MAG-MMAR-2012-03

MONTHLY MARKET ASSESSMENT REPORT

For the Billing Period 26 February to 25 March 2012

PHILIPPINE ELECTRICITY MARKET CORPORATION

MARKET ASSESSMENT GROUP (MAG)

List of Figures

List of Tables

Monthly Market Assessment Report

This report assesses the results of the integrated Luzon and Visayas market operation for the period 26 February to 25 March 2012 and how the market performed compared with the previous billing period and the same billing period last year.

Supply and Demand Situation

A notable increase in the monthly average system demand[1] (ex-ante) was seen during the period in review as it went up by 5.2 percent (345 MW) from the previous billing period and 8.2 percent (533 MW) from the same billing period last year. The hourly demand ranged from a minimum of 5,211 MW to a maximum of 8,695 MW *(Table 1)*. The maximum demand, which occurred on March 8, 2012 at trading interval 1400H, showed a modest increase of 2.3 percent from the previous billing period brought about by hotter weather this summer season. The average mean temperature in Luzon increased by 3.3 percent from the previous billing period *(Table 2)*. Likewise, the maximum demand continued to grow year-on-year as it registered a 5.8 percent growth from the same billing period last year. Examining the demand of Luzon and Visayas, the average demand of both regions increased compared with the previous billing period and same billing period last year *(Table 3)*.

Similarly, the monthly average system supply[2] showed a slight increase from the previous billing period by 1.3 percent (8,707 MW to 8,818 MW) and same billing period last year by 2 percent (8,70743 MW to 8,818 MW) *(Table 1).* The system supply during the billing period ranged from 7,242 MW to 9,522 MW. With lower capacity offers, the average regional supply in Luzon decreased by 1.4 percent (7,252 MW to 7,383 MW) from the previous billing period *(Table 4)*. On the other hand, the average supply in Visayas increased significantly by 16 percent from the previous billing period's average supply of 1,537 MW *(Table 4).* Compared with same billing period last year, the average supply in Visayas went up by 10.5 percent as new coal plants PEDC and KSPC started joining the WESM in March 2011.

In general, there was an adequate supply margin during the billing period, averaging 1,800 MW with minimum of 35 MW and maximum of 3,647 MW. This was, however, lower by 11.5 percent (average of 234 MW) and 16.6 percent (average of 358MW) than the previous billing period and same billing period last year *(Table 1)*, which was due to higher demand during the current billing period.

[1] The system demand is equal to the total scheduled MW of all load resources in Luzon and Visayas plus losses.
[2] The supply is equal to the total offered capacity of all generator resources in Luzon and Visayas adjusted for any security limit provided by the System Operator. Other constraints considered during MMS simulation such as generator offered ramp rates may result to lower supply.

Figure 1. Demand and Supply (Ex-ante), March 2012

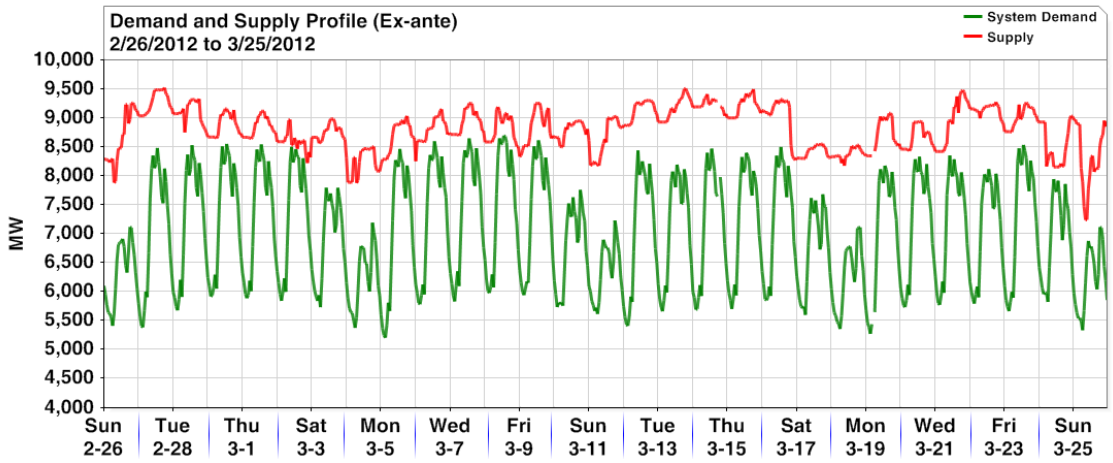


Table 1. Demand and Supply Summary (Ex-ante), March 2012, February 2012, and March 2011

	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	8,695	5,211	7,018	8,500	4,785	6,673	8,220	4,746	6,485	2.3	8.9	5.2	5.8	9.8	8.2
Supply	9,522	7,242	8,818	9,482	7,604	8,707	9,641	6,930	8,643	0.4	(4.8)	1.3	(1.2)	4.5	2.0
Supply/Demand Variance	3,647	35	1,800	4,187	188	2,034	3,535	286	2,158	(12.9)	(81.5)	(11.5)	3.2	(87.9)	(16.6)

Note: The derived values were non-coincident.

Table 2. Regional Temperature[3], March 2012, February 2012, and March 2011

Mean Temperature	March 2012 (°C)			Febuary 2012 (°C)			March 2011 (°C)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luzon	31	27	28	30	26	27	30	26	28	3.3	3.8	3.7	3.3	3.8	0.0
Visayas	29	26	27	28	24	26	30	24	27	3.6	8.3	3.8	(3.3)	8.3	0.0

Table 3. Regional Demand Summary (Ex-ante), March 2012, February 2012, and March 2011

	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luzon	7,403	4,449	5,947	7,198	4,077	5,652	6,971	4,038	5,485	2.8	9.1	5.2	6.2	10.2	8.4
Visayas	1,370	762	1,070	1,346	665	1,024	1,307	690	1,000	1.8	14.6	4.5	4.8	10.4	7.1

Note: The derived values were non-coincident.

Table 4. Regional Supply Summary (Ex-ante), March 2012, February 2012, and March 2011

	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luzon	7,922	5,674	7,281	8,075	6,317	7,383	8,096	5,644	7,252	(1.9)	(10.2)	(1.4)	(2.1)	0.5	0.4
Visayas	1,706	1,369	1,537	1,606	1,005	1,325	1,630	1,132	1,391	6.2	36.1	16.0	4.7	21.0	10.5

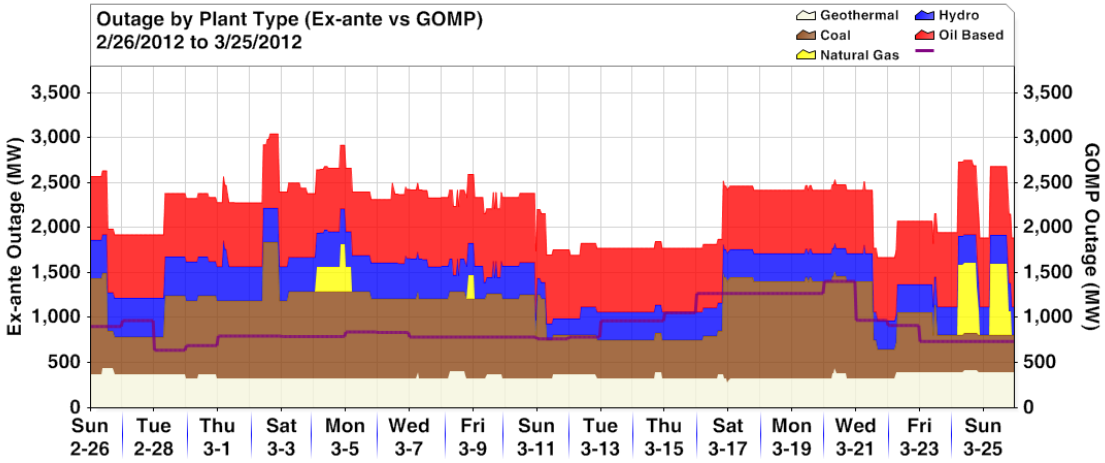
Note: The derived values were non-coincident.

[3] Regional temperature (Average Mean Temperature) is based on weather underground website. Luzon temperature is based on Manila station while Visayas temperature is based on Cebu station.

Plant Outages

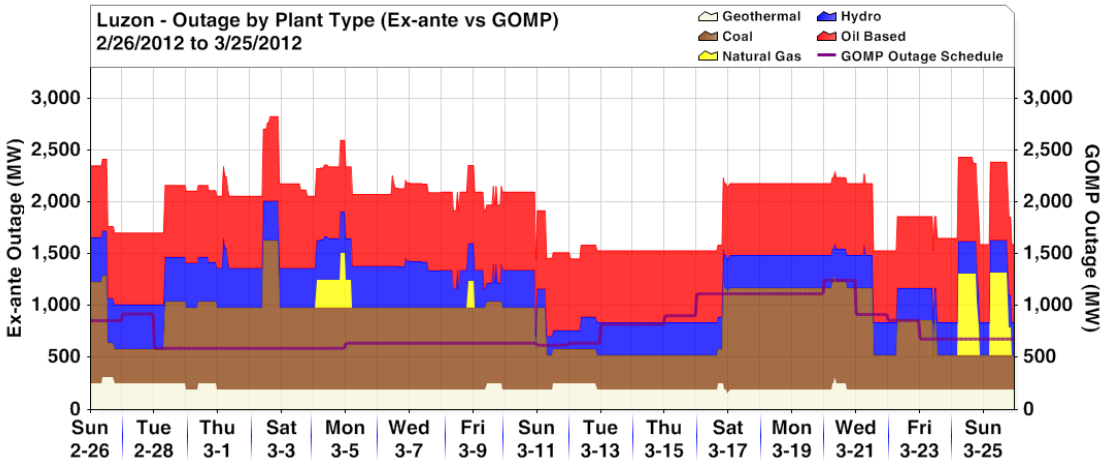
Figure 2 shows the system capacity on outage by plant type during the billing period, averaging 2,229 MW. The maximum capacity on outage of 3,047 MW occurred on March 2, 2012 during trading intervals 1600H to 2200H. On the other hand, the minimum capacity on outage was registered at 1,672 MW in several trading intervals on March 21 and 22, 2012.

Figure 2. Plant Capacity on Outage, March 2012



The monthly average capacity on outage in Luzon during the billing period was lower by 9.4 percent than the previous billing period *(Table 5)*. The capacity on outage posted an average of 1,976 MW, ranging from 1,454 MW to 2,825 MW. The highest capacity on outage in Luzon coincided with the highest system-wide outage capacity. Coal plants registered the highest outage capacity with an average of 708 MW followed by oil based plants with 661 MW. Meanwhile, natural gas plants had the lowest average outage capacity with 47 MW.

