FINDINGS OF THE MARKET SURVEILLANCE AND COMPLIANCE PANEL
MSCP/2007/F1

Market Surveillance and Compliance Panel ("MSCP")
Mr Joseph Grimberg, Chair
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Date
21 March 2007

Subject
High Regulation Prices from October 2006 to January 2007

INTRODUCTION

1. From the last quarter of 2006 to the early months of 2007, the Market Surveillance and Compliance Panel ('MSCP') has observed a surge in the average regulation price.

2. In a letter dated 8 February 2007, a major electricity consumer requested the MSCP to investigate the regulation prices. The consumer observed that there had been a substantial increase in the regulation price in the wholesale market in 2007 over the historical average price levels. The consumer expressed that this was an unacceptable outcome in a competitive market. It had resulted in a significant increase in the cost of electricity for consumers.

3. The consumer recommended that the high regulation price outcomes be investigated to determine the following:

    a. Is capacity capable of providing regulation being intentionally withheld?
    b. Are there any noticeable consistencies in bidding behaviour which historically were not occurring?
    c. What is the root cause of higher flat average regulation prices?
    d. Why are these high regulation prices not signaling a competitive response from market participants capable of providing regulation?

MSCP INVESTIGATION

4. Section 4.1.1 of Chapter 3 of the Singapore Electricity Market Rules (the 'market rules') provides for the MSCP to assess whether the underlying structure of the wholesale electricity markets is consistent with the efficient and fair operation of a competitive market.

5. Under section 4.6.1 of Chapter 3, the MSCP may in accordance with section 4.8 initiate an investigation into any activities in the wholesale electricity markets or the conduct of a market participant, market support services licensee, the EMC or the PSO that is brought to the attention of the MSCP by way of referral or complaint from any source. Section 4.8 of Chapter 3 also provides that the MSCP may report any findings to Energy Market Company, the Power System Operator ('PSO') or the Energy Market Authority ('EMA').

6. Having regard to the above, the MSCP decided to initiate an investigation into the high regulation prices.

REVIEW PERIOD

7. The high regulation price trend was first observed in October 2006 when the regulation price jumped from an average of $18.1/MWh in September 2006 to $85.9/MWh. This was also higher than the average of $53.4/MWh for the first nine months of the year. The high regulation price trend continued at an average of $85.9/MWh in November 2006 and $187.0/MWh in December 2006 before setting a record high of $719.5/MWh in January 2007.

8. Although the regulation price remained high in February 2007 at $228.9/MWh, it fell to an average of $75/MWh for the first ten days of March 2007.

9. On 9 February 2007, the regulator EMA informed market players that it was investigating the high regulation prices. The MSCP observed that around the time of this announcement, regulation prices dropped significantly.

10. The MSCP has therefore focused its investigation on the period October 2006 to January 2007 (the 'review period').

INVESTIGATION METHODOLOGY

11. The MSCP has carried out its investigation by reviewing the overall design and structure of the regulation market.

12. The performance of the regulation market during the review period was compared with its past performance.

13. The requirement for regulation is determined to be 100 MW by the PSO and has not changed since market start in 2003. Given that demand in the regulation market is fixed, detailed analysis was carried out on supply conditions such as plant outages, regulation offer quantities and regulation offer prices. This assists

us in identifying deviations from historical patterns and understanding the reasons behind the regulation market performance during the review period.

PRICE TRENDS AND DEVIATION FROM HISTORICAL PERFORMANCE

14. Average regulation prices for the first two years of the market were $36.5/MWh in 2003 and $32.6/MWh in 2004. This jumped to $68.7/MWh in 2005 and $53.4/MWh in the first nine months of 2006.

15. Using a price duration curve[1] and table (see Chart 1 and Table 1), the following general price trends since market start were observed:

    a. Regulation prices were equal to or less than $88.9/MWh for up to 99 percent of the time in 2003;
    b. The number jumped to $115.5/MWh in 2004 before setting a historical high of $1500/MWh in 2005;
    c. It dropped to $370.7/MWh for January to September 2006 before rising to $1350/MWh for Oct 2006 to January 2007.

16. The MSCP also observed that there had been marginal change in regulation prices for up to 92 percent of the time since market start in 2003. However, prices increased substantially during the last 5 to 6 percent of the time, especially in 2005 and 2006. This could be the reason behind the higher average regulation prices between January 2005 and September 2006 compared to the period between January 2003 and December 2004.

17. During the review period, regulation prices deviated from historical performance. The following was observed:

    a. The regulation prices were similar to those of previous years for up to 50 percent of the time;
    b. However, the regulation prices were either higher than or equal to $393.4/MWh for the last 30 percent of the time. This is substantially higher than the $29/MWh to $39/MWh registered between 2003 and September 2006.

[1] A price duration curve shows the percentage of time that regulation prices were at a given level for the period under consideration.

