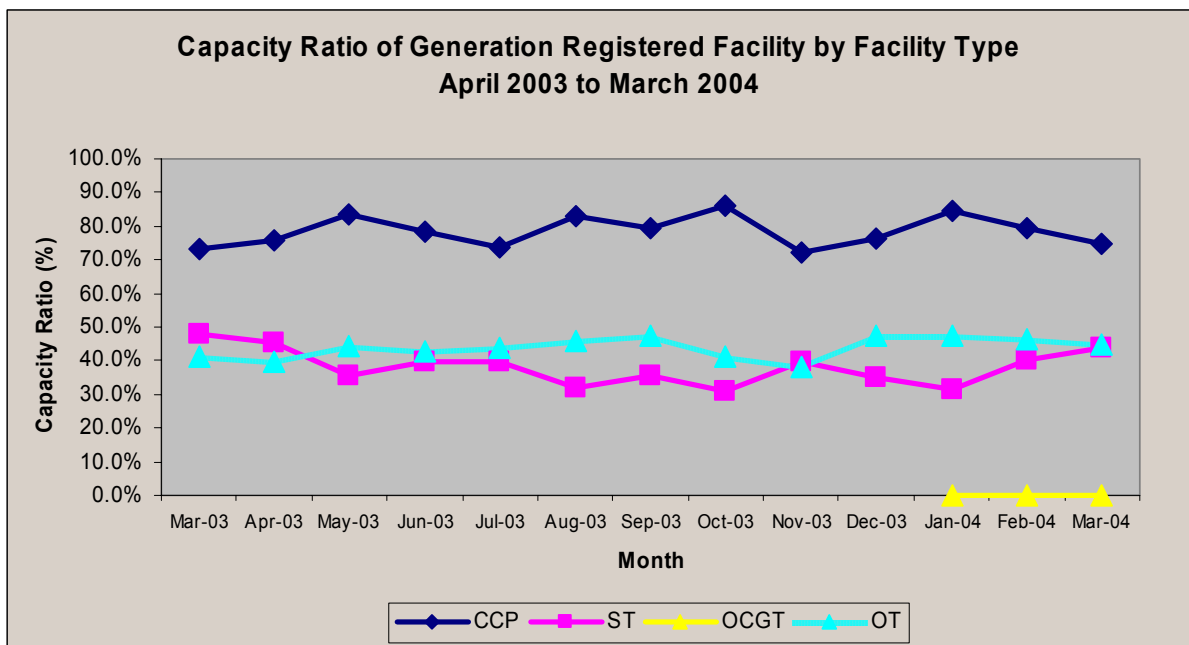


Chart 1.1

For the period April 2003 to March 2004, the monthly capacity ratio of CCGTs remained consistently higher than that of steam turbine and other facilities such as incineration plants. The higher capacity ratio of CCGTs indicates that competitive pressures are working in the market to cause energy to be more frequently dispatched by more efficient facilities.

1.2 Supply cushion: Ratio between (a) supply and demand gap (i.e difference between total offered volume and system demand) and (b) supply

This index measures supply adequacy. It indicates the level of unused capacity that was offered but not scheduled and could be called up if required. The total offered volume refers to the total amount of energy offered by all generation registered facilities. System demand refers to the demand forecast by the PSO used to determine the real-time dispatch schedule for energy.

Chart 1.2.1 is a scatter diagram showing the relationship between the Uniform Singapore Energy Price ("USEP") and energy supply cushion for the period April 2003 to March 2004.

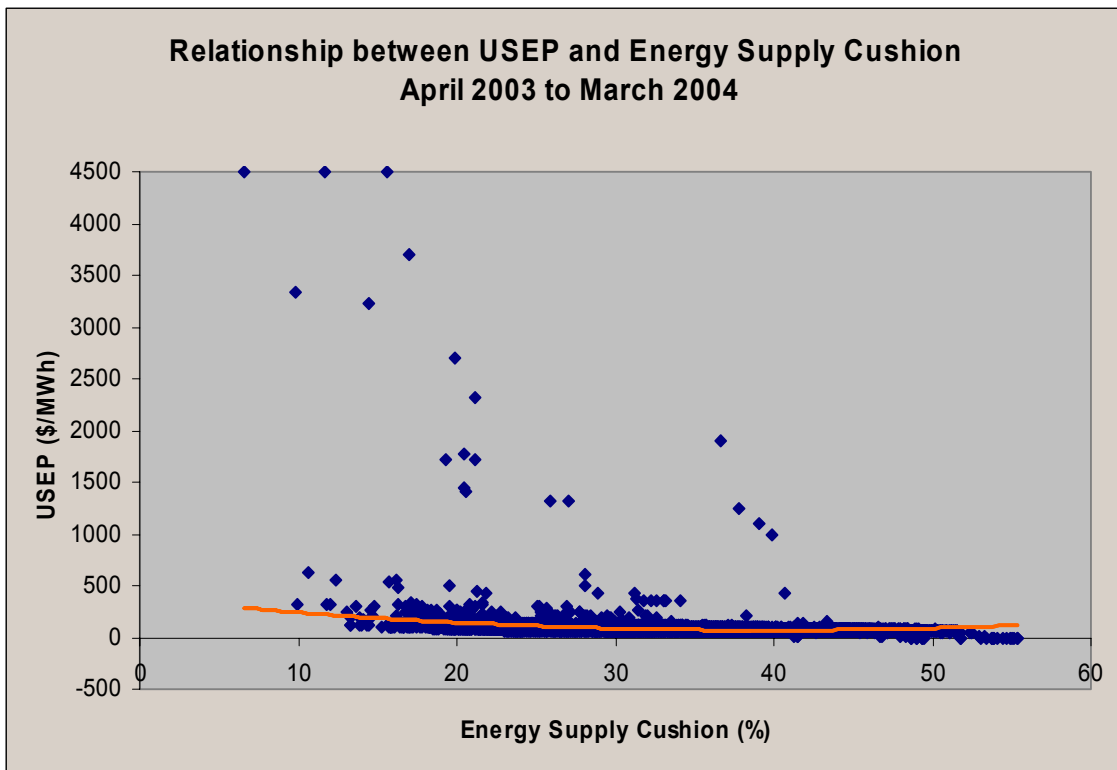


Chart 1.2.1

The trend line of Chart 1.2.1 shows an inverse relationship between the USEP and the energy supply cushion. As the energy supply cushion increases, the USEP decreases. This is consistent with competitive market predictions.

1.3 Market share

For the period April 2003 to March 2004, the MSCP has compared a generation licensee's market share by actual metered energy quantity and its market share by maximum generation capacity. The results indicate that competitive forces are at work because it is observed that generation licensees that have a higher proportion of CCGTs to total capacity also have a higher ratio of actual-output market share to maximum-capacity market share. In other words, the degree of excess capacity tends to be higher for generation licensees that have less of the more efficient CCGTs.

1.4 Outage

Outages of generation registered facilities are divisible into three groups:

- (a) planned outage, defined to "include both the Annual Outage plan for overhaul, retrofitting or inspection and Short-term Outage Plan for urgent repair or maintenance" in the System Operation Manual;
- (b) unplanned outage, defined as "the case in which the generation licensee has to carry out immediate rectification works and has less than 1 business day to inform the PSO before intentional de-synchronisation of the generation unit" in the System Operation Manual; and
- (c) forced outage, defined as "an unanticipated intentional or automatic removal from service of equipment or the temporary de-rating of, restriction of use or reduction in performance of equipment" in the market rules.

Planned outage is approved by the PSO to ensure that the outage does not affect system security. Forced outages and, to a certain extent, unplanned outages cannot be anticipated. The frequency of forced outage and unplanned outage indicates the reliability of a generation registered facility. Generation outage can have a significant impact on prices. During periods of high demand, forced outage and unplanned outage may contribute to high energy or ancillary service prices.

Chart 1.4.1 summarises the total capacity on planned outage respectively for each generation licensee during the period April 2003 to March 2004.