Figure 3. Plant Outage Capacity, March 2012- Luzon



The current billing period showed a higher level of capacity on outage in Luzon vis-a-vis the capacity on outage based on the NGCP-SO's CY2012 Grid Operating and Maintenance Program (GOMP) (shown in Table 6) due to the occurrence of forced and unplanned outages. It was also observed that several power plants such as Angat A 1, San Roque 2, and Sta. Rita 3, although not included in the GOMP, were declared to be on planned outage by NGCP-SO.

Table 5. Luzon Regional Outage Summary (Ex-ante), March 2012, February 2012, and March 2011

Resource Type	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	1,436	330	661	1,766	330	708	977	0	267	(18.7)	0.0	(6.7)	47.0		147.9
Natural Gas	794	0	47	1,759	0	74	521	0	85	(54.8)		(36.8)	52.6		(45.1)
Geothermal	316	158	210	312	253	253	474	312	348	1.3	(37.6)	(16.9)	(33.4)	(49.4)	(39.5)
Hydro	664	179	342	654	249	451	171	95	103	1.6	(28.1)	(24.1)	288.2	88.2	231.4
Oil Based	872	692	716	752	692	694	382	312	338	16.0	0.0	3.1	128.3	121.8	111.8
TOTAL	2,825	1,454	1,976	3,558	1,704	2,181	1,945	719	1,141	(20.6)	(14.7)	(9.4)	45.2	102.2	73.2

Note: The derived values by resource type were non-coincident. The total values were derived based on aggregate hourly outage.

Table 6. Luzon Regional Outage Summary (GOMP), March 2012, February 2012, and March 2011

Resource Type	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Jan - Feb 2012)			% Y-on-Y Change (Feb 2011 - Feb 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	330	0	80	789	330	493	330	0	295	(58.2)	(100.0)	(83.8)	139.1		67.3
Natural Gas	0	0	0	529	0	178	263	0	209	(100.0)		(100.0)	101.0		(14.8)
Geothermal	204	121	156	196	84	139	259	182	195	4.1	44.2	12.0	(24.4)	(53.9)	(28.5)
Hydro	645	332	426	415	185	284	617	304	421	55.5	79.9	50.3	(32.8)	(39.3)	(32.6)
Oil Based	120	0	116	360	0	154	70	0	60	(66.7)		(24.9)	414.3		157.0
TOTAL	1,248	593	778	2,091	745	1,248	1,438	819	1,179	(40.3)	(20.5)	(37.7)	45.4	(9.0)	5.8

Note: The derived values by resource type were non-coincident. The total values were derived based on aggregate hourly outage.

Table 7 lists the outages of hydro, coal, and oil based plants in Luzon with outage duration of 3 or more consecutive days during the billing period. Hydro plant San Roque 2 was unavailable starting March 12 due to the conduct of turbine inspection. Meanwhile, hydro plants Bakun 1 and 2, Binga 1 and Angat Main 2, which are already out before the billing period, remain on outage during the billing period. The other hydro plants Angat Main 1, Binga 2 and Kalayaan 2, which were also on outage prior to the billing perios, went back online during the billing period.

There was no occurrence of planned outage of coal plants in Luzon since the planned outage of Calaca 2 based from the GOMP did not push through. However, forced outages of coal plants occurred during the billing period, which includes Calaca 2, Sual 1 and 2, and QPPL.

On the other hand, oil-based plant Limay 3 experienced forced outage during the billing period while Limay 2, Limay 4, and Malaya 1 remained on outage in the entire period.

Table 7. Major Plant Outages, March 2012 - Luzon

Plant/Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Remarks
Hydro Plants					
Angat A 3	6	3/4/2012 4:03	3/7/2012 10:07	3.3	Tripping of unit transformer number 3
Angat M 1	50	10/7/2011 0:01	2/29/2012 16:57	145.7	Repair of concrete foundation at lower bracket
Binga 2	26	1/6/2012 7:08	3/6/2012 21:06	60.6	Replacement of Main Transformer
Kalayaan 2	180	2/1/2012 09:48	3/10/2012 22:30	38.5	Tripped as generator due to upper guide bearing high meal temperature
Angat A 1	6	3/7/2012 00:01			Bus cable replacement
Angat M 2	50	5/24/2011 0:01			APMT
San Roque 2	133	3/12/2012 8:51			Annual turbine inspection
Bakun 1	38	11/23/2011 0:01			Total plant shutdown due to tunnel rehabilitation
Bakun 2	38	11/23/2011 0:01			Total plant shutdown due to tunnel rehabilitation
Binga 1	26	1/6/2012 7:03			For refurbishment until August 1 2012
Coal Plants					
Sual 2	647	2/23/2012 5:07	2/26/2012 11:30	3.3	Tripped due to sudden closure of governor valve number 3.
Sual 2	647	3/16/2012 0:01	3/21/2012 12:53	5.5	Boiler tube leak
QPPL	459	2/28/2012 7:15	3/10/2012 22:05	11.6	Leak at Main Stop Valve
Calaca 1	330	8/29/2011 22:15			Emergency shutdown due to suspected reheater leak.
Oil based Plants					
Limay 3	60	3/6/2012 11:25	3/12/2012 0:01	5.53	Failed to synchronize due to fire protection relay activated
Limay 2	60	1/6/2012 16:01			Non-availability of programmable processor
Limay 3	60	3/23/2012 12:03			Aborted start-up due to flue gas leak at diverted damper drain pipe
Limay 4	90	4/15/2011 6:43			Generating bearing trouble
Malaya 1	300	8/15/2011 13:19			High furnace pressure

Visayas capacity on outage *(Figure 4)* was dominated by geothermal plants with an average capacity on outage of 137 MW followed by the coal plants with 102 MW. The average capacity on outage in Visayas during the billing period was greater by 24.3 percent and 192.6 percent than the previous billing period and the same billing period last year. The highest capacity on outage was registered on March 3-4, 2012.

Figure 4. Plant Capacity on Outage, March 2012 - Visayas

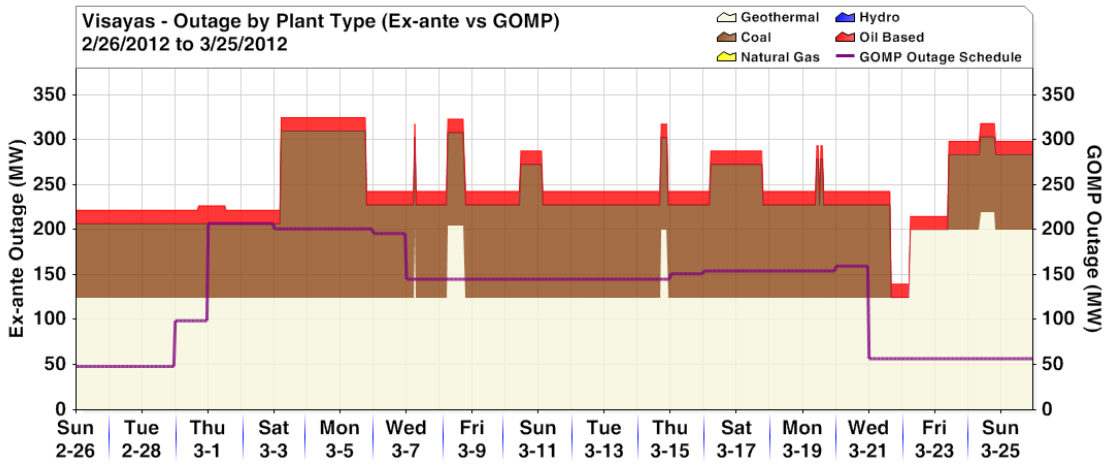


Table 8. Visayas Regional Outage Summary (Ex-ante), March 2012, February 2012, and March 2011

Resource Type	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	185	0	102	464	0	91	51	0	13	(60.1)		11.1	264.2		705.2
Geothermal	220	125	137	169	50	97	150	0	0	30.1	152.5	40.9	46.6		50,244
Hydro	0	0	0	0	0	0	0	0	0						
Oil Based	20	15	15	26	15	15	89	55	74	(23.1)	0.0	(2.0)	(77.4)	(72.7)	(79.5)
TOTAL	325	140	254	604	96	204	216	55	87	(46.2)	46.6	24.3	50.5	154.5	192.6

Note: The derived values by resource type were non-coincident. The total values were derived based on aggregate hourly outage.

Table 9. Visayas Regional Outage Summary (GOMP), March 2012, February 2012, and March 2011

Resource Type	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Jan - Feb 2012)			% Y-on-Y Change (Feb 2011 - Feb 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	154	0	83	127	0	86	0	0	0	21.1		(2.7)	#DIV/0!		
Geothermal	43	38	39	38	0	22	38	0	4	14.4		77.0	14.4		861.1
Hydro	0	0	0	0	0	0	5	0	0				(100.0)		(100.0)
Oil Based	16	5	10	47	6	23	11	6	6	(66.0)	(16.7)	(54.3)	45.5	(9.1)	82.8
TOTAL	207	49	132	210	11	130	48	6	10	(1.1)	340.9	1.6	330.1	781.8	1,212.0

Note: The derived values by resource type were non-coincident. The total values were derived based on aggregate hourly outage.

Table 10 shows the major plant outages in Visayas during the billing period. The coal plant CEDC 3, which was placed on outage in the previous billing period (as classified by NGCP-SO as planned outage although not included in the GOMP), synchronized back to the grid on March 3, 2012. Meanwhile, Kepco Salcon 1 and PEDC 1 experienced forced outages.

Table 10. Major Plant Outages, March 2012 - Visayas

Plant/Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Remarks
Geothermal Plants					
Mahanagdong B1	7	2/19/2012 3:01			Steam supply deficiency
Malitbog 2	75	3/22/2012 6:21			Generator Overcurrent
Upper Mahiao 3	37.5	2/13/2012 7:47			Steam supply deficiency
Leyte 1	31	1/27/2012 8:05			Due to high vibration
NNGPP	49.5	7/1/2011 0:11			To conduct plant rectification
Coal Plants					
CEDC 3	82	2/18/2012 1:04	3/5/2012 18:26	16.72	Under prventive maintenance
Kepco Salcon 1	103	3/3/2012 2:38	3/21/2012 15:55	18.55	Boiler tube leak
PEDC 1	83.7	3/23/2012 9:59			Tripped due to excessive pressure at boiler furnace

Market Price Outcome

While there was an increase in system demand and a modest decrease in supply, the monthly average market price[4] during the billing period of PhP4,498/MWh increased significantly by 32.8 percent (by PhP1,112/MWh) compared with the previous billing period. Likewise, this was higher by 85 percent (by PhP2,066/MWh) than the same billing period last year. The maximum price during the billing period was registered at PhP40,917/MWh on March 8 trading interval 1100H while the minimum price was recorded at PhP1,035/MWh on March 10 trading interval 0700H. Highly notable was the escalation in maximum price of 120.6 percent from previous billing periods PhP18,551/MWh.