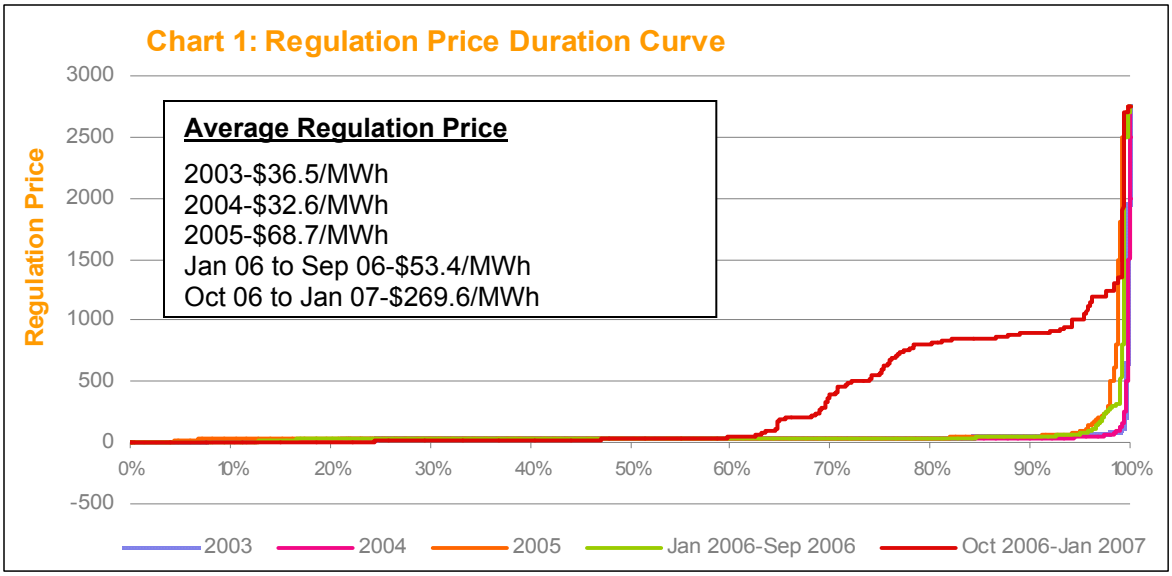


Table 1: Regulation Price by Percentage of Hours

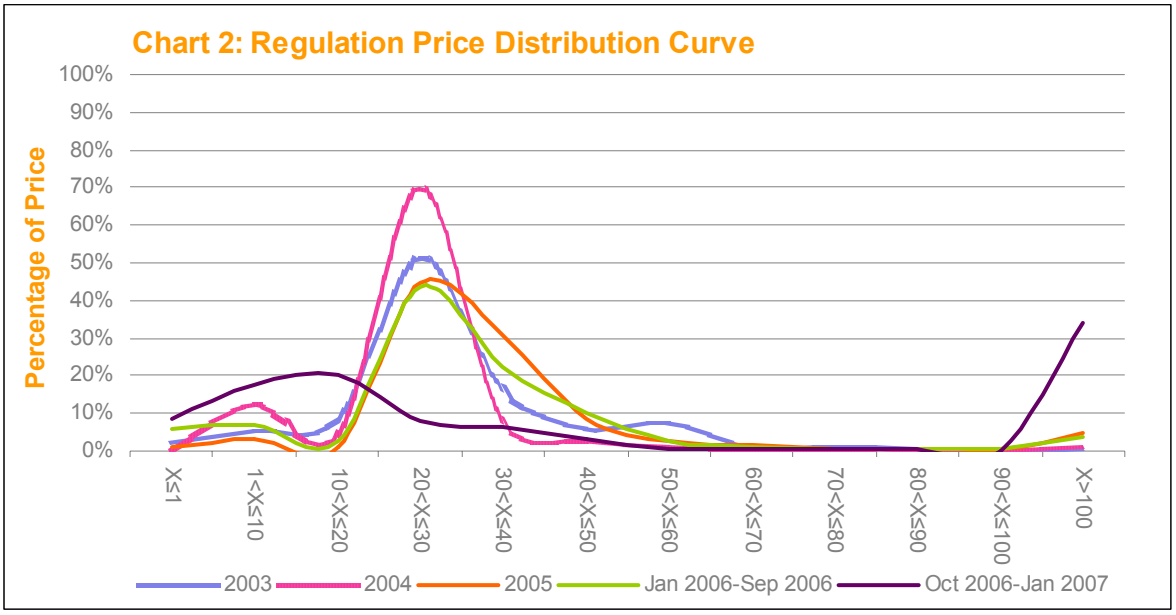
	Regulation Price ($/MWh)				
	2003	2004	2005	Jan 06-Sep 06	Oct 06-Jan 07
Up to 10% Hours	14.0	5.5	28.0	2.9	1.1
Up to 20% Hours	24.0	25.0	28.0	27.6	5.0
Up to 30% Hours	27.0	28.0	28.0	28.0	18.7
Up to 40% Hours	29.0	28.0	29.0	29.0	18.9
Up to 50% Hours	29.0	28.0	30.0	29.0	28.2
Up to 60% Hours	29.0	28.0	32.3	31.0	45.4
Up to 70% Hours	34.0	29.0	39.0	38.8	393.4
Up to 80% Hours	39.0	29.0	39.0	40.0	805.0
Up to 90% Hours	50.1	39.0	50.9	49.0	900.0
Up to 91% Hours	50.1	39.0	55.8	50.0	900.0
Up to 92% Hours	50.1	39.0	59.0	51.3	908.1
Up to 93% Hours	51.3	39.0	63.8	59.0	920.0
Up to 94% Hours	56.0	39.0	70.0	60.0	950.0
Up to 95% Hours	59.0	48.9	87.9	71.5	1000.0
Up to 96% Hours	59.0	49.0	150.0	98.3	1110.0
Up to 97% Hours	59.0	50.1	200.0	164.4	1200.0
Up to 98% Hours	70.1	61.4	359.4	281.3	1250.0
Up to 99% Hours	88.9	115.5	1500.0	370.7	1350.0