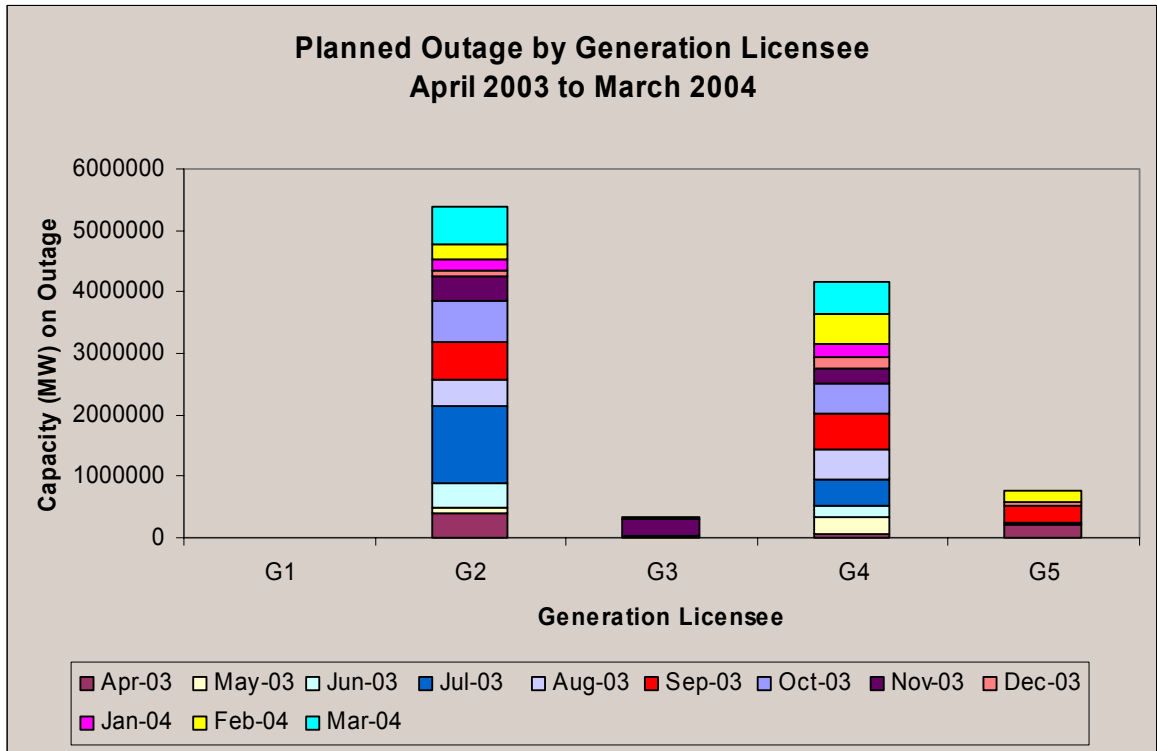


Chart 1.4.1

Charts 1.4.2 and 1.4.3 summarise the total capacity on forced outage and unplanned outage respectively, for each generation licensee during the period April 2003 to March 2004. Partial trips were not taken into account for Chart 1.4.2. As there is at present no readily available data as to when a forced outage ends, this chart is based on tracking the duration from commencement of an outage to the point when a generation registered facility under forced outage is next scheduled by the MCE.

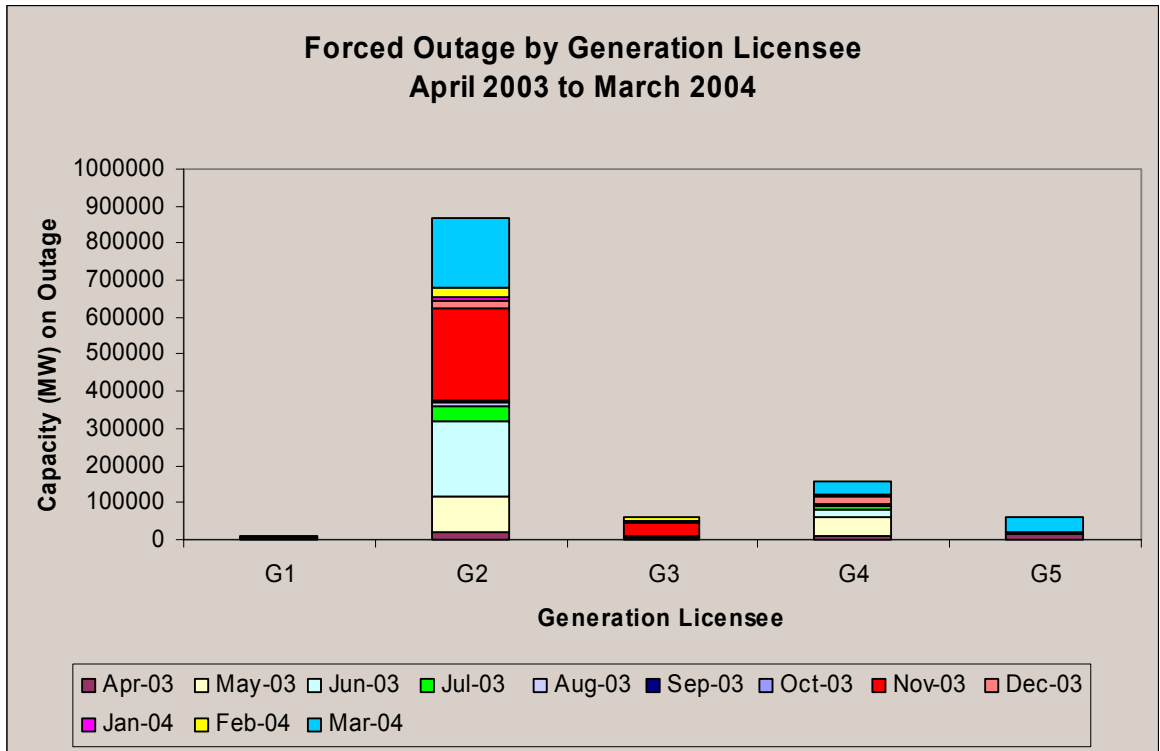


Chart 1.4.2

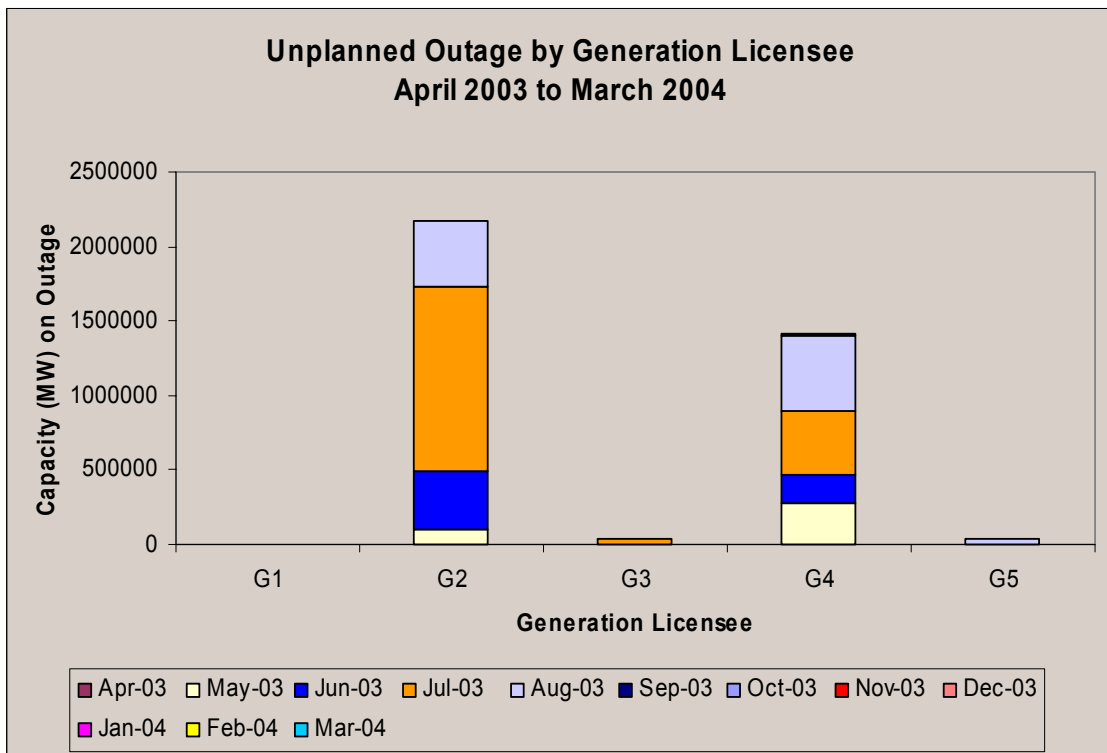


Chart 1.4.3

Forced or unplanned outage leading to high prices is an area of focus for monitoring. During the period April 2003 to March 2004, there were 48 occasions where WEP exceeding \$200/MWh were associated with forced or unplanned outage of generation registered facilities. When forced or unplanned outages occurred in respect of 2 or more generation registered facilities simultaneously, the impact on price in periods immediately following the outages was significant. The following indicate the impact on the 3 occasions when such outages occurred in respect of 2 generation registered facilities simultaneously, during the period April 2003 to March 2004. For comparison, the volume-weighted average WEP for the period April 2003 to March 2004 was \$90.30/MWh.