High prices were observed on February 28-March 2 and March 5-9 when tightness in the supply and demand condition occurred resulting, among others, from the outage of coal plants QPPL, Kepco Salcon 1 and CEDC 3. The forced outage of another coal plant Sual 1

[4] The market prices were represented by the following: (i) ex-ante load weighted average price (LWAP) for trading intervals without pricing error during ex-ante, (ii) ex-post LWAP for trading intervals with pricing error during ex-ante but without pricing error during ex-post, (iii) LWAP based on the market re-run result for trading intervals with pricing error both during ex-ante and ex-post, (iv) administered price for loads for trading intervals under market intervention, and (v) estimated load reference price (ELRP) for trading intervals where the ERC-approved Price Substitution Mechanism (PSM) was applied.

on March 2 (0925H-2130H) had severed the supply condition during the peak hours of the trading day causing the prices to spike as high as PhP40,523/MWH. As discussed earlier, the system demand was highest on March 8 and was seen to have contributed to the price spikes during the trading day.

Lower prices (mostly below PhP5,000/MWh) were observed during the rest of the billing period which had a better supply and demand condition.

Figure 5. Market Price Trend, March 2012

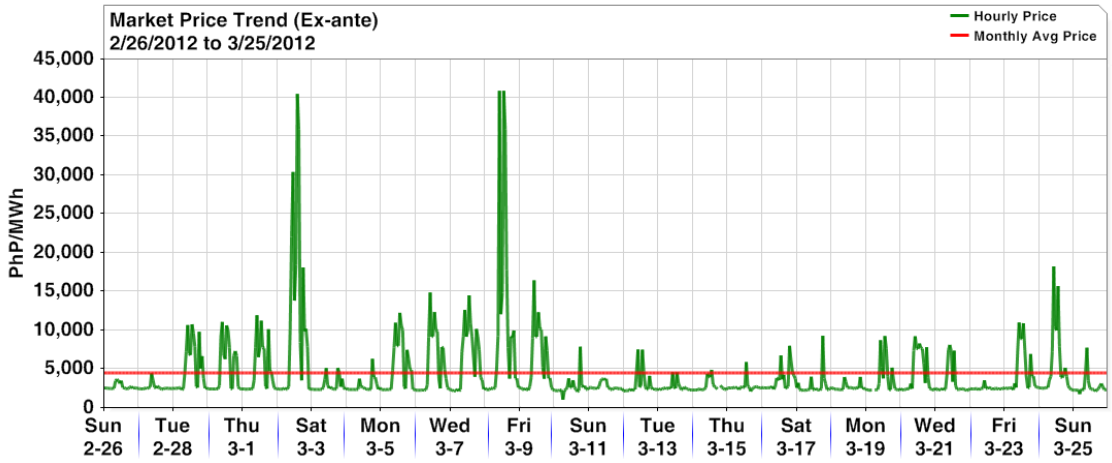


Figure 6. Market Price Trend - Luzon, March 2012

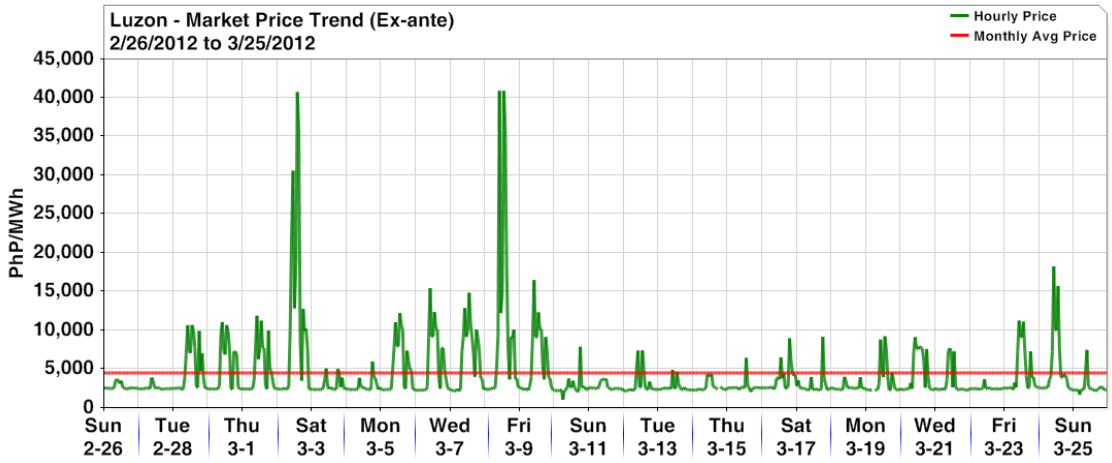
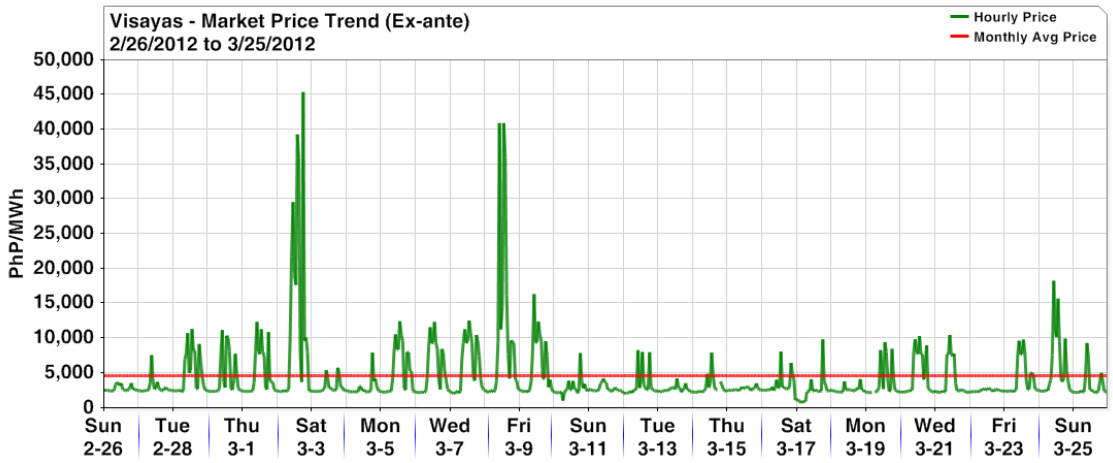


Figure 7. Market Price Trend - Visayas, March 2012



Comparing the regional prices from the previous billing period, the average prices increased by 34.7 percent (PhP3,324/MWh to PhP4,476/MWh) in Luzon and 23.9 percent (PhP3,734/MWh to PhP4,625/MWh) in Visayas *(Table 11)*.

Table 11. Market Price Summary, March 2012, February 2012, and March 2011

	March 2012 (PhP/MWh)			February 2012 (PhP/MWh)			March 2011 (PhP/MWh)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Viz	40,917	1,035	4,498	18,551	0	3,386	15,550	0	2,432	120.6		32.8	163.1		85.0
Luzon	40,917	1,035	4,476	18,575	0	3,324	17,285	0	2,380	120.3		34.7	136.7		88.1
Visayas	45,380	726	4,625	18,417	0	3,734	9,477	0	2,721	146.4		23.9	378.8		70.0

The price distribution in figure 8 shows the price movements during the billing period compared with previous billing period and same billing period last year. Lower occurrence of prices at PhP2,000.0/MWh and below was observed during the billing period compared with the other billing periods. Consequently, higher occurrence of prices above PhP2,000/MWh was seen during the billing period. *(Table 12)*

Figure 8. Market Price Distribution, March 2012, February 2012, and March 2011

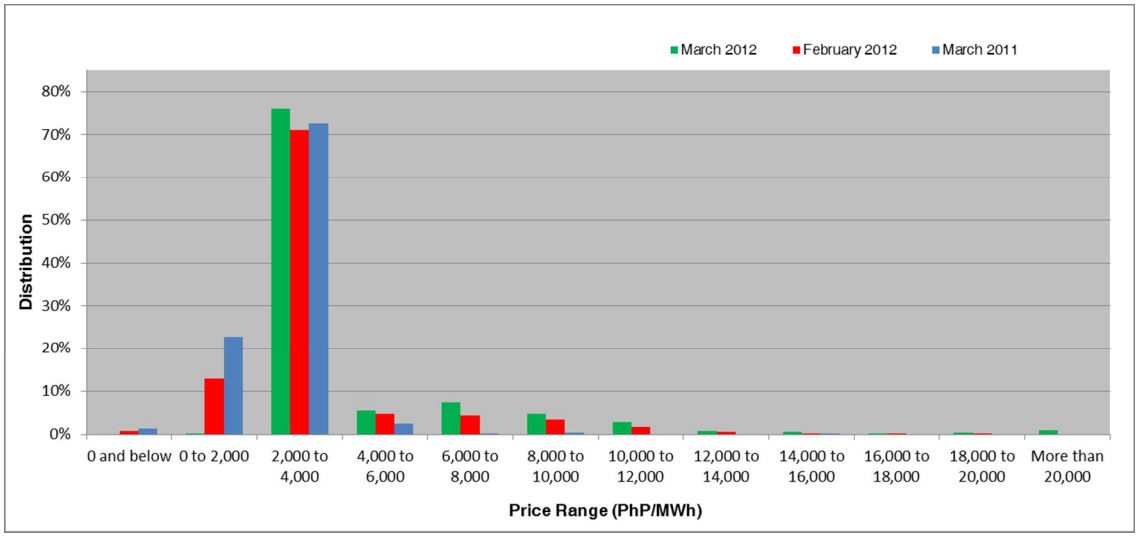


Table 12. Market Price Distribution, March 2012, February 2012, and March 2011

Price Range (PhP/MWh)	% Distribution		
	March 2012	February 2012	March 2011
0 and below	0.0	0.8	1.3
0 to 2,000	0.3	12.9	22.7
2,000 to 4,000	76.1	71.1	72.5
4,000 to 6,000	5.5	4.8	2.5
6,000 to 8,000	7.3	4.3	0.3
8,000 to 10,000	4.8	3.4	0.4
10,000 to 12,000	2.9	1.7	0.0
12,000 to 14,000	0.9	0.5	0.0
14,000 to 16,000	0.6	0.1	0.1
16,000 to 18,000	0.3	0.1	0.0
18,000 to 20,000	0.4	0.1	0.0
More than 20,000	1.0	0.0	0

Comparing the regional prices, there was slight difference in the maximum prices in Luzon and Visayas for the current and previous billing periods. All billing periods have higher average prices in Visayas than Luzon. The differences in regional average prices in the current and previous billing periods were generally brought about by regional application of pricing error notices (PEN). On the other hand, the regional price differences in the same billing period last year were brought about by HVDC constraints.

Table 13. Regional Price Summary, March 2012, February 2012, and March 2011

	Luzon (In PhP/MWh)			Visayas (In PhP/MWh)			% Difference		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
March 2012	40,917	1,035	4,476	45,380	726	4,625	(9.8)	42.6	(3.2)
February 2012	18,575	0	3,324	18,417	0	3,734	0.9		(11.0)
March 2011	17,285	0	2,380	9,477	0	2,721	82.4		(12.5)

High Price Analysis

Market prices above PhP15,000/MWh occurred on March 2, 8, 9, and 24, 2012. These trading intervals are shown in table 14 with corresponding Reserve Margin Index[5] (RMI).