Regulation prices were relatively unchanged between 2003 and 2006 for up to 92% of the time, prior to the high regulation prices from Oct 2006

Regulation prices increased substantially during the last 5 to 6 % of the time

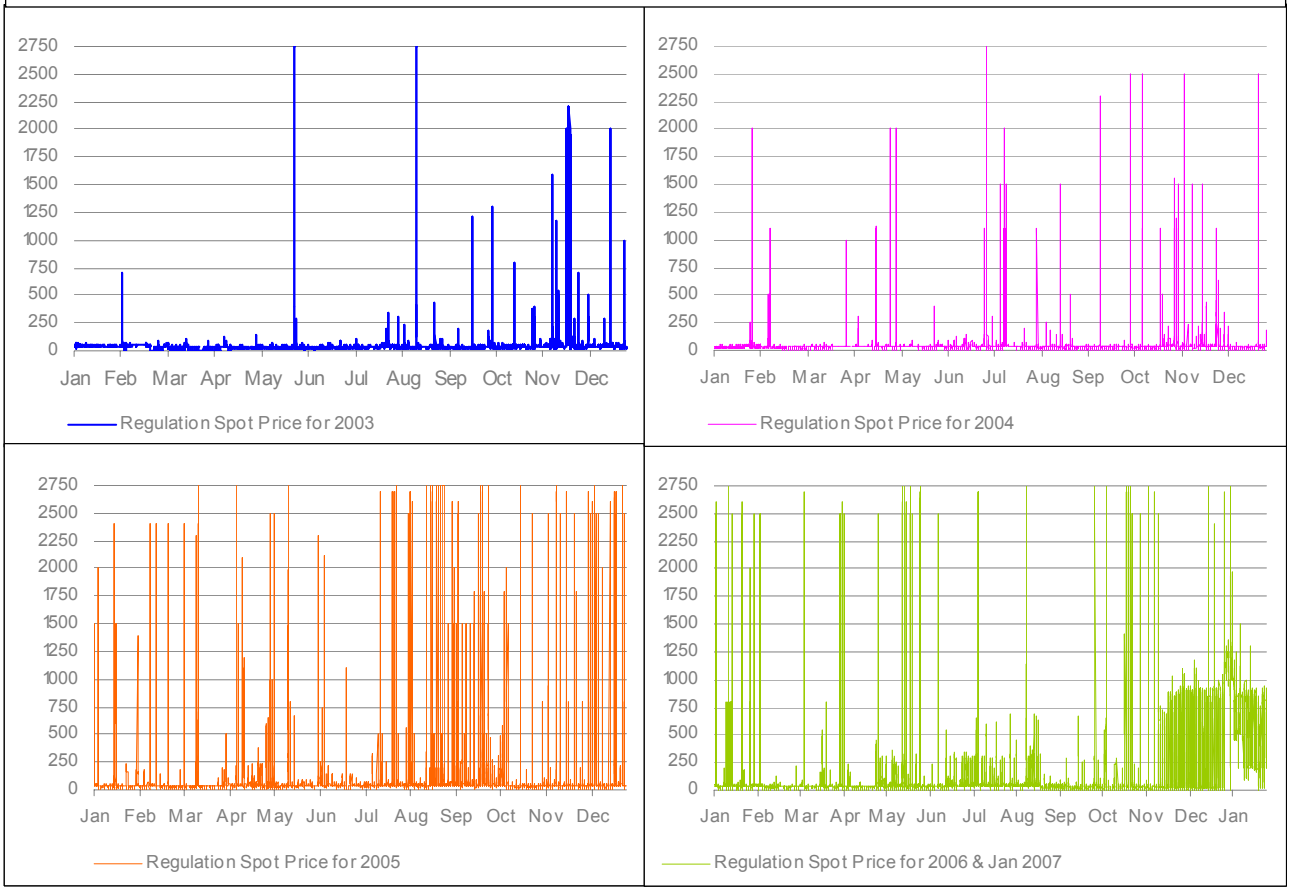
18. The price distribution curve in Chart 2 shows that regulation prices in general have become more disperse since market start until September 2006. Although the median for regulation prices remained at between $20/MWh and $30/MWh prior to the high regulation prices in October 2006, this percentage dropped from a peak of nearly 70 percent in 2004 to around 44 percent between January and September 2006.