Forced Outage on 26 May 2003 at 12:07 (period 25)

The WEP for periods 26 to 29 reached \$3529.15/MWh, \$3101.09/MWh \$4376.22/MWh and \$498.73/MWh respectively. The volume-weighted average WEP for the day reached \$356.80/MWh. The forced outage of the 2 generation registered facilities was caused by sudden loss of pressure in the fuel gas supplied to both facilities.

Forced Outage on 14 August 2003 at 13:02 (period 27)

The WEP for periods 28 to 33 reached \$4374.57/MWh, \$4478.60/MWh, \$3282.75/MWh, \$317.39/MWh, \$316.90/MWh and \$615/MWh respectively. The volume-weighted average WEP for the day reached \$395.93/MWh. The forced outage of the 2 generation registered facilities was caused by a technical problem affecting the cooling water pumps which service both facilities.

Forced Outage on 15 November 2003 at 21:44 (period 44)

With the forced outage of 2 generation registered facilities occurring at 21:44, the WEP for periods 45 to 47 reached \$1337.94/MWh, \$1338.39/MWh and \$502.15/MWh respectively. The volume-weighted average WEP for the day reached \$155.07/MWh. The 2 generation registered facilities were manually tripped as an emergency safety measure because of technical problems in their steam turbine and boiler.

2. Demand Indices

2.1 Comparison of latest available pre-dispatch load forecast with real-time load forecast

The accuracy of the load forecast used in generating the pre-dispatch schedule is important in producing an accurate pre-dispatch schedule, which enables market participants to respond appropriately in the real-time. Comparison of the pre-dispatch and real-time load forecasts indicates the degree of accuracy of the pre-dispatch load forecast. Little deviation from pre-dispatch load forecast to real-time load forecast is expected.

Chart 2.1 shows the variation between the latest available pre-dispatch load forecast (normal load forecast) and the real-time load forecast for energy for the period April 2003 to March 2004.

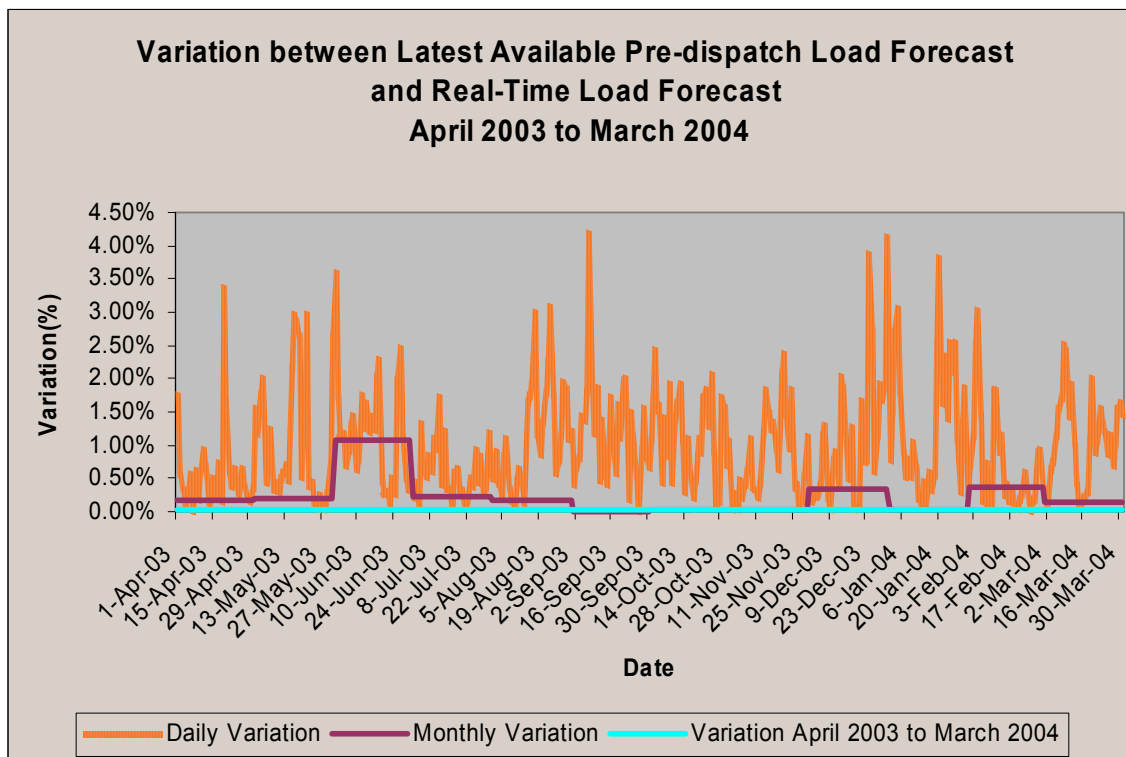


Chart 2.1

Between April 2003 and March 2004, the daily variation² between the latest available pre-dispatch load forecast and real-time load forecast ranged from 0.0% to 4.2%, the monthly variation ranged from 0.0% to 1.1% and the variation for the period April 2003 to March 2004 was 0.02%. The chart shows that the latest available pre-dispatch load forecast quite closely reflects the real-time load forecast.

2.2 Comparison of real-time load forecast with metered energy quantity

The accuracy of the load forecast used in generating real-time dispatch and pricing schedules is important as it affects pricing outcomes and system security in the real-time. Comparison of the real-time load forecast and metered energy quantity indicates how closely the load forecast used by the MCE in generating the real-time dispatch schedule matches the actual metered energy quantity. Little deviation is expected between the real-time load forecast and the metered energy quantity.

Chart 2.2 shows the variation between the real-time load forecast and the metered energy quantity for the period April 2003 to March 2004.

² The variation is calculated according to the following formula:

$$\text{Variation (\%)} = 100\% \times \frac{\text{Absolute value (the latest available pre-dispatch load forecast (MW) - real-time load forecast (MW))}}{\text{Real-time load forecast (MW)}}$$

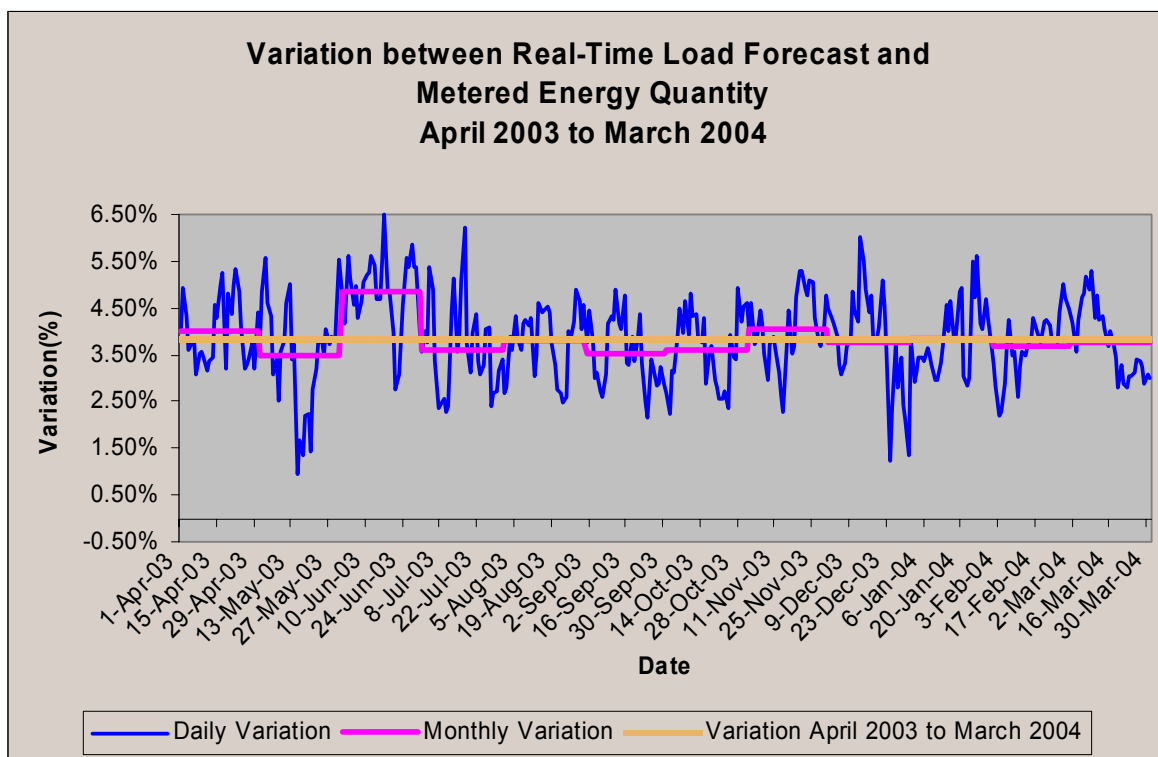


Chart 2.2

Between April 2003 and March 2004, the daily variation³ between the real-time load forecast of total energy quantity and the metered energy quantity ranged from 0.9% to 6.5%, the monthly variation ranged from 3.5% to 4.9% and the variation for the period April 2003 to March 2004 was 3.8%.