[5] Reserve Margin Index (RMI) calculates the percent difference of the offered capacity and the demand, including the reserve operating reserve requirement. However, the co-optimization of energy and reserve is not yet implemented.

Table 14. Hourly Price and Reserve Margin Index

Date	Trading Interval	Hourly Price (PhP/MWh)	RMI Ex-ante (%)	RMI Ex-post (%)
3/2/2012	11	22,050	-0.04	0.09
3/2/2012	12	30,443	3.16	2.89
3/2/2012	14	18,471	1.04	0.94
3/2/2012	15	40,523	1.20	-0.23
3/2/2012	16	35,895	3.02	3.28
3/2/2012	19	18,103	3.20	3.79
3/8/2012	11	40,917	4.29	4.08
3/8/2012	14	40,914	2.99	1.51
3/8/2012	15	35,918	3.15	2.41
3/8/2012	16	17,816	4.52	4.67
3/9/2012	11	16,445	5.83	5.36
3/24/2012	11	18,254	5.17	4.96
3/24/2012	14	15,715	5.50	5.67

March 2, 2012, 1100H to 1200H and 1400H to 1600H

During the trading date, the Market Operator (MO) issued pricing error notices (PEN) when the system experienced undergeneration (*generation deficiency*) at trading intervals1200H during ex-ante, and 1100H, 1400H-1500H during ex-ante and ex-post. Likewise PENs were issued during intervals with prices above PhP18,000/MWh due to the constraints violations in Meralco interchange substations in Zapote and Balintawak. The high prices occurred when the RMIs were relatively low (certain intervals had negative RMIs) further worsened by ramp limited offers of certain generators like San Roque and Limay A and B. The supply declined considerably when Sual 1 went on forced outage from 0925H to 2130H severely affecting the prices in trading intervals with higher demand.

March 8, 2012, 1100H and 1400H to 1600H

Highest market price was registered at trading interval 1100H (PhP40,917/MWh) while demand peaked at 8,695 MW at interval 1400H during the trading date. System demand drove the high price in the 4 trading intervals along with the derated capabilities of Pagbilao CFTPP[6], especially during peak hours (1000H to 1700H), ramp limited offers of San Roque HEP, and outages of 3 units of Leyte A. Market prices during 1100H and 1400H to 1500H were derived from PSM due to line congestions. PSM during 1100H and 1400H was due to the congestion of Bauang ‘D BPPC 230kV line while interval 1500H was due to the congestion at New Naga- Quiot 138kV line.

The total MRU schedule of 258 MW along with the demand dip at trading intervals 1500H and 1600H may have slightly helped the price to go down. Limay A and B were designated

[6] Pagbilao 1 was derated to 320 MW from trading intervals 1000 to 2400H while Pagbilao 2 was operated to 364 MW from intervals 0900H to 1700H

as MRUs due to system voltage requirements while the MRU designation of Bacman G01 was due to its commercial operation requirement (Commissioning Test).

March 9, 2012, 1100H

Ex-ante pricing errors were issued during the trading date except for intervals 0200H-0300H and 0600H-0700H brought about by the constraints violations in Meralco load interchange substations in Araneta, Zapote and Balintawak. The market prices of trading intervals with pricing errors during ex-ante were derived from ex-post prices. The lowest RMI during the trading date occurred at trading interval 1100H with 5.83 and 5.36 during ex-ante and ex-post, respectively, that affected the price to become PhP16,445/MWh.

March 24, 2012, 1100H and 1400H

While trading intervals 1100H and 1400H of March 24 had the lowest demand among the trading intervals with high prices, RMIs were registered below 6 percent in both ex-ante and ex-post. The observed tight demand and supply condition especially during intervals 1100H and 1400H was due mainly to the outage (annual preventive maintenance) of the Sta. Rita Ð Calaca 230kV line 1 (0635H to 1819H), which consequently limited the generation of Sta. Rita 1 and 4, and San Lorenzo 1 (about 160 MW to 170 MW) during trading intervals 1100H to 1800H as contingency measures imposed by NGCP-SO. Also, Sta. Rita 2 and 3, and San Lorenzo 2 were placed on shutdown to give way to the said line outage.

Pricing Errors and Market Intervention

The summary of the issuance of PEN, PSM application, and market intervention events is shown in Table 15.

The market results showed a significant increase in pricing errors in Luzon with 63.4 percent of the time or in 472 trading intervals *(from 30.9% or 230 trading intervals from the previous* billing *period)* during the ex-ante process. The 242 additional occurrences of pricing errors were mostly off-peak hours due to the prevalent constraints in Meralco interchange substation in Araneta starting March 3, 2012. The constraint in the Araneta substation was brought about by the outage of its transformer T03. Likewise, the continuous violation of the constraints (N-1) requirement at MERALCO interchange substations in Zapote and Balintawak was still present during the billing period. Meanwhile, system-wide pricing errors were issued in 6 trading intervals due to base case constraint at Palinpinon GPP transformer 2 and PEDC transformer 3, undergeneration *(generation deficiency)* conditions, and inconsistencies in security limit in Bacman G02 which resulted to a constraint violation in Bacman transformer 4.

The ex-post market results, on the other hand, indicated system-wide pricing errors in 9 trading intervals likewise due to undergeneration *(generation deficiency)* conditions and input data concerns in Maasin, Tabago, and Makban loads. On the other hand, market intervention was initiated twice by the Market Operator (MO) due to Market Management System (MMS)- related problems on March 14, 2012 trading interval 1900H and March 19, 2012 trading interval 0600H.

During ex-ante, the PSM was applied for the whole system (Luzon and Visayas) in 12 trading intervals due to constraint violations on several transmission lines as shown in table 16.

Table 15. PEN, PSM and MI Summary, March 2012

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	6	0.8	472	63.4		-	478	64.2
PEN (RTX)	9	1.2		-		-	9	1.2
PSM (RTD)	12	1.6		-		-	12	1.6
PSM (RTX)	2	0.3		-		-	2	0.3
MI	2	0.3		-		-	2	0.3

Note: The column "Total" refers to the total number of trading intervals with PEN, PSM or MI (system-wide or regional)

Table 16. PSM Component, March 2012

Price Separation Methodology (PSM) (Ex-Ante)	
Congestion	**No. of Trading Intervals**
Constraint on New Naga - Quiot 138 kV line	3
Calauan - Makban 230 kV line	3
Bauang - BPPC 230 kV line	3
Constraint violation on New Naga - Quiot 138kV line. Constraint on New Naga - Cebu 138 kV line	1
Constraint on San Jose 750 MVA transformers	1
Constraint on Leyte - Cebu branch group	1
Total	**12**

Figure 9 and Table 17 show the correlation of the hourly prices and demand in March 2012 and the previous billing period and same billing period last year. In general, all billing periods showed positive relationship between price and demand although the level of significance is not that strong. With respect to prices above PhP10,000/MWh, the relationship diminished considerably especially during the same billing period last year due to minimal occurrence of prices above PhP10,000/MWh. This indicated that the high prices in the current and previous billing periods were not primarily driven by demand but rather by capacity offers, offer prices and outages.

Figure 9. Market Price Distribution, March 2012, February 2012, and March 2011

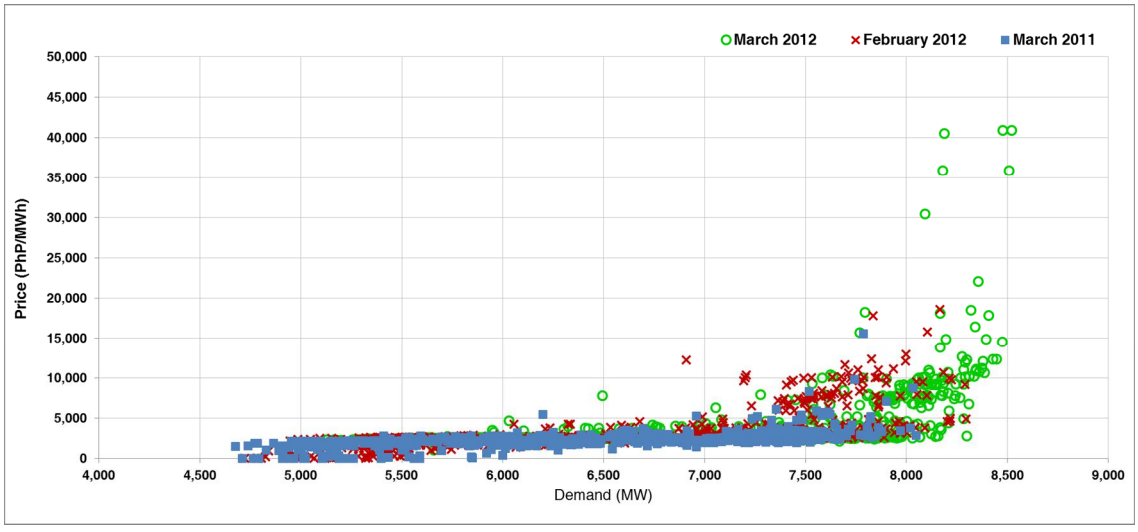


Table 17. Price and Demand Relationship, March 2012, February 2012, and March 2011

	March 2012	February 2012	March 2011	% M-on-M Change	% Y-on-Y Change
All Prices	0.5227	0.6009	0.5481	(13.0)	(4.6)
Prices >= PhP10,000	0.2173	0.3039		(28.5)	

HVDC Scheduling

During the billing period, constraints in the HVDC occurred only in relevant trading intervals (three during ex-ante and five during ex-post) when the transfer capability of the HVDC was set by NGCP-SO to 100 MW (March 16 trading interval 2400H to March 17 trading interval 0400H) due to hotspot correction of Tayabas 600 MVA transformer 3 *(Table 18)*.