19. For the review period, the price distribution curve also shows deviation from the past, with the median for regulation prices shifting to more than $100/MWh. In fact, only 8.2 percent of the regulation prices during the review period fell into the $20/MWh to $30/MWh price range.



20. Charts 3a to 3d indicate that regulation prices have become increasingly volatile since market start. Chart 3d also shows that from the end of 2006 to early 2007, there was a concentration of higher prices, which deviated from historical performance.

Chart 3a to 3d: Volatility of Regulation Prices since Market Start in 2003



21. In summary, although average prices and volatility have generally increased in the regulation market since market start in 2003, the price pattern during the review period deviated from the trends which were observed prior to that period.

OBSERVATIONS AS TO SUPPLY CONDITIONS

22. Given that the high regulation prices only emerged in October 2006, the MSCP has for the purpose of this investigation used supply data starting from April 2006 for supply comparison and analysis. The three supply conditions comprising plant outages, regulation offer quantities and regulation offer price are considered below.

a. Plant Outages

23. As shown in Table 2, with the exception of January 2007, there was in general no significantly higher level of total planned outages for regulation providers (i.e. combined cycle gas turbines ('CCGTs') and steam turbines) during the review period. The average level of planned outages for such facilities was 609.2MW between April 2006 and September 2006 compared to 518.1MW during the review period.

24. However, the MSCP noticed a substantial jump in CCGT planned outages to more than 800MW in January 2007 compared to less than 400MW between April and December 2006. This was the highest number recorded since market start and involved three CCGTs.

Table 2: Planned Outages by Types, April 2006-January 2007

	Planned Outages (MW)		
	ST	CCGT	Total
Apr-06	1052.15	305.37	1357.52
May-06	806.54	397.13	1203.67
Jun-06	858.05	218.48	1076.53
Jul-06	741.10	240.00	981.10
Aug-06	1390.67	258.19	1648.86
Sep-06	700.72	341.99	1042.72
Oct-06	610.94	390.11	1001.05
Nov-06	583.24	245.93	829.17
Dec-06	658.77	391.13	1049.90
Jan-07	459.68	805.23	1264.90
Total:	7861.86	3593.56	11455.42

b. Regulation Offer Quantities

25. Table 3 shows the average regulation offer quantities between April 2006 and January 2007 that meet the conditions for providing regulation specified in the market rules.

26. Based on historical price behavior, two major factors which had caused high regulation prices were:

a. Low energy demand – During periods of low energy demand, the quantity of energy that generation units are scheduled to dispatch may drop. This may result in the generation units failing to meet their respective regulation minimum condition and therefore not be selected to provide regulation;

b. Commissioning of new generation units – During its commissioning, a generation unit can provide energy but not regulation. Assuming no increase in energy demand, with the greater competition to provide energy, which the commissioning unit introduces, this means that the quantity of energy that other generation units are scheduled to dispatch may drop. This may again result in these other generation units failing to meet their respective regulation minimum condition and therefore not be selected to provide regulation.

In both the above cases, a reduction in the total regulation offer quantity can be expected, leading to high regulation prices.