The metered energy quantity based on settlement data furnished by the MSSL excludes the station load and auxiliary load consumption while the real-time load forecast includes these components. This partly explains why the metered energy quantity is systematically lower than the real-time load forecast. Other factors that may contribute to the variation are loss factors and metering errors. Taking into account the station load, the auxiliary load consumption and loss factors, the real-time load forecast reflects quite closely the actual energy demand.

³ The variation is calculated according to the following formula:
$$\text{Variation (\%)} = 100\% \times (\text{real-time load forecast (MW)} \times (1/2 \text{ h}) - \text{metered energy quantity (MWh)}) / \text{metered energy quantity (MWh)}$$

3. Price Indices

3.1 WEP

The WEP is the price that retailers pay for energy in \$/MWh. The USEP makes up the bulk of the figure. The rest of the components are the Allocated Regulation Price (“AFP”), Hourly Energy Uplift Charge (“HEUC”), Monthly Energy Uplift Charge (“MEUC”), EMC administrative costs and PSO administrative costs.

The daily volume-weighted average WEP for the period April 2003 to March 2004 ranged from \$50.94/MWh to \$395.93/MWh, with a volume-weighted average WEP over the same period of \$90.30/MWh.

It is instructive to note that a structural break occurred on 1 January 2004 when vesting contracts were implemented. From April to December 2003, the daily volume-weighted average WEP ranged from \$68.14/MWh to \$395.93/MWh with a volume-weighted average WEP over the period of \$96.57/MWh. From January to March 2004, however, the daily volume-weighted average WEP ranged from \$50.94/MWh to \$89.97/MWh, with a volume-weighted average WEP over the period of \$71.40/MWh. There is significant drop in the average price between the two periods after the introduction of vesting contracts.

3.1.1 Correlation between WEP and metered energy quantity

Chart 3.1.1 illustrates the movements of the daily volume-weighted average WEP against the total metered energy quantity for the period April 2003 to March 2004.

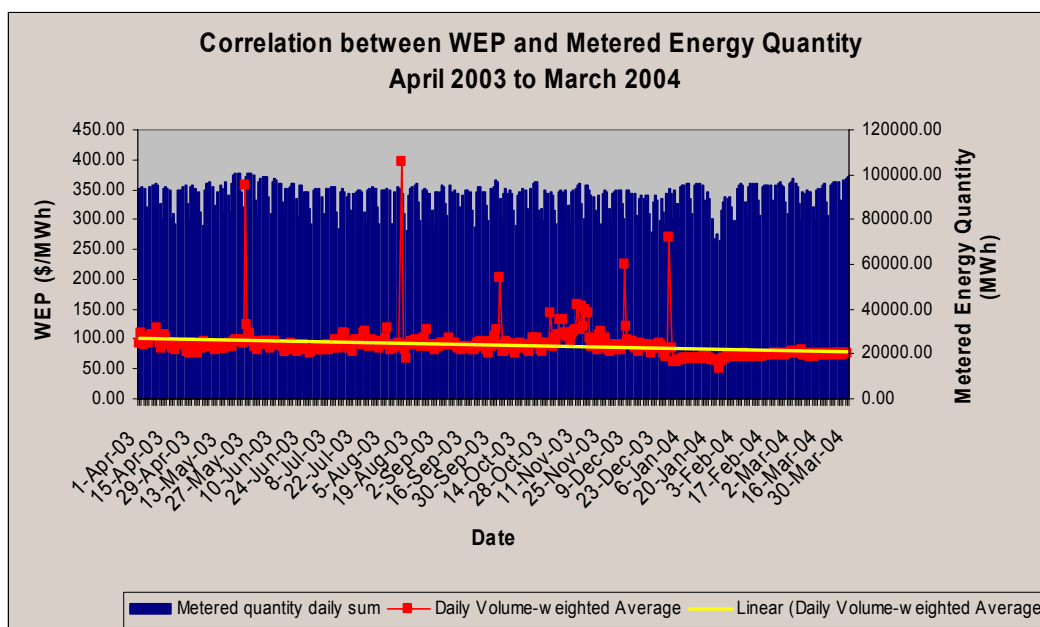


Chart 3.1.1

For the period April 2003 to March 2004, the daily volume-weighted average WEP ranged from \$50.94/MWh to \$395.93/MWh, with a volume-weighted average WEP over the same period of \$90.30/MWh. Over the same period, the daily metered energy quantity ranged from 70835 MWh to 100772 MWh with an average of 90207 MWh.

Chart 3.1.2 shows the daily correlation coefficient⁴ of WEP and metered energy quantity for the period April 2003 to March 2004.

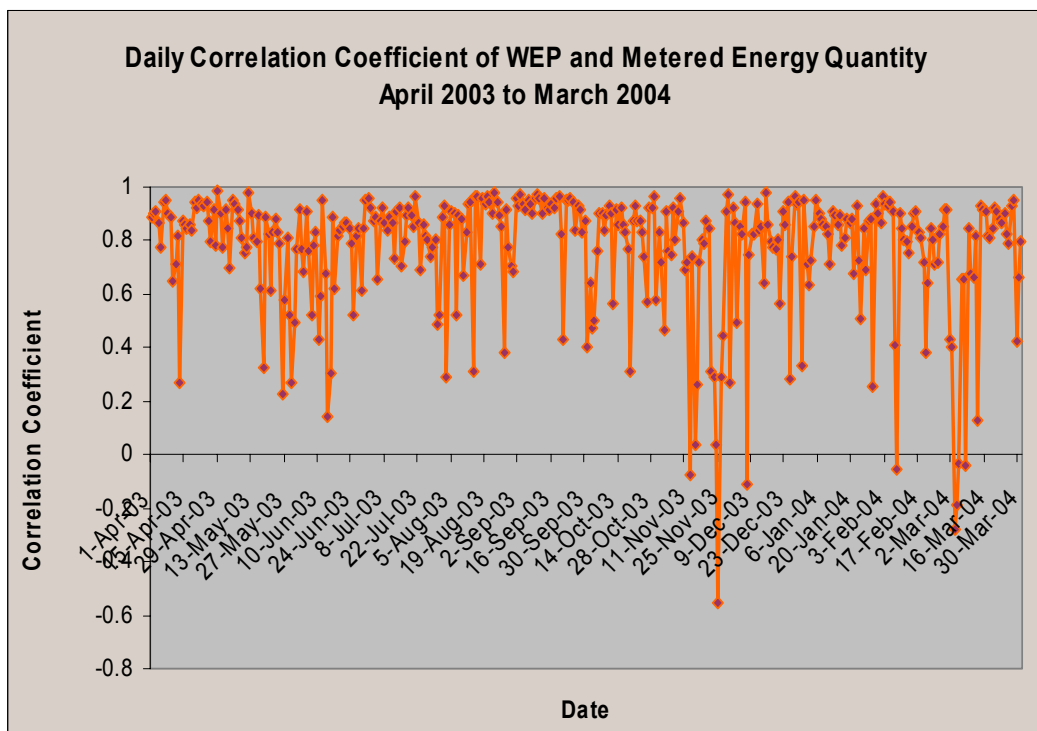


Chart 3.1.2

There is a significant correlation between WEP and metered energy quantity for the period April 2003 to March 2004. The daily correlation coefficients ranged from -0.55 to 0.98 with an average of 0.77. More than 88% of the daily correlation coefficients are above 0.5 which shows a high correlation between WEP and metered energy quantity.

⁴ The correlation coefficient measures the extent to which the two variables move in tandem with each other. It has a value between -1 to 1. When the correlation coefficient is close to 1, it means the two variables are moving closely together in the same direction. When the correlation coefficient is -1, it means the two variables are moving in opposite directions.