In the previous billing period, constraint in the HVDC occurred on February 23 when the transfer capability of the HVDC was set by NGCP-SO to zero (trading intervals 1200H-1600H, 1800H-1900H during ex-ante and trading intervals 1100H-1800H during ex-post). While NGCP-SO still manages the scheduling of the HVDC flow, constraint in the HVDC occurred at about 46 percent and 50 percent of the ex-ante and ex-post runs, respectively, of the same billing period last year. It was on April 29, 2011 when the free-flow of HVDC was implemented. *(Tables 19 to 20)*

Table 18. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), March 2012

Results of HVDC Scheduling	HVDC Limit during Ex-ante (Visayas/Luzon)			HVDC Limit during Ex-post (Visayas/Luzon)		
	(No. of Trading Intervals)			(No. of Trading Intervals)		
	100/100	150/440	Total	100/100	150/440	Total
Visayas to Luzon	**5**	**648**	**653**	**5**	**657**	**662**
Limit Not Maximized	2	648	*650*		657	*657*
Limit Maximized [1\]	3		*3*	5		*5*
Luzon to Visayas		**41**	**41**		**32**	**32**
Limit Not Maximized		41	*41*		32	*32*
Limit Maximized [1\]						
No Flow [1\]						
TOTAL	**5**	**689**	**694**	**5**	**689**	**694**

Notes: 1\ with price separation

Table 19. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), February 2012

Results of HVDC Scheduling	HVDC Limit during Ex-ante (Visayas/Luzon)					HVDC Limit during Ex-post (Visayas/Luzon)				
	(No. of Trading Intervals)					(No. of Trading Intervals)				
	0/0	150/150	150/440	440/440	Total	0/0	150/150	150/440	440/440	Total
Visayas to Luzon		**28**	**680**	**1**	**709**		**29**	**674**	**1**	**704**
Limit Not Maximized		*5*	*679*	*1*	*685*		*4*	*674*	*1*	*679*
Limit Maximized [1\]		*23*	*1*		*24*		*25*			*25*
Luzon to Visayas			**27**		**27**			**32**		**32**
Limit Not Maximized			*17*		*17*			*19*		*19*
Limit Maximized [1\]			*10*		*10*			*13*		*13*
No Flow [1\]	**7**				**7**	**7**				**7**
TOTAL	**7**	**28**	**707**	**1**	**743**	**7**	**29**	**706**	**1**	**743**

Notes: 1\ with price separation

Table 20. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), March 2011

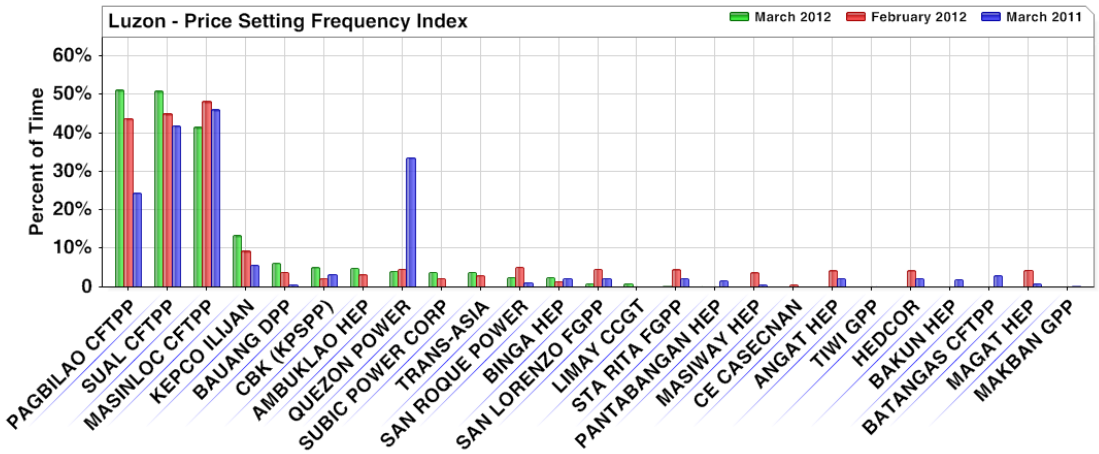
Results of HVDC Scheduling	Direction of HVDC Flow Imposed during Ex-ante				Direction of HVDC Flow Imposed during Ex-post			
	Vis to Luz	Luz to Vis	Zero Limit	Total	Vis to Luz	Luz to Vis	Zero Limit	Grand Total
HVDC Limit Not Maximized	322	38		360	300	33		333
HVDC Limit Maximized 1\	66	74		140	78	87		165
Zero HVDC Schedule 1\	85	63	21	169	95	55	21	171
TOTAL	**473**	**175**	**21**	**669**	**473**	**175**	**21**	**669**
Percent of Total Intervals	*71%*	*26%*	*3%*		*71%*	*26%*	*3%*	

Notes: 1\ with price separation

Price Setting Plants[7]

As shown in Figure 10, 16 plants from Luzon have been considered as price setters across all price levels during the billing period. The coal plants Pagbilao CFTPP (at 51%), Sual CFTPP (at 51%), and Masinloc CFTPP (at 42%), natural gas plant Kepco Ilijan (at 14%), and oil-based plant Bauang DPP (at 6%) remained the top five frequent price setters. It was noted that the Price Setter Frequency Index (PSFI) of the coal plants Pagbilao and Masinloc increased from previous months attributed to the availability of both plants during the billing period. Pagbilao and Masinloc set the price in the price range of PhP2,000/MWh to PhP4,000/MWh while Sual set the price mostly in the price range of PhP2,000/MWh to PhP5,000/MWh. Although Sual Units 1 and 2 encountered forced outages, the plant still managed to post a 51 percent PSFI.

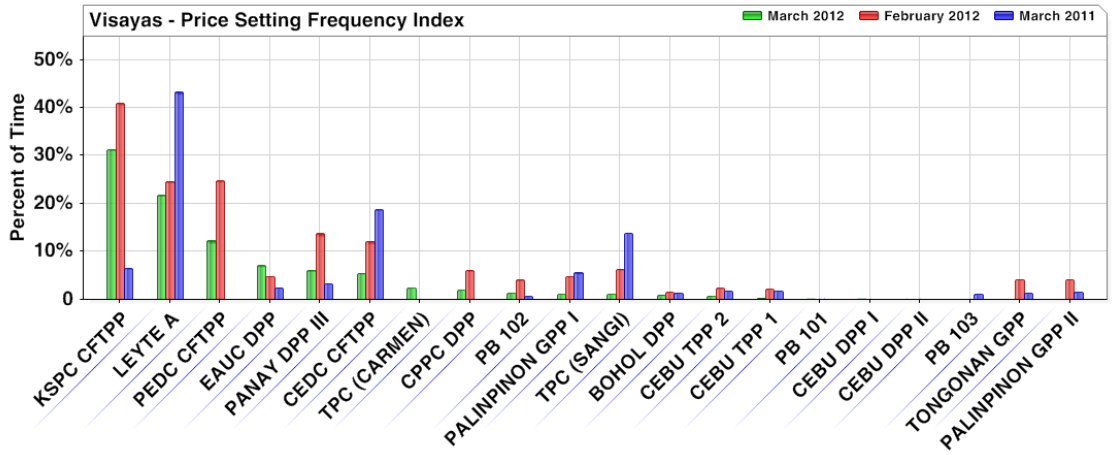
Figure 10. Price Setting Frequency Index (Luzon Plants), March 2012, February 2012, and March 2011



In Visayas *(Figure 11),* 17 plants have been considered as price setters across all price levels with coal plants KSPC (at 31%) and PEDC (at 12%), geothermal plant Leyte A (at 22%), and oil-based plants EAUC DPP (7%) and Panay DPP 3 (at 6%) as most frequent price setters. The PSFI of Visayas plants, except EAUC, declined during the billing period compared with the previous billing period.

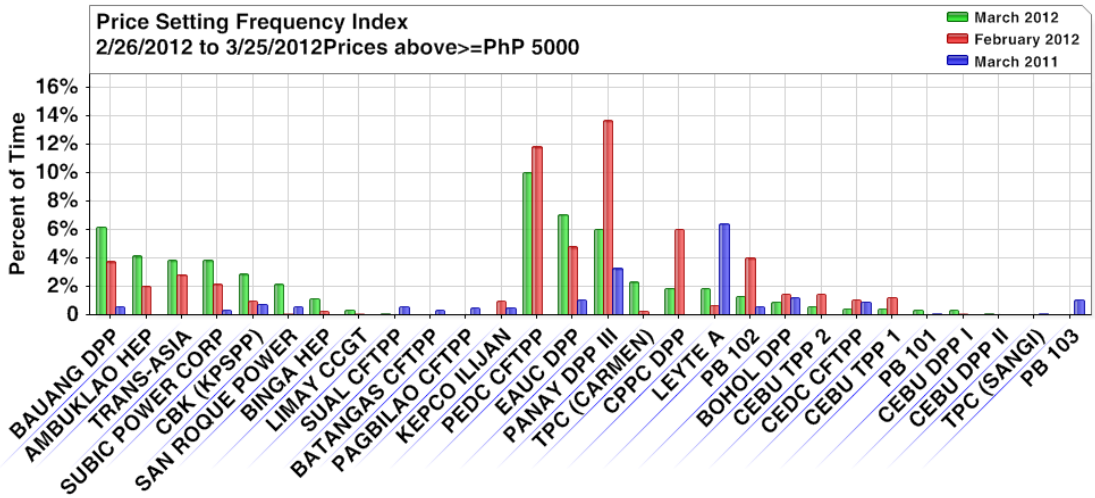
[7] A generator trading node is considered as a price setter when its last accepted offer price is between 95% to 100% of its nodal price. A generating plant is considered as price setter if at least one of its trading nodes was price setter in a given trading hour. The percentages stated in the price setting discussion represent the percent of time that a given plant was considered as price setter during the billing month.

Figure 11. Price Setting Frequency Index (Visayas Plants), March 2012, February 2012, and March 2011



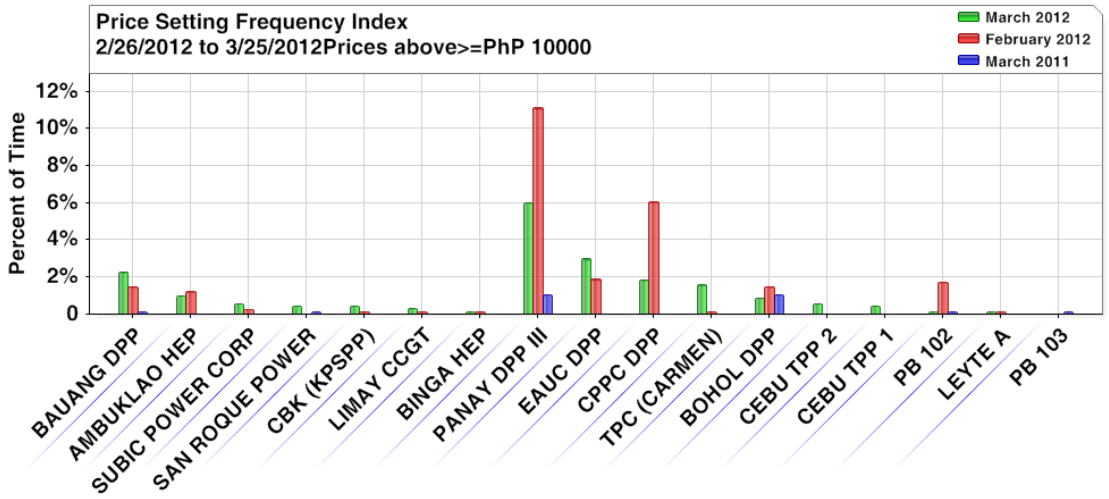
Looking at the PhP5,000/MWh and above price range, 23 plants have been considered as price setters composed of nine (9) plants from Luzon and twelve (14) plants from Visayas *(Figure 12)*. During the billing period, the oil-based plants Bauang DPP (at 6%), Trans Asia (at 4%), and Subic (at 4%) topped the price setting plants from Luzon. Meanwhile, the coal plant PEDC (10%) and oil based plants Panay DPP III (at 10%), EAUC (at 7%), and TPC Carmen (2%) topped the price setting plants from Visayas.