Table 3: Regulation Offers in MW, April 2006-January 2007

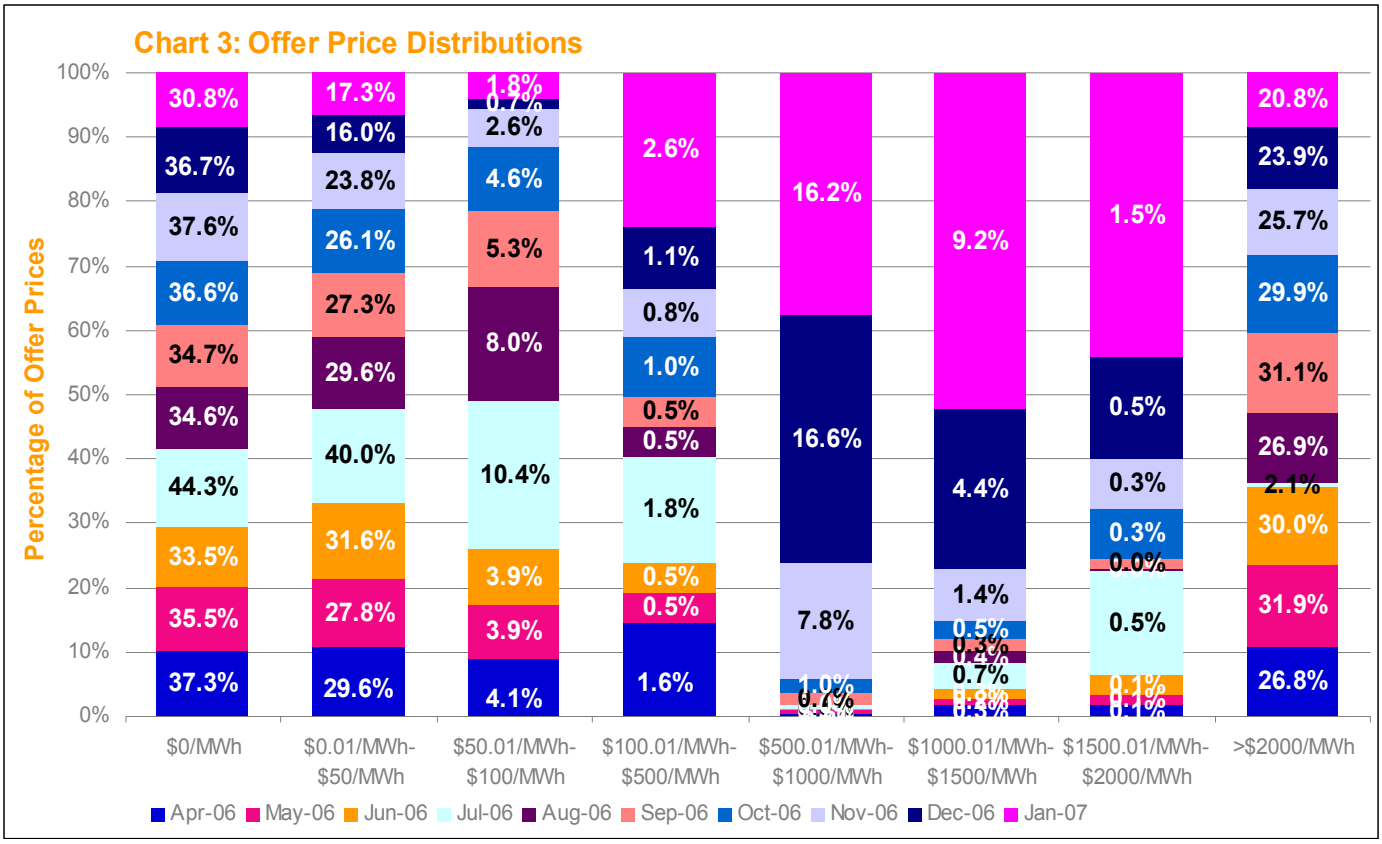
	Regulation Offers (MW)	
	Total	**Average**
Apr-06	265,419	184.32
May-06	285,378	191.79
Jun-06	276,701	192.15
Jul-06	205,882	138.36
Aug-06	273,465	183.78
Sep-06	290,786	201.93
Oct-06	283,196	190.32
Nov-06	267,190	185.55
Dec-06	284,181	190.98
Jan-07	274,312	184.35
Total:	2,706,510	184.35

27. Although the review period coincided with low energy demand in some periods and the commissioning of a new CCGT unit, Table 3 shows that the quantities of regulation on offer during the review period were not significantly lower. In fact, the lowest supply figure was recorded in July 2006, which was outside of the review period.

c. Regulation Offer Prices

28. Our analysis of regulation offer price behaviour showed that supply patterns were quite similar between April 2006 and September 2006, as can be seen from Chart 3. However, this changed dramatically beginning from October 2006, with higher average regulation offer prices observed. The following changes in offer patterns during the review period compared to the period between April 2006 and September 2006 were also observed:

    a. In general, the proportion of offers in the lower price range of $0.01/MWh to $100/MWh and the extremely high price range of more than $2000/MWh had dropped;
    b. The proportion of offers falling within the $100.01/MWh to $2000/MWh price range had increased.



d. Summary

29. In summary, the analysis of supply conditions shows that the level of planned outages and quantities of regulation offered generally did not deviate from historical trends during the review period.

30. The only exception was the higher than previously seen level of planned outages for CCGTs in January 2007. This contributed to offers in the $0/MWh price range falling to their lowest level of 30.8 percent in January 2007 compared to 33.5 to 44.3 percent between April 2006 and December 2006.

31. However, the pricing of regulation offers had changed during the review period. There was a significant shift in capacity which was historically offered at either the $0.01/MWh to $100/MWh price range or the exceeding $2000/MWh price range, to the $100.01/MWh to $2000/MWh price range.

REASONS FOR HIGH REGULATION PRICES

32. Based on our above analysis, the high regulation prices during the review period were the result of the following:

    a. Regulation offers particularly those at the lower price bands ($0.01/MWh to $100/MWh) and the extremely high price band (more than $2000/MWh) were converging at the $100.1/MWh to $2000/MWh price band;

b. This had led to more regulation prices clearing at the higher $100.1/MWh to $2000/MWh price band compared to the lower price band of $0.01/MWh to $100/MWh and extremely high price band of more than $2000/MWh;

c. The maintenance of up to three CCGT plants worsened the supply condition in January 2007 as capacity offered at $0/MWh dropped significantly to 30.8 percent from an average of 36.8 percent between April 2006 and December 2006.