3.1.2 Frequency distribution of WEP according to (a) percentage of hours of occurrence and (b) percentage of quantity of energy affected

Tables 3.1.2.1 and 3.1.2.2 illustrate the frequency distribution of WEP according to (a) percentage of hours, and (b) percentage of quantity of energy affected.

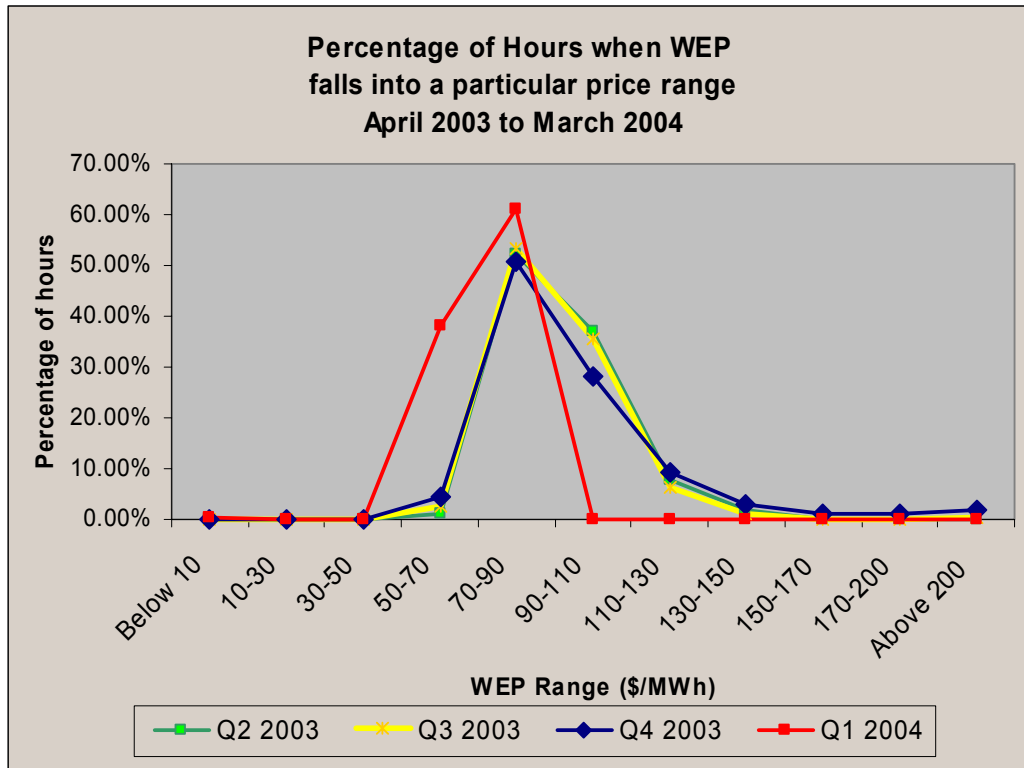


Chart 3.1.2.1

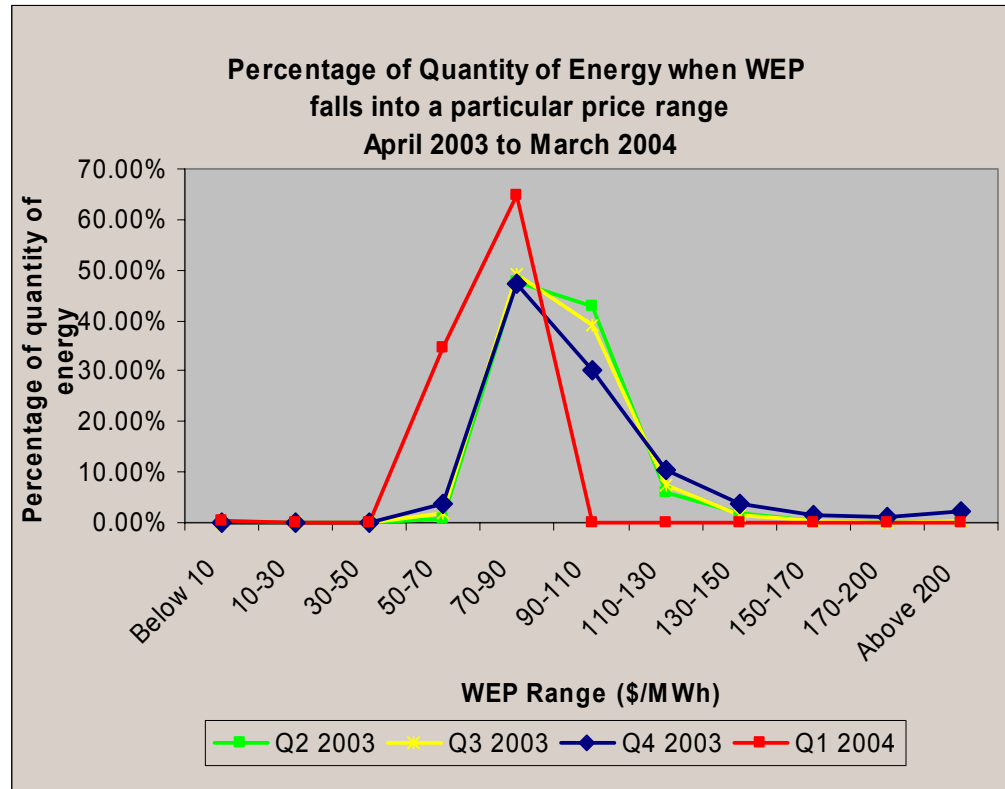


Chart 3.1.2.2

Both charts illustrate a significant leftward shifting of the frequency distribution of WEP from the last three quarters of 2003 to the first quarter of 2004, again indicating a decrease in average WEP after vesting contracts were introduced on 1 January 2004.

3.1.3 Correlation between WEP and fuel price

This index measures price responsiveness of WEP to fuel cost, which makes up the major part of the variable cost of energy.

In Singapore, the main sources of fuel for electricity generation are fuel oil and natural gas. The price of natural gas is pegged to the fuel oil price. The published Brent crude oil price, obtained from the International Petroleum Exchange ("IPE"), is used as a proxy for fuel price that is used to construct the correlation coefficient below.

Chart 3.1.3.1 shows the 21-day moving average of the daily volume-weighted average WEP and 21-day moving average of the one-month futures price of Brent crude oil for the period April 2003 to March 2004.

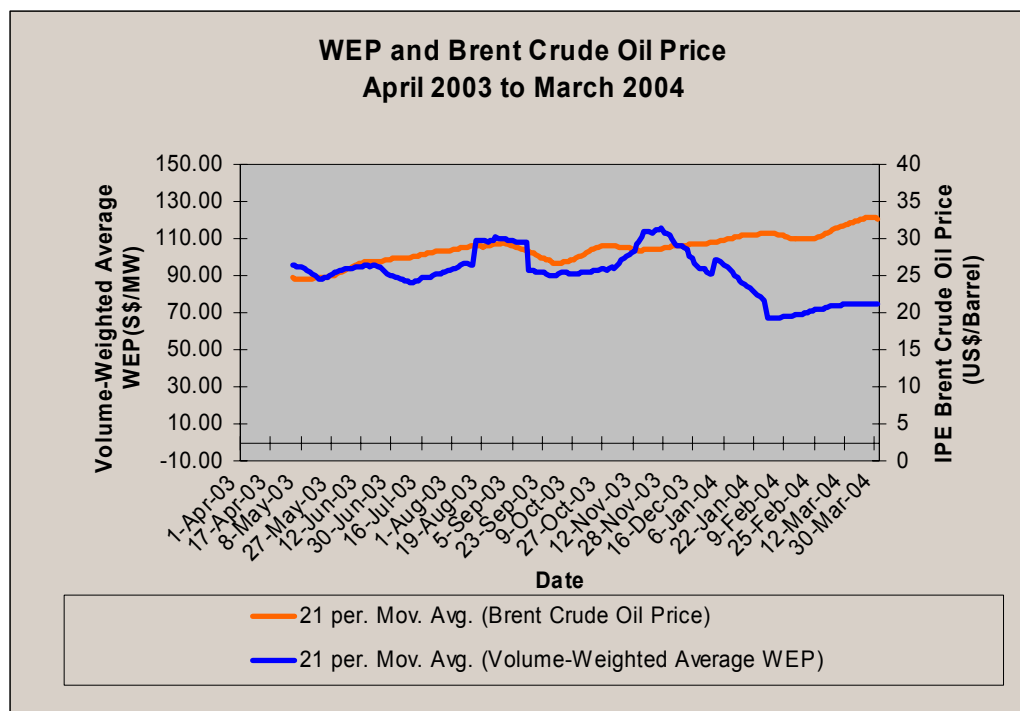


Chart 3.1.3.1

Using the 21-day moving average of the WEP and 21-day moving average of the one-month futures price of Brent crude oil, the correlation coefficient for the period April 2003 to December 2003 is 0.49. After the introduction of vesting contracts on 1 January 2004, the correlation coefficient dropped sharply to -0.20.