Figure 12. Price Setting Frequency Index (PhP5,000 and Above), March 2012, February 2012, and March 2011



The number of price setters at the price level of PhP10,000/MWh and above was reduced to 16 plants in the billing period: 7 plants from Luzon and 9 plants from Visayas *(Figure 13)*. The top 3 price setters included Panay DPP III, EAUC, and CPPC.

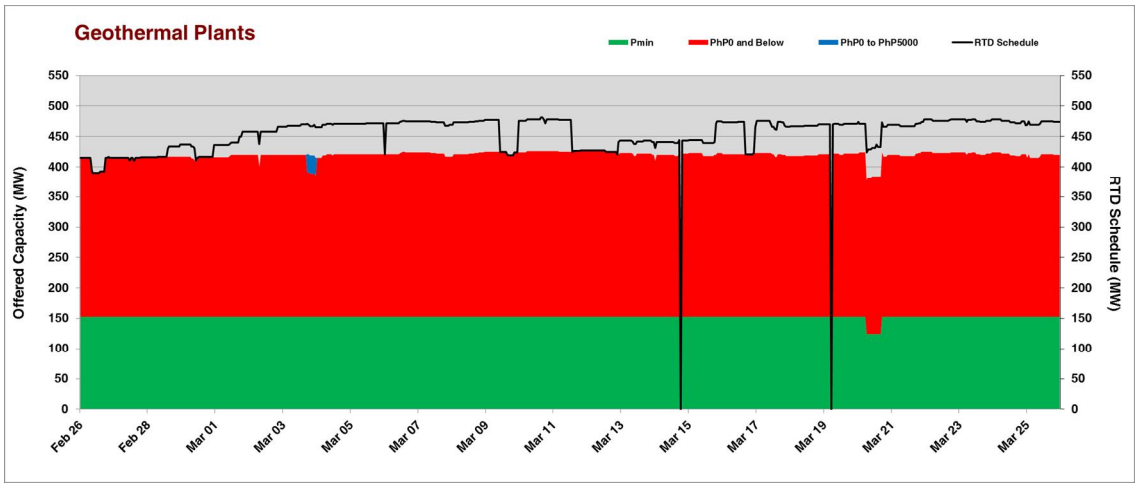
Figure 13. Price Setting Frequency Index (PhP10,000 and Above), March 2012, February 2012, and March 2011



Generator Offer Pattern

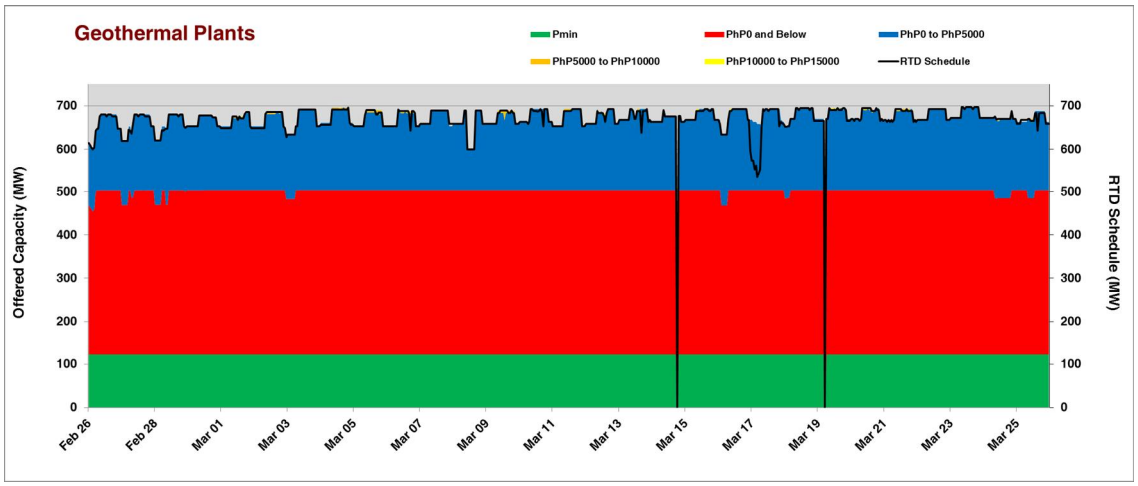
Geothermal plants in Luzon had the lowest price offer among the plant resources with offer prices of PhP0.00/MW and below *(Figure 14)*. Most of the time, the maximum offered capacity of geothermal plants in Luzon were scheduled for dispatch. It was noted that Bacman G01 was scheduled for dispatch ranging from 13 MW to 55 MW through the imposition of security limits by NGCP-SO in compliance to the commercial operation requirements (commissioning test).

Figure 14. Geothermal Plants Offer Pattern (Luzon), March 2012



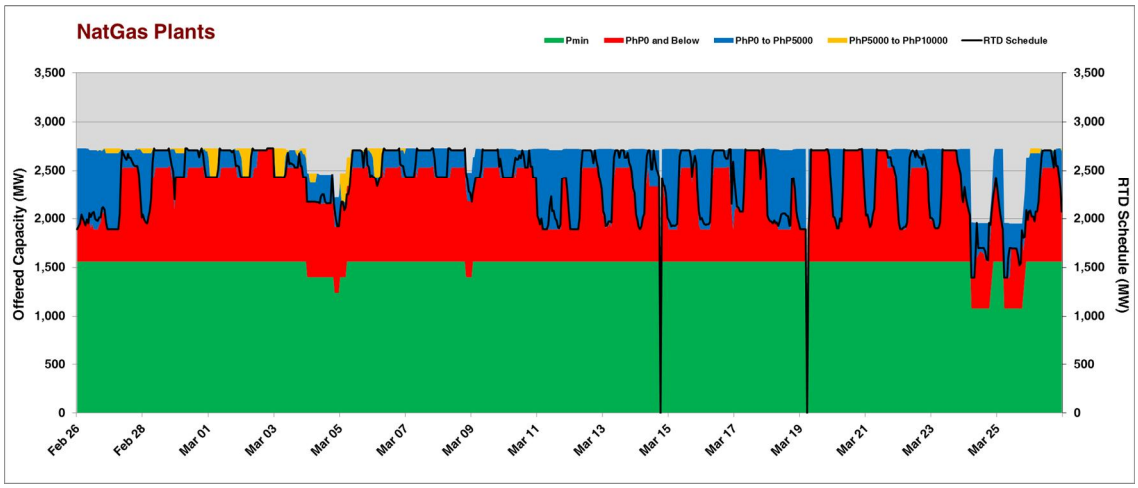
On the other hand, the offer prices of the geothermal plants in Visayas were mostly in the range of PhP0/MW to PhP5,000/MW *(Figure 15)*. Offer price reached as high as PhP10,685/MW.

Figure 15. Geothermal Plants Offer Pattern (Visayas), March 2012



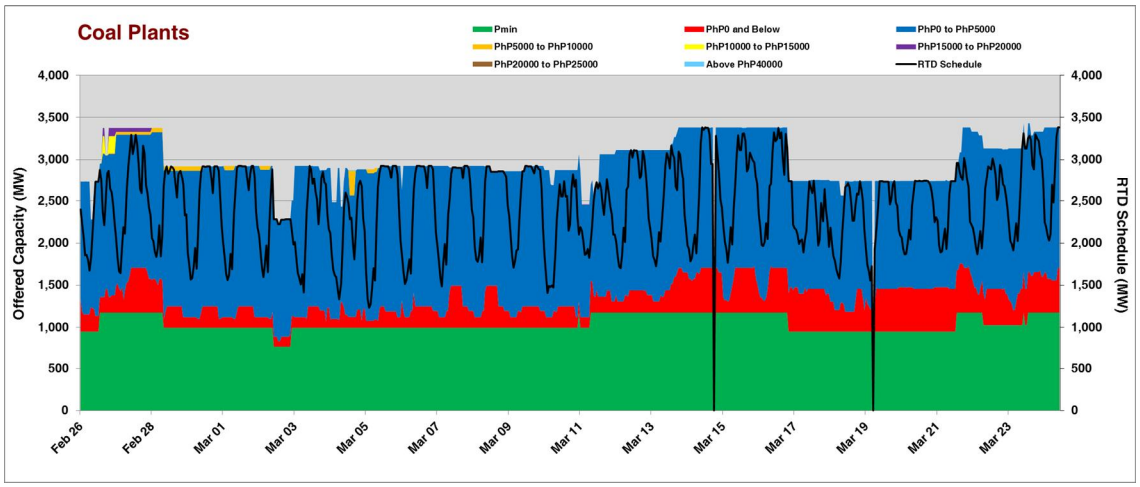
About 99.3 percent of the offered capacities (average of 2,643 MW) of natural gas plants were priced at PhP5,000/MW and below. The other 0.7 percent of the offered capacities (average of 26 MW) were priced above PhP5,000/MW *(Figure 16)*. As discussed earlier, natural gas plants had the lowest average capacity on outage, improving the level of capacity offered for the billing period with 2,662 MW, an increase of an average of 21 MW from the previous billing period.

Figure 16. Natural Gas Plants Offer Pattern (Luzon), March 2012



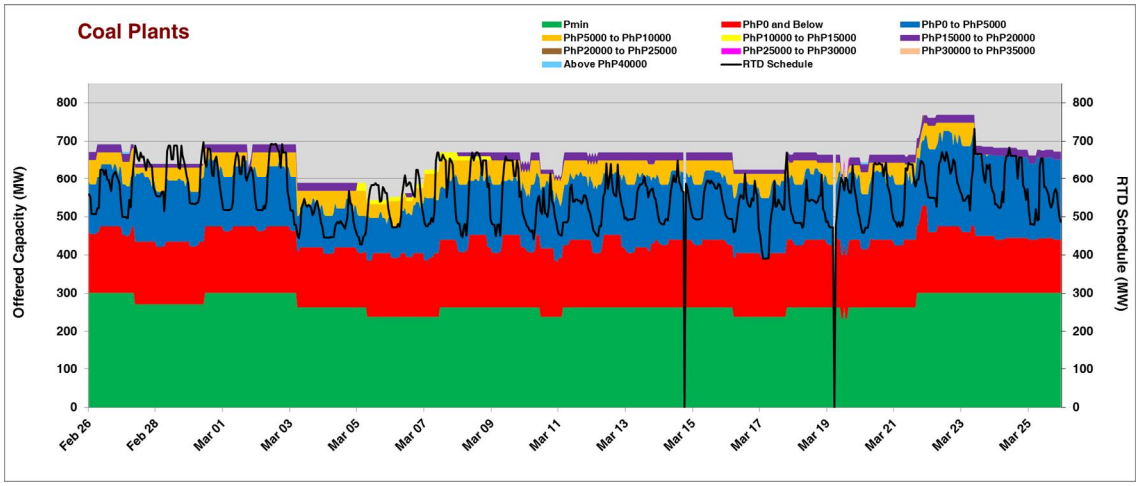
About 99.4 percent of the offered capacities of coal plants in Luzon (average of 2,979 MW) were priced at PhP5,000/MW and below *(Figure 17)*. The 6 percent decrease in coal plantsǫ outage capacity contributed to the improvement in the offer of coal plant in Luzon.