MARKET EFFICIENCY

33. Under the market rules, the role of the MSCP is to assess if the underlying structure of the wholesale electricity markets is consistent with the efficient and fair operation of a competitive market. The MSCP considered this question with regard to the regulation market performance during the review period.

34. The MSCP's observations are set out in the following paragraphs.

a. Energy Supply Cushion

35. The average supply cushion for energy has been declining from a high of 26.4 percent in 2003 to 23.6 percent in 2006.

36. The supply cushion measures spare capacity available after dispatch. It indicates the amount of capacity available to meet additional demand or sudden drop in supply such as outages.

37. As the supply cushion declines, the capacity set aside for reserve and regulation to meet any imbalances between load and supply will become more valuable. A declining supply cushion can therefore be expected to give rise to increasing reserve and regulation prices.

b. Planned Outages

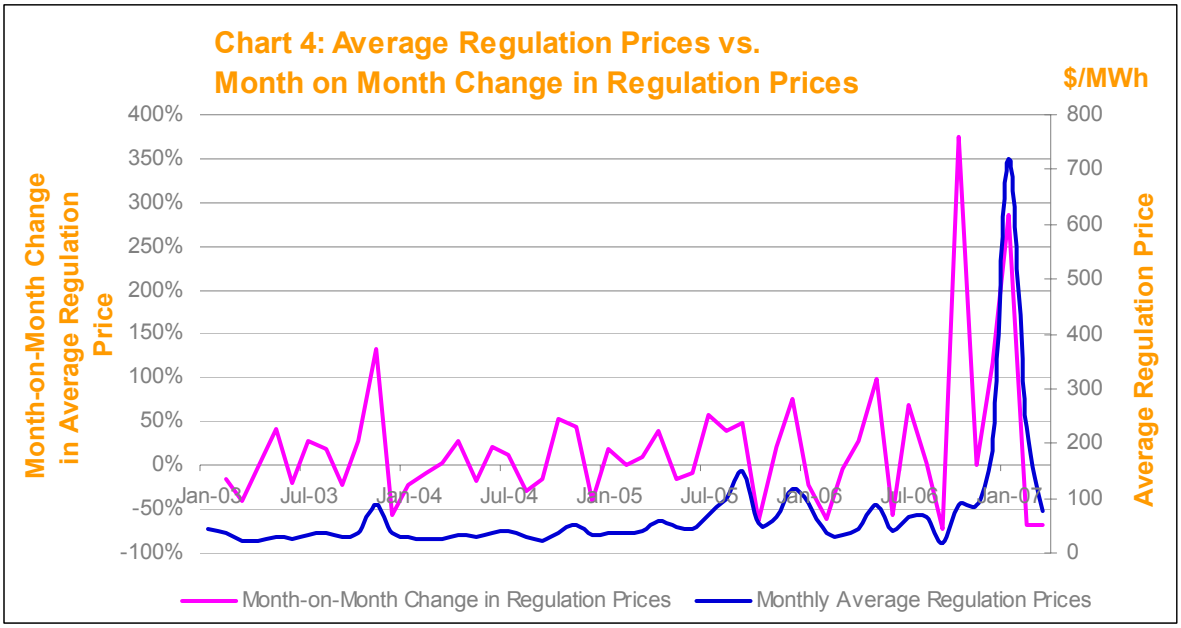
38. With the all-time high level of CCGT planned outages in January 2007, it was also conceivable that prices would be higher than usual in January 2007.

39. Nonetheless, January was only one of the months during the review period. Higher regulation prices had been observed since October 2006.

c. Magnitude and Speed of Change of High Prices

40. Since market start, it has not been unusual to observe big movements in average regulation prices even on a monthly basis. As shown in Chart 4, the month-on-month change in regulation prices can swing between about negative 50 to 150 percent prior to the high regulation prices in October 2006.

41. However, it is also clear from Chart 4 that during the review period, the high prices had deviated from the normal trend observed historically, both in terms of the magnitude of change and the speed at which changes occurred.