3.1.4 Periods with WEP above \$200/MWh

From April 2003 to March 2004, there were 105 periods where the WEP exceeded \$200/MWh.

During such occurrences of high WEP, one or more of the following phenomena were observed:

(a) Above average system demand

The average system demand referred to is the average peak⁵ or non-peak⁶ period system demand for the month, depending on whether the period in question falls within a peak or non-peak period. In 89 out of the 105 incidents of high WEP, the system demand for the period was observed to be above the average system demand.

⁵ Peak period refers to periods 19-36 from Mondays to Fridays (excluding public holidays).

⁶ Non-peak period refers to periods 1-18 and 37-48 on weekdays and all periods for Saturdays, Sundays and public holidays.

(b) Forced or unplanned outage

Forced or unplanned outage of a generation registered facility has impact on the WEP because of their negative impact on the energy supply cushion in the periods immediately following the period during which the outage commenced. It is observed that 48 out of the 105 incidents of high WEP occurred in relation to the forced or unplanned outage of generation registered facilities.

(c) Offers of 0 quantity when the respective generation registered facilities were not under planned, unplanned or forced outage

Even when generation registered facilities do not have planned, unplanned or force outages, they may if they wish to offer 0 quantity of energy at any given point in time. In all 105 incidents of high WEP, offers of 0 quantity of energy were observed to have been submitted by one or more generation registered facilities in the absence of any outage. Presently, there are no rules restricting such offer behaviour.

(d) Below average energy supply cushion

The average energy supply cushion referred to is the average peak or non-peak period energy supply cushion for the month, depending on whether the period in question falls within a peak or non-peak period. In 88 out of the 105 incidents of high WEP, the energy supply cushion for the period was observed to be below the average energy supply cushion.

Factors that may contribute to a below average energy supply cushion include an increase in system demand or offers of 0 quantity of energy, or when facilities are under outages. These phenomena have been discussed above. In addition, the supply cushion could be reduced by reduction of actual quantities offered to below the standing offers.

(e) Offers of energy at \$4500/MWh

These are cases where energy was offered at \$4500/MWh. In 83 out of the 105 incidents of high WEP, offers of energy at \$4500/MWh were observed to have been submitted by one or more generation registered facilities. Should an offer at \$4500/MWh be selected, this will cause the market clearing price for energy to reach \$4500/MWh. 3 such incidents occurred during the period April 2003 to March 2004. In the 3 cases, when the generation registered facilities offering \$4500/MWh were cleared by the MCE, they were actually not able to dispatch the quantities cleared. This may lead to a shortage of supply and may also have a potential impact on system security. There are no rules restricting offers of energy at \$4500/MWh.

(f) Offer Variations

58 out of the 105 incidents of high WEP had occurred when offer variations or revisions to standing offers were observed. 54 out of the 58 variations or revisions were offers exceeding offer change limits (i.e. they were made after gate closure).

3.2 USEP and ancillary prices

The wholesale electricity markets also include real-time markets for ancillary services (ie reserve and regulation). Reserve means generation capacity that can be called upon to replace scheduled energy supply that is unavailable as a result of a forced outage, or to augment scheduled energy as a result of unexpected demand. It is divided into three classes: primary reserve, secondary reserve and contingency reserve. Regulation enables the output for a generating unit to be frequently adjusted so that any power system frequency variations or imbalance between load and output from the generating facilities can be corrected.

Chart 3.2 summarises the 30-day moving average of daily volume-weighted average USEP and ancillary service prices for the period April 2003 to March 2004.

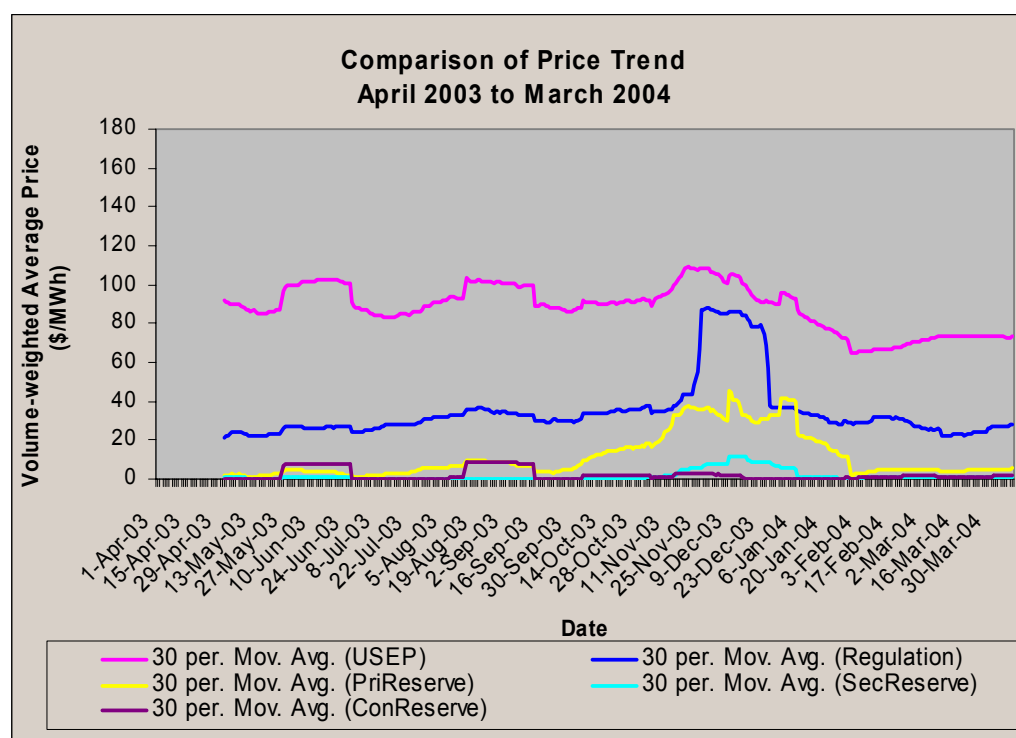


Chart 3.2

All reserve prices remained low from April 2003 till September 2003. This may be attributed to the fact that in the wholesale electricity markets of Singapore, the reserve cost is paid by generation licensees and the reserve cost that each generation licensee pays is affected by the volume of energy it generates, and its reliability. Increased occurrences of forced outage since April 2003 increased the failure probability. The decrease in reliability resulted in the affected generation registered facilities being charged more of the reserve price. It was therefore in the interest of generation licensees to keep the reserve price low.

The higher reserve prices towards the end of 2003 was due to the disruption of gas supply from the West Natuna field in Indonesia from 14 November 2003 to 4 December 2003. As described above, this resulted in a decline in CCGT availability

which in turn gave rise to higher reserve requirements and lower availability of reserve capacity.

The regulation price was also high during the gas supply interruption from 14 November 2003 to 4 December 2003 as more forced outages occurred during that period and fewer generation registered facilities were able to supply regulation.

All prices have dropped since the implementation of vesting contracts from 1 January 2004.

Greater Transparency Towards Information Sharing Among Market Participants

In the course of its work, the MSCP has noted that section 9.2.3 of Chapter 6 of the market rules provide for each generator to receive only that portion of the real-time dispatch schedule that is relevant to its facilities. In other words, each generator does not get to see the full contents of the real-time dispatch schedule other than its own dispatch schedule.

The MSCP therefore wrote on 9 March 2004 to the EMC stating that it considered that disclosing the dispatch quantity of each generator to all market participants would provide better transparency to the market to respond more competitively. In view of the potential benefits, the MSCP suggested this as an area for further study by the EMC, including the seeking of industry views.

INVESTIGATIONS

Summary of Investigation Activities

Under the market rules, the MSCP may initiate an investigation into any activities in the wholesale electricity markets or the conduct of a market participant, the MSSL, the EMC or the PSO that is brought to the attention of the MSCP by way of a referral or complaint from any source, or that the MSCP determines as warranting an investigation.

The MSCP may refuse to commence or may terminate an investigation where the MSCP is of the view that a complaint, referral or investigation is frivolous, vexatious, immaterial or unjustifiable, or not directly related to the operation of the wholesale electricity markets, or is within the jurisdiction of another party.