Figure 17. Coal Plants Offer Pattern (Luzon), March 2012



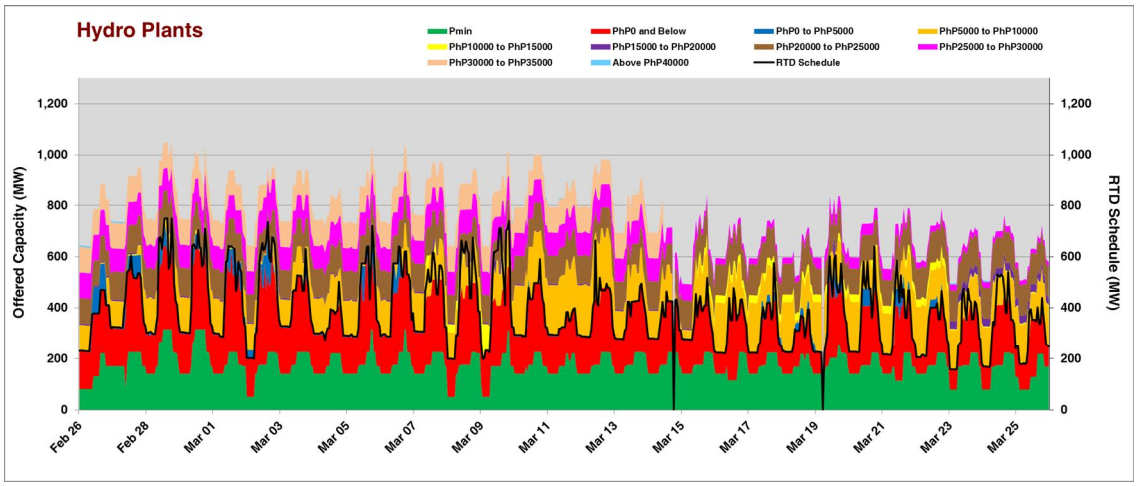
In Visayas, about 91% of the offered capacity of coal plants (average of 597 MW) were priced at PhP5,000/MW and below. The other 9% of the offered capacities (average of 59.3 MW) were priced above PhP5,000/MW, reaching as high as PhP62,000/MW in few occasions during March 20 *(Figure 18)*. Average total offered capacity slightly decline from the previous month by 15 MW due to the outages of CEDC 3, PEDC 1, and Kepco Salcon 1 during the current billing period.

Figure 18. Coal Plants Offer Pattern (Visayas), March 2012



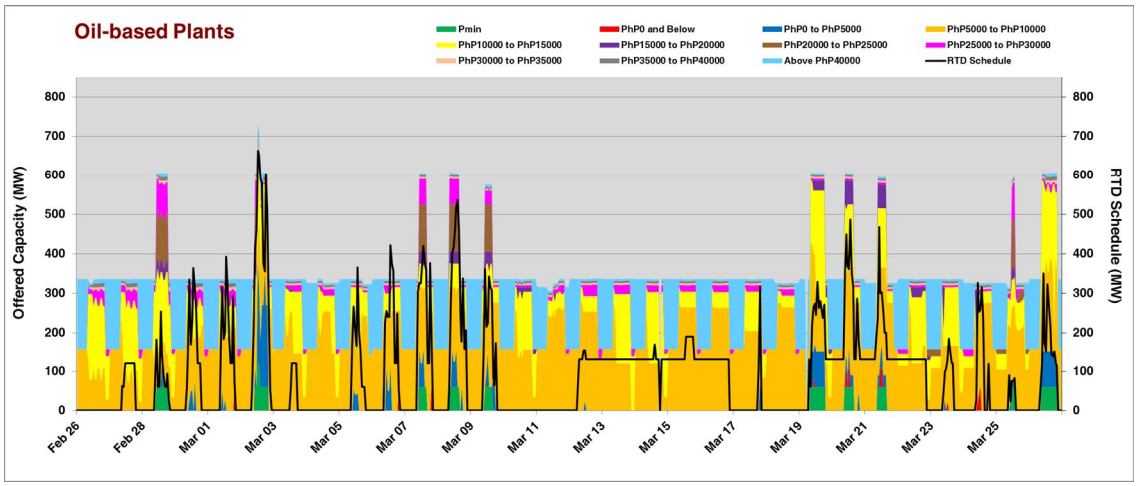
In Figure 19, the capacity and price offers of hydro plants in Luzon during the billing period remained volatile, ranging from 491 MW to 1,050 MW. Also, it was observed that 31 percent of the time, the maximum capacity was offered at a higher price range of above PhP20,000/MW to PhP35,000/MW.

Figure 19. Hydro Plants Offer Pattern (Luzon), March 2012



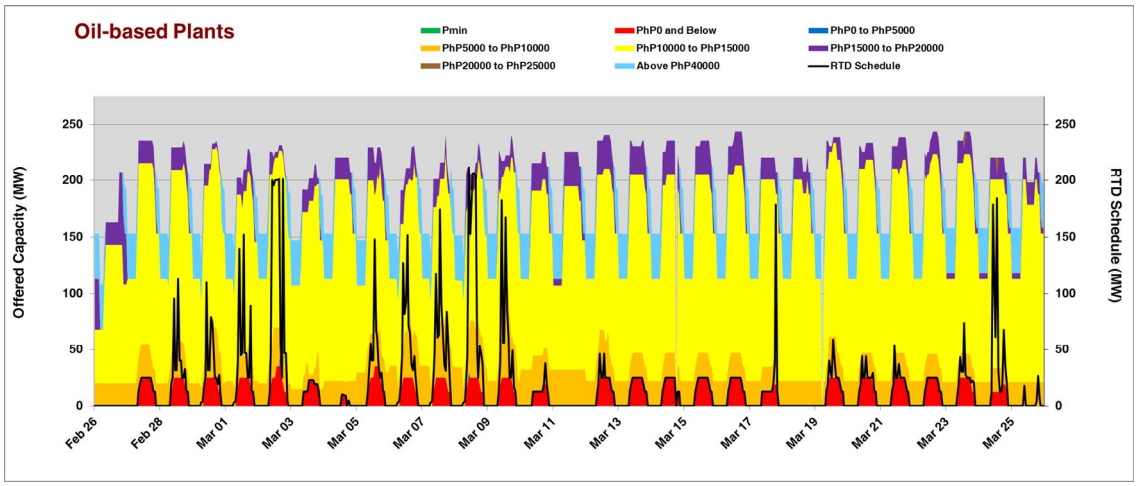
The offered capacity of the Luzon oil-based plants ranged from 305 MW to 725 MW while the offer prices ranged between PhP0.00/MW and PhP62,000/MW. The low capacity offers from oil-based plants in Luzon accounts to about 29 percent of the capacity gap in the region *(Figure 20).* Limay CCGT and Malaya TPP were scheduled/dispatched as must run units in certain trading intervals during the billing period due to system voltage requirement especially during high system demand.

Figure 20. Oil-based Plants Offer Pattern (Luzon), March 2012



The capacity and price offers from oil-based plants in Visayas ranged from 108 MW to 244 MW and PhP0.0/MW to PhP60,000/MW, respectively *(Figure 21)*.

Figure 21. Oil-based Plants Offer Pattern (Visayas), March 2012



Capacity Factor

During the current billing period, geothermal plants in Luzon showed more than 100 percent capacity factor based on offered capacity *(Table 21)*. Almost all the time, the Luzon geothermal plantsoffered capacities were scheduled for dispatch in the system due to low offer prices. As discussed earlier in the offer pattern of geothermal plants, the capacitor factor of more than 100 percent based on offer was attributed to the dispatch of Bacman G01 as must-run unit for the conduct of commissioning tests. It was also noted that due to outages and capacity gaps, the capacity factor of geothermal plants was 52 percent and 68 percent based on registered capacity and net of outages, respectively.

Natural gas plants consistently have high capacity factors above 80 percent. A modest increase was observed in month-on-month comparison in RTD schedule versus registered less outage capacity and offered capacity.

Figure 22. Capacity Factor (Luzon Plants), March 2012

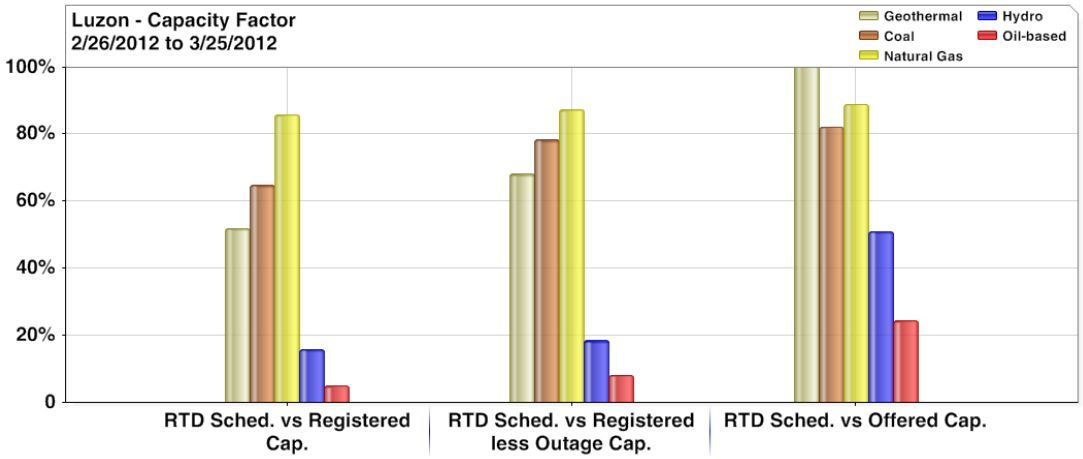


Table 21. Summary of Capacity Factor by Plant Type in Luzon, March 2012, February 2012, and March 2011