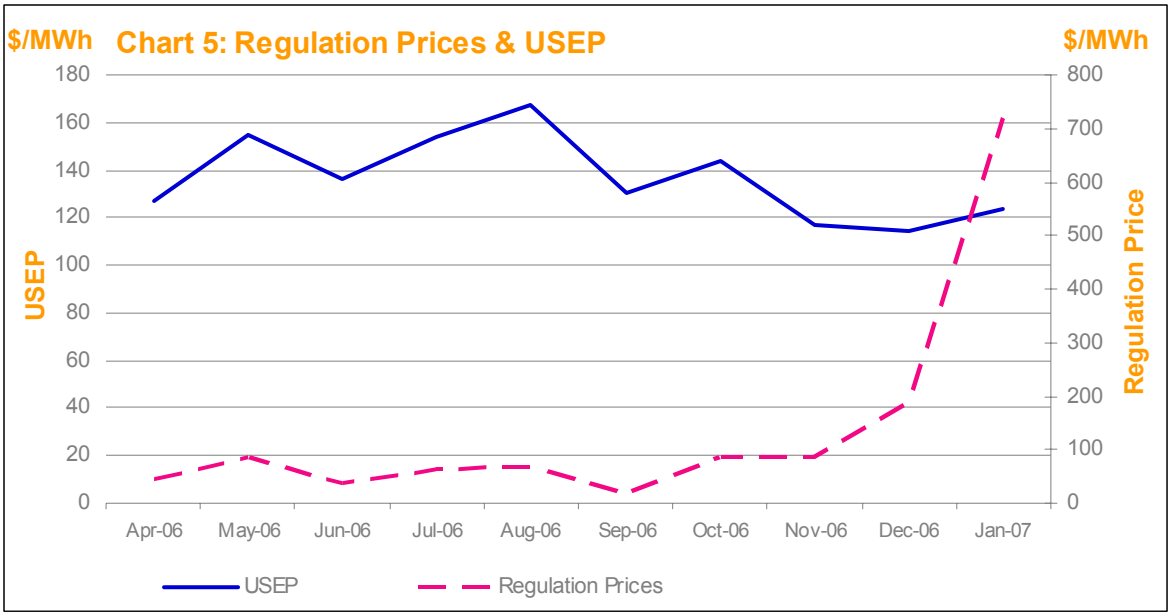


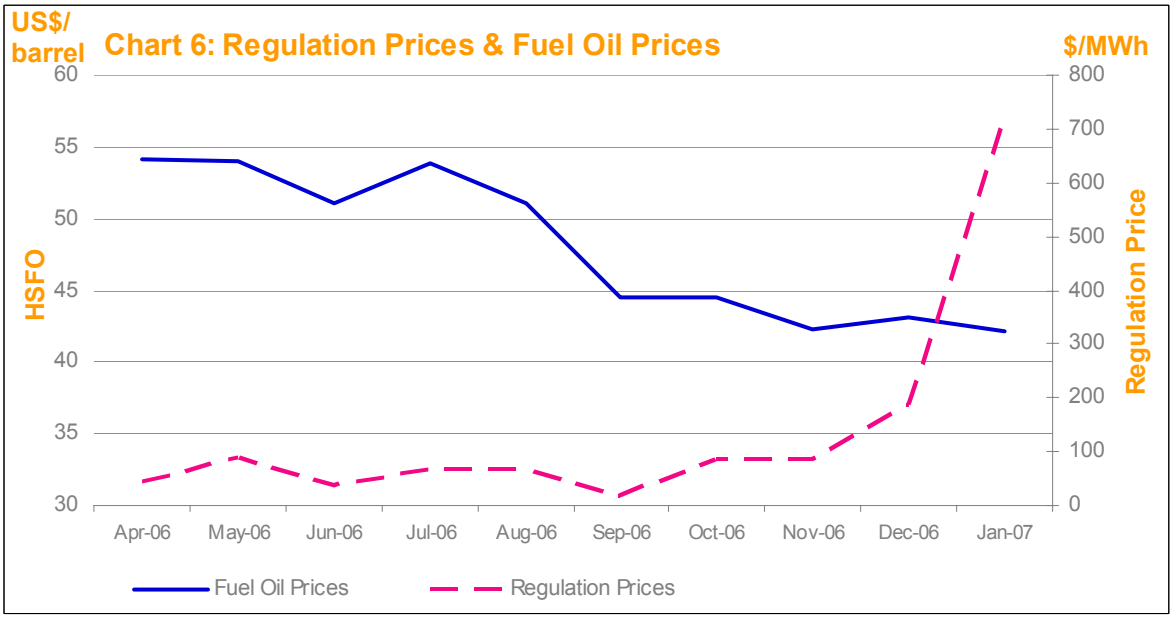
d. Energy Prices and Fuel Cost

42. Since hitting a high of $167.4/MWh in August 2006, the average energy price (Uniform Singapore Energy Price or USEP) has been generally lower as shown in Chart 4 below. The declining fuel cost and energy demand in some periods were the primary reasons behind the lower USEP.

43. The prices for High Sulphur Fuel Oil ('HSFO') (see Chart 5), the most relevant fuel reference price for generation companies in Singapore, dropped from an average of US$51.4 a barrel between April and September 2006 to an average of US$43 a barrel during the review period.

44. However, unlike energy prices, the regulation price performance during the review period did not reflect the performance of the underlying fuel oil fundamental.





e. Offer Prices

45. The increasing regulation offer prices between the $100.01/MWh and $2000/MWh price range since October 2006 was mainly responsible for the higher average prices during the review period.

f. Market Reaction to Regulator Announcement on 9 February

46. Around the time when the EMA informed market players on 9 February 2007 that it was investigating the high regulation prices, the MSCP observed a significant drop in the regulation prices as shown in Chart 7, Table 4 and Table 5.