We have prepared statistics to reflect the position on investigation and enforcement activities as close as possible to the time of preparing this report. These statistics cover the period from market start on 1 January 2003 to 31 May 2004:

Number of offers exceeding offer change limits considered	10173
Total number of cases (excluding offers exceeding offer change limits)	66
of which:	
▪ number of self-reports	54
▪ number of referrals or complaints	7
▪ number initiated by MSCP	5
Total number of cases under investigation	21
Total number of cases pending determination	12
Total number of cases closed	33
▪ number of cases where MSCP determined a breach	22
▪ number where MSCP determined no breach	3
▪ number where MSCP decided to take no further action	8
Number of formal MSCP hearings	0
Enforcement Action	
▪ Highest financial penalty imposed on a party in breach	\$50,000
▪ Total financial penalties imposed on parties in breach	\$50,000
Costs	
▪ Highest award of costs imposed on a party in breach	\$14,000
▪ Total costs imposed on parties in breach	\$14,000

Reports of determinations of breach made by the MSCP are published in accordance with the market rules on the EMC website at www.emcsg.com.

SECTIONS 50 AND 51 OF THE ELECTRICITY ACT

Information Requirements to Assist the Authority

The market rules provide for the MAU, under the supervision and direction of the MSCP, to develop a set of information requirements to assist the EMA to fulfill its obligations with respect to prohibiting anti-competitive agreements and abuse of a dominant position under sections 50 and 51 of the Electricity Act. The information requirements were to be made available for publication within 3 calendar months of market start.

The first set of information requirements was finalized in consultation with the EMA and made available to the EMC for publication on 27 March 2003. As the market evolved, modifications to the information requirements were made and published on 18 August 2003 and 28 January 2004.

The MAU regularly provides data to the Authority according to the information requirements.

Reports to the Authority

The market rules also provide for the MSCP to include in its report a summary of reports that have been made to the EMA regarding any complaint that may have been received or any information that may have been uncovered that may indicate the possibility of anti-competitive agreements, or the abuse of a dominant position, contrary to sections 50 or 51 of the Electricity Act.

On 2 May 2003, the MSCP met with the EMA to discuss their respective roles. During the meeting, the EMA clarified that the role of the MSCP is to report possible cases of anti-competitive behaviour to the EMA should any be detected. All investigations into anti-competitive behaviour would be under the purview of the EMA.

In the course of monitoring and investigative activities carried out from April 2003 to March 2004, the MSCP and MAU did not receive any complaint, or uncover any material evidence that indicated the possibility of anti-competitive agreements, or the abuse of a dominant position contrary to sections 50 or 51 of the Electricity Act.

ASSESSMENT OF WHOLESALE ELECTRICITY MARKETS

In this report, the MSCP is required to provide its general assessment as to the state of competition and compliance within, and the efficiency of, the wholesale electricity markets. Its assessment of the state of competition and efficiency, and the state of compliance is set out below.

State of Competition Within and Efficiency of the Wholesale Electricity Markets

In general⁷ *competition* and *regulation* are instrumental to achieving *market efficiency* and the necessary elements for efficient markets are:

- Many sellers who are responsive to price;
- Many buyers who are responsive to price;
- Liquid, efficient and complete marketplaces;
- Resolution of conflicts of interest so that there is equal access to essential facilities; and
- Good regulation of remaining monopolies.

Each of these factors is examined below in the context of the wholesale electricity markets of NEMS.

⁷ Sally Hunt, "Making Competition Work in Electricity Markets", John Wiley & Sons Inc, 2002

1. Sellers and Supply Responsiveness

There are at present five generation licensees participating in the wholesale electricity markets. They are:

- (a) National Environment Agency;
- (b) PowerSeraya Ltd;
- (c) SembCorp Cogen Pte Ltd;
- (d) Senoko Power Ltd; and
- (e) Tuas Power Ltd.

Supply in the wholesale electricity markets remains concentrated because the three big generation licensees together own about 90% of the total installed capacity in Singapore.

However, there are other factors that can cause the market to actually behave with a reasonable degree of efficiency despite a high concentration ratio.

One potentially important factor is the degree of *excess capacity* in the system. For the period from April 2003 to March 2004, the maximum installed generation capacity was 9208MW. This was observed on 31 March 2004. The maximum instantaneous peak system demand of 5139MW was recorded by the PSO on 23 May 2003. There is therefore significant excess capacity in the system. This would provide incentive for the sellers in the market to compete more aggressively because keeping idle capacity is unprofitable.

Another potentially important factor is that although the industry is concentrated, many of the plants installed by the three big generation licensees are older and inefficient steam plants. Recall that the three big generation licensees together own about 90% of the total installed capacity in Singapore. However, a significant proportion of their plants are not the efficient CCGTs compared to smaller generation licensees. If the market is to operate with a certain degree of efficiency, then electricity should be generated more frequently by the more efficient plants. This indeed is the case as we have observed earlier that generation licensees that have more efficient plants tend to proportionally generate more electricity from these plants.

The ultimate gauge of whether a certain degree of efficiency is achieved is in the observed level of wholesale market prices. The volume-weighted average USEP (with HEUC adjustment) for the period April to December 2003 was \$93.97/MWh (volume based on actual metered energy quantity). This price is very near to the long run marginal cost of a CCGT (based on the formula adopted by the EMA for computing the vesting contract hedge price for the first quarter of 2004). It is also near to the average price cap resulting from the rate of return regulation implemented by the EMA for the whole of 2003 on the outputs of the three big generation licensees.

At the start of 2004, vesting contracts were implemented by the EMA in respect of about 65% of the wholesale market. The vesting contract hedge price was set at \$94.24/MWh which is estimated to be the long run marginal cost of CCGT for the first quarter of 2004. It is observed that the volume-weighted average USEP (with HEUC adjustment) for the period from January to March 2004 decreased to \$69.70/MWh after the introduction of vesting contracts. The significant fall in the market prices was due largely to the aggressive bidding by the generation licensees.

For the period April 2003 to March 2004, there were 105 periods out of 17568 where WEP exceeded \$200/MWh. It was observed that any price spikes were only temporary, with the

market responding by offering more supply, and prices coming down to normal levels very quickly.

Another important factor is the supply responses by industry players in the area of investment in new capacities. Although the market has significant excess capacity, a significant proportion of the installed capacities are older plants which are not as efficient as the CCGTs. Several generators have publicized their intent to develop new CCGTs or convert steam plants into CCGTs. Replacement of older inefficient plants by newer efficient plants is a good sign that market forces are operating in the right direction to potentially reduce the cost of electricity generation in the future.

2. Buyers and Demand Responsiveness

The price elasticity of demand appears to be very small⁸.

On 1 July 2004, the EMC registered the first interruptible load participant. An opportunity may arise in the future to assess demand price responsiveness when the interruptible load scheme becomes fully operative.

3. Liquid, Efficient and Complete Marketplaces

A *liquid* marketplace has many buyers and sellers who can access each other easily and have access to information about market prices. An *efficient* marketplace is one where participants cannot systematically predict which way prices will move. A *complete* marketplace has a full set of forward and spot marketplaces and risk-management tools, for each specific product, time and place.⁹

The matter of transparency of information, the publication of market outlook scenarios, pre-dispatch schedules, short-term schedules, market advisories (including information on forced outages) and information on planned outages to market participants should assist market participants to make more informed decisions. However, the MCSP noted that the market could be made more efficient if more market information on trades during the trading period could be made available to market participants other than the trader's own dispatch schedule. The MSCP suggested this as an area for further study by the EMC, including the seeking of industry views.

Currently, the wholesale electricity market is a spot market. Before the introduction of vesting contracts, market participants relied mainly on bilateral contracts to hedge their exposure to spot market prices. Futures and other risk management tools are yet to evolve in the wholesale electricity market to make the market more complete.

4. Resolution of Conflicts of Interest so that there is Equal Access to Essential Facilities

The essential facilities are transmission and system operations.

In NEMS, the transmission system is owned by SP PowerAssets Ltd ("SP PowerAssets"). The system operator, the PSO is a division of the regulator, EMA. Both the transmission and system operation functions are separate from generation. They are accessible to all, thus

⁸ Chang Youngho and Tay Tuan Hin, "Price Responsiveness in the New Electricity Market: A Singapore Experience" (Mimeo December 2003) estimated that the price elasticity of demand is very low at less than 0.1 %.

⁹ Sally Hunt, "Making Competition Work in Electricity Markets", John Wiley & Sons Inc, 2002

removing possible conflicts of interest in terms of transmission access for competing generation licensees.

5. Regulation of Remaining Monopolies

Even with deregulation, some aspects of the electricity industry remain as natural monopolies.

Current monopoly businesses in the wholesale electricity markets are those of transmission (SP PowerAssets), the market operator (EMC) and the power system operator (PSO). SP PowerAssets and the EMC are regulated by the EMA through licences. The PSO is a division of the EMA.

Transmission is a natural monopoly and it is likely to remain as such for the sake of cost efficiency. As a natural monopoly, its transmission charges are regulated. During the period 1 April 2003 to 31 March 2004, SP PowerAssets reduced its transmission charges by up to 14%.

The EMC budget and PSO budget are reviewed by the Rules Change Panel and approved by the EMA. Approved amounts are recovered via EMC administrative costs and PSO administrative costs for each settlement period from all market participants who have traded in that period.

For the period 1 January 2003 to 31 March 2003, the budgeted EMC administrative costs were \$0.68/MWh. For the period 1 April 2003 to 31 March 2004, the budgeted EMC administrative costs were \$0.47/MWh. It was observed that the EMC administrative costs dropped to an average of \$0.41/MWh for the period January to March 2004. The drop was due to the rebate paid by the EMC to the market over these 3 months for over-recovery of EMC administrative costs during the period January to March 2003.

At market start in January 2003, the budgeted PSO administrative costs were \$0.28/MWh. The PSO budgeted administrative costs were \$0.26/MWh for the period 1 April 2003 to 31 March 2004.

In general, the cost of electricity to consumers has been reduced in respect of the reduction in transmission charges, EMC administrative costs and PSO administrative costs.

Summary - Efficiency

On the supply side of electricity generation, 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 the markets.

However, there are several indicators that suggest that a certain degree of efficiency has been achieved in the markets:

- (a) The volume weighted average market price in 2003 was near to the long run marginal cost of a CCGT calculated based on the formula adopted by the EMA for computing the vesting contract hedge price for the first quarter of 2004;
- (b) Although there were periods of price spikes due to various factors such as outages, they are infrequent and temporary;
- (c) With the introduction of vesting contracts at the beginning of 2004, market prices fell significantly due to more aggressive bidding by sellers;
- (d) Electricity was generated more frequently by the more efficient CCGTs;

- (e) Despite the excess capacity, there are plans among the sellers to add to the existing capacity with newer and more efficient CCGTs. These new CCGTs are likely to displace the less efficient plants.

Two reasons may have contributed to the above:

- (i) The significant excess capacity currently existing among the sellers that provides incentive for greater competition;
- (ii) The regulation by EMA:
- in the form of rate of return regulation in 2003;
 - in the form of vesting contracts in 2004;
 - of the localized market power of a generator in the northern area¹⁰; and
 - of the transmission of electricity and in making the transmission facility accessible to all.

State of Compliance within the Wholesale Electricity Markets

Our assessment as to the state of compliance within the wholesale electricity markets is set out below.

1. Obligation to Make Self-reports or Complaints

Under section 7.1.9 of Chapter 3 of the market rules, a market participant, the EMC, the PSO or the MSSL is obliged to make self-reports to the MSCP if it believes or becomes aware that it has breached, is breaching or may be breaching the market rules. The provision also requires these market players to make referrals or complaints to the MSCP if they become aware that another market player may have breached the market rules. Additionally, the MSCP may initiate an investigation if it comes to the attention of the MSCP that a market player may have breached the market rules.

Before market start, the MAU conducted an education forum for market players to provide awareness of the market rule that requires them to make self-reports and referrals or complaints to the MSCP. Over a period of time, the MSCP has been receiving self-reports on cases of possible rule breaches from market players, including in the area of offers exceeding offer change limits. Self-reports comprise the largest percentage of the cases reviewed by the MSCP.

2. Offers Exceeding Offer Change Limits

In the course of reviewing offers exceeding offer change limits, the MSCP felt that the applicable market rules lacked clarity in the following areas:

- (a) although the market rules provided for no tolerance for offers exceeding offer change limits, such offers were in practice allowed to be made but were reported to the MSCP;

¹⁰ Before market start on 1 January 2003, it was discovered that there were limitations in the north-south transmission lines of Singapore. In order to meet the load requirement in the northern area, there was reliance on a power station located in the north to generate sufficient quantities. To mitigate the localized market power of the relevant generator, the regulator, EMA, acted pursuant to the generator's electricity licence to direct the generator to secure dispatch of adequate generation units in its power station to meet the minimum generation requirement determined by the EMA. For the period from April 2003 to March 2004, the MSCP understands that the generator fulfilled the minimum generation requirement imposed by the EMA. The MSCP has also not observed high locational prices occurring in the northern area.

- (b) whether an offer exceeding offer change limits was permitted to be made if it was made on certain grounds referred to in the market rules (eg forced outage);
- (c) whether an offer exceeding offer change limits made on any other ground was prohibited under the market rules and constituted a rule breach such that enforcement action may be taken by the MSCP; and
- (d) the scope of the MSCP investigative powers in relation to offers exceeding offer change limits.

This lack of clarity limited the ability of the MSCP to act in respect of such offers. After a careful study of several electricity markets' approach in handling these offer variations, the MSCP submitted a rule change proposal to the Rules Change Panel to address the situation. The necessary rule changes took effect on 2 March 2004. With the rule changes in place, the MSCP will continue to closely monitor the area of offers exceeding offer change limits and to take action where appropriate.

3. Types of Rule Breaches

The types of rule breaches that have been observed in the market since market start can be broadly categorized as follows:

- (a) Offers exceeding offer change limits – Market participants making offer variations within the 4 hours prior to the relevant dispatch period potentially in breach of the market rules.
 - (b) Market information – Failure by the market operator to determine and publish schedules and release information, or failure to do so on time.
 - (c) Non-compliance with dispatch instructions – Failure by market participants to comply with dispatch instructions.
 - (d) Metering data – Failure by the MSSL to submit metering data to the market operator on time.
 - (e) Settlement – Failure to issue settlement statements on time.
- The rule breaches observed have had varying impact on the market.

Of the cases reviewed by the MSCP during the course of the year, the highest percentage involved breaches by the EMC. The EMC breaches were mainly caused by IT problems, and have thus far not been found to have any significant impact on the market. The number of breaches by the EMC have also declined since the first three months of the market.

The breach by a market participant has been found to have had a more significant impact. During the course of the year, the MSCP investigated a case of non-compliance with dispatch instructions by a market participant. The breach was found to be deliberate, to have had a financial impact on other generation licensees, and to have put system security at risk. Taking into account the seriousness of the breach, the MSCP imposed a financial penalty against the generation licensee. This was the first case where the MSCP found it appropriate to take enforcement action of a pecuniary nature against a market player.

4. Issue Regarding Financial Penalties

The MSCP understands that the imposition of penal sanctions is generally void unless it has a statutory basis. Any financial penalties imposed by the MSCP pursuant to the market rules may therefore not be legally enforceable in the absence of legislative authority.

In this regard, section 47 of the Electricity Act provides that:

“... the market rules may include provisions authorizing and governing the imposition of financial penalties on market participants.”

Section 2 of the Electricity Act defines “market participant” to mean:

“a person –

- (a) authorized by an electricity licence; and
- (b) registered in accordance with the market rules,

to trade in any wholesale electricity market...”.

Before market start, a change to the market rules was made to enable the MSCP to impose financial penalties against the EMC. However, the EMC does not fall within the definition of “market participant” in the Electricity Act. The imposition of financial penalties against the EMC therefore does not fall within the scope of section 47 of the Electricity Act. In the absence of any statutory basis for the imposition of financial penalties against the EMC, any financial penalties imposed by the MSCP against the EMC may not be legally enforceable.

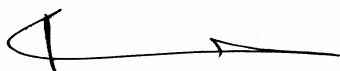
Notwithstanding this, the EMC voluntarily agreed to be subject to financial penalties under the market rules by offering verbal assurance to the MSCP that the EMC would pay any financial penalties imposed on it by the MSCP. On 26 February 2004, the EMC confirmed this assurance in writing.

In view of its continuing disquiet, on 27 April 2004 the MSCP wrote to the EMA concerning this issue.

At the time of preparing this report, the MSCP understands that the above issue is under review by the EMA.

CONCLUSION

The MSCP believes that this report fairly represents the activities of the wholesale electricity markets of NEMS which arose during the period under review, including observations of the MSCP where thought of as appropriate. Comments from the EMA and market players which may be useful to the MSCP in the performance of its functions in the future would be most welcome.



Joseph Grimberg
Chair, Market Surveillance and Compliance Panel
20 July 2004