47. The following price trends were observed:

a. ***Area A (1 to 8 February 2007)*** – In February, prior to the EMA's announcement, almost 98 percent of the regulation price still cleared at between $100.01/MWh and $1000/MWh as the percentage of offers between $100.01/MWh and $2000/MWh remained high at 30.9 percent;

b. ***Area B (9 to 16 February 2007)*** – This period coincided with the EMA's announcement of an investigation into the high regulation prices. Although occasional price spikes were still observed, most regulation prices cleared at less than $100/MWh. This was accompanied by changes in offer prices as the percentage of offers between $100.1/MWh and $2000/MWh dropped to 23.7 percent;

c. ***Area C (17 to 28 February 2007)*** – The return of a CCGT unit previously on planned maintenance helped reduce volatility as the average regulation price dropped to $79.6/MWh with the percentage of prices cleared below $100/MWh strengthening to 80 percent;

d. ***Area D (1 to 10 March 2007)*** – The total capacity of regulation offered dropped to an average of 174MW (see Table 5) as up to three CCGT s were on planned maintenance during this period. This led to higher price volatility. However, the average regulation price was lower as the percentage of offers at less than $100/MWh continued to strengthen.

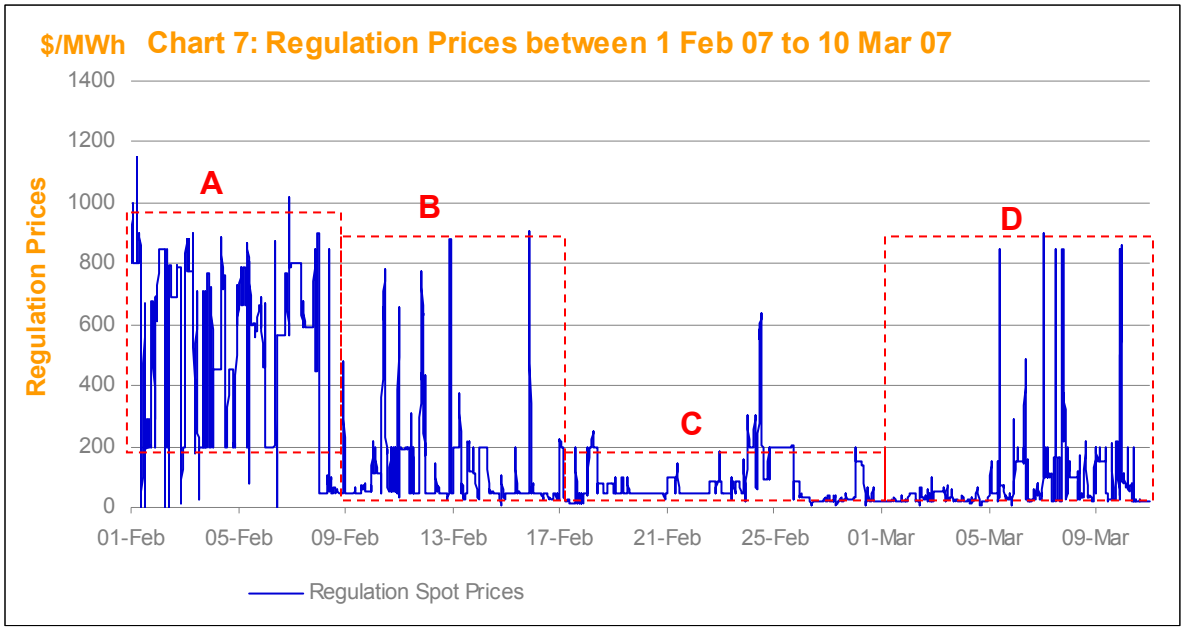


Table 4: Regulation Price Pattern between 1 February-10 March 2007

	Regulation Price ($/MWh)			
	Area A	**Area B**	**Area C**	**Area D**
Average Regulation Price	499.8	110.8	79.6	75.5
Maximum Regulation Price	1150.0	900.0	628.1	900.0
% of Prices in the $0/MWh to $100/MWh Range	13.28%	69.27%	80.03%	81.04%
% of Prices in the $100.01/MWh to $2000/MWh Range	86.72%	30.73%	19.97%	18.96%

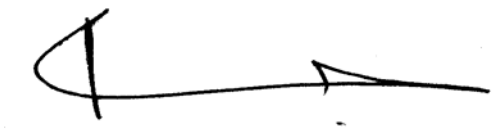
Table 5: Regulation Offer Pattern between 1 February-10 March 2007

	Regulation Offers			
	Area A	**Area B**	**Area C**	**Area D**
Average Regulation Offer Quantity	198.2	192.0	201.2	174.9
% of Offers in the $0/MWh to $100/MWh Range	48.68%	52.93%	51.44%	53.42%
% of Offers in the $100.01/MWh to $2000/MWh Range	30.88%	23.71%	25.51%	23.61%

CONCLUSION

48. Having regard to the above, in our view, the regulation price performance during the review period indicates that the current regulation market structure warrants closer review.

49. Given that the regulator EMA has informed the industry that it is investigating the high regulation prices, the MSCP notes that this matter is receiving the requisite attention.



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