Plant Type	RTD Sched. vs Registered Cap.				
	March 2012	February 2012	March 2011	%M-on-M Change	%Y-on-Y Change
Coal	65%	59%	57%	10.0	3.3
Natural Gas	86%	83%	69%	3.0	21.3
Geothermal	52%	47%	49%	10.6	(4.1)
Hydro	16%	18%	19%	(13.5)	(1.3)
Oil-based	5%	3%	2%	67.8	87.5
Plant Type	**RTD Sched. vs Registered less Outage Cap.**				
	March 2012	**February 2012**	**March 2011**	**%M-on-M Change**	**%Y-on-Y Change**
Coal	78%	72%	67%	8.3	8.1
Natural Gas	87%	85%	84%	2.0	1.2
Geothermal	68%	66%	75%	3.5	(12.1)
Hydro	18%	23%	20%	(18.0)	15.0
Oil-based	8%	5%	2%	71.2	136.8
Plant Type	**RTD Sched. vs Offered Cap.**				
	March 2012	**February 2012**	**March 2011**	**%M-on-M Change**	**%Y-on-Y Change**
Coal	82%	77%	73%	7.3	5.7
Natural Gas	89%	87%	86%	1.9	1.2
Geothermal	109%	100%	99%	8.9	0.6
Hydro	51%	53%	87%	(4.1)	(38.9)
Oil-based	24%	15%	18%	62.9	(17.5)

Table 22. Capacity Factor by Plant Type in Luzon, March 2012

Plant Type	Total RTD Sched. (MW-Hr)	Total Registered Cap. (MW-Hr)	Total Registered less Outage Cap. (MW-Hr)	Total Offered Cap. (MW-Hr)	Capacity Factors		
					Registered Cap.	Registered less Outage Cap.	Offered Cap.
	(A)	(B)	(C)	(D)	(A / B)	(A / C)	(A / D)
Coal	1,712,583	2,642,058	2,183,555	2,082,131	65%	78%	82%
Natural Gas	1,647,527	1,921,755	1,889,152	1,852,825	86%	87%	89%
Geothermal	316,519	610,512	464,617	291,304	52%	68%	109%
Hydro	266,837	1,683,805	1,446,147	523,974	16%	18%	51%
Oil-based	60,690	1,243,648	746,840	249,510	5%	8%	24%

Visayas had only 3 major plant types, namely, geothermal, coal, and oil based plants *(Figure 23)*. In RTD schedule versus offered capacity, only geothermal plants improved by a modest 1.5 percent from the previous billing period and 6.4 percent against last year. Generally, all month-on-month comparison increased comparatively except for the capacity factor based registered capacity of coal plants.

Figure 23. Capacity Factor (Visayas Plants), March 2012

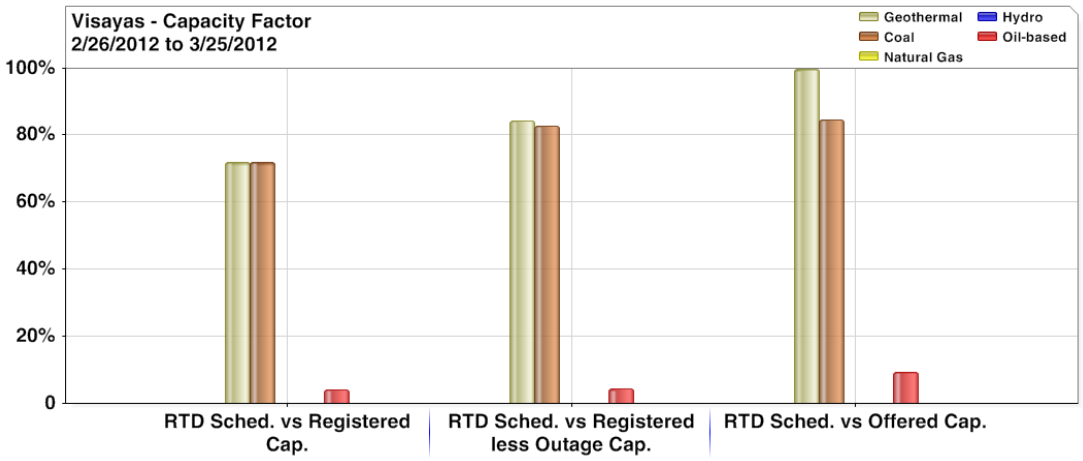


Table 23. Summary of Capacity Factor by Plant Type in Visayas, March 2012, February 2012, and March 2011

Plant Type	RTD Sched. vs Registered Cap.				
	March 2012	February 2012	March 2011	%M-on-M Change	%Y-on-Y Change
Coal	72%	72%	85%	(0.4)	(15.4)
Geothermal	72%	69%	70%	4.2	(1.5)
Oil-based	4%	4%	4%	4.1	7.6
Plant Type	**RTD Sched. vs Registered less Outage Cap.**				
	March 2012	**February 2012**	**March 2011**	**%M-on-M Change**	**%Y-on-Y Change**
Coal	83%	82%	89%	1.1	(6.7)
Geothermal	84%	77%	77%	9.4	10.3
Oil-based	4%	4%	4%	4.0	(0.2)
Plant Type	**RTD Sched. vs Offered Cap.**				
	March 2012	**February 2012**	**March 2011**	**%M-on-M Change**	**%Y-on-Y Change**
Coal	85%	83%	91%	1.6	(8.0)
Geothermal	100%	98%	92%	1.5	6.4
Oil-based	9%	9%	9%	3.5	(2.1)

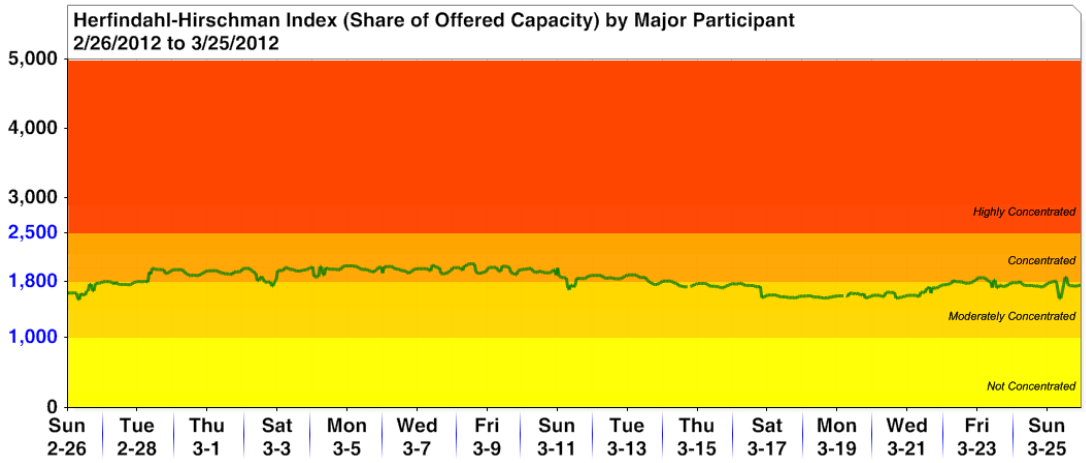
Table 24. Capacity Factor by Plant Type in Visayas, March 2012

Plant Type	Total RTD Sched. (MW-Hr)	Total Registered Cap. (MW-Hr)	Total Registered less Outage Cap. (MW-Hr)	Total Offered Cap. (MW-Hr)	Capacity Factors		
					Registered Cap.	Registered less Outage Cap.	Offered Cap.
	(A)	(B)	(C)	(D)	(A / B)	(A / C)	(A / D)
Coal	387,076	537,989	467,441	457,168	72%	83%	85%
Geothermal	465,313	646,669	551,573	467,267	72%	84%	100%
Oil-based	12,783	308,969	298,459	136,575	4%	4%	9%

Market Concentration

The Herfindahl-Hirschman Index (HHI) calculated based on offered capacity by major participants' grouping still indicated a concentrated (first half of the billing period) to moderately concentrated (second half of the billing period) market condition during the billing period *(Figure 24)*.

Figure 24. Hourly HHI based on Offered Capacity by Major Participant Grouping, March 2012

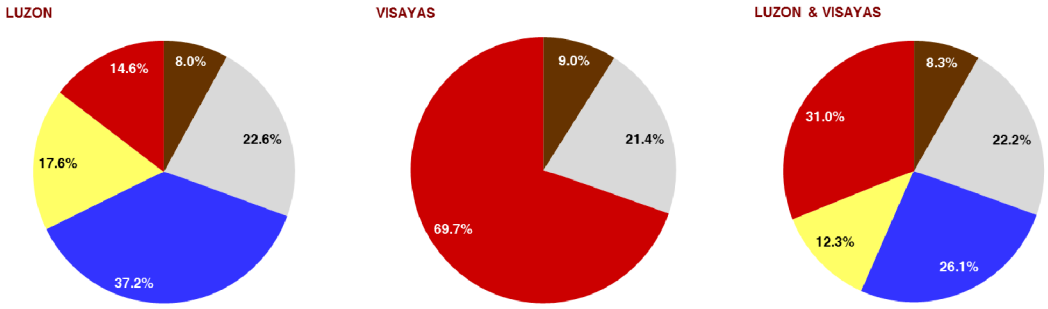


Compliance Monitoring

Compliance to Must Offer Rule

Continued non-compliance with the must-offer rule by generator trading participants in Luzon and Visayas was observed throughout the covered billing period. About 61.1 percent and 53.9 percent of the total generator-trading intervals[8] in Luzon and Visayas, respectively, had capacity gap[9] during the billing period. Figure 25 and Table 25 show the summary of the generator-trading intervals with capacity gap distributed by resource type. In Luzon, hydro plants had the highest share of the capacity gap at 37.2 percent with reasons mostly attributed to limitation in water elevation and ancillary service. This was followed by geothermal plants at 22.6 percent. Meanwhile in Visayas, oil-based plants had the highest share at 69.7 percent followed by geothermal plants at 21.4 percent.

Figure 25. Generator-Trading Intervals with Capacity Gap by Resource, March 2012



[8] Total generator resource-trading intervals - calculated as the number of registered generator resource nodes multiplied by the total trading intervals in the billing month.
[9] Capacity gap - registered capacity less outage capacity less offered capacity, calculated for each generator resource node per trading interval.

Table 25. Generator-Trading Intervals with Capacity Gap by Resource, March 2012

	Luzon		Visayas		Luzon and Visayas	
	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total
Coal	1829	8.0%	875	9.0%	2704	8.3%
Geothermal	5184	22.6%	2082	21.4%	7266	22.2%
Hydro	8550	37.2%			8550	26.1%
Natural Gas	4040	17.6%			4040	12.3%
Oil-based	3364	14.6%	6789	69.7%	10153	31.0%
Total	**22967**	**100%**	**9746**	**100%**	**32713**	**100%**

Figure 26 and Table 26 show the summary of the generator-trading intervals with capacity gap distributed based on the category of reasons[10] provided by the generator trading participants as part of their offer submission. About 27.1 percent and 38.5 percent of the generator-trading intervals with capacity gap in Luzon and Visayas, respectively, were attributed to equipment related concerns. Although, it was noted that about 30.1 percent and 36.2 percent of the generator-trading intervals with capacity gap in Luzon and Visayas, respectively, were not provided reasons by the generator trading participants.

Figure 26. Generator-Trading Intervals with Capacity Gap by Reason, March 2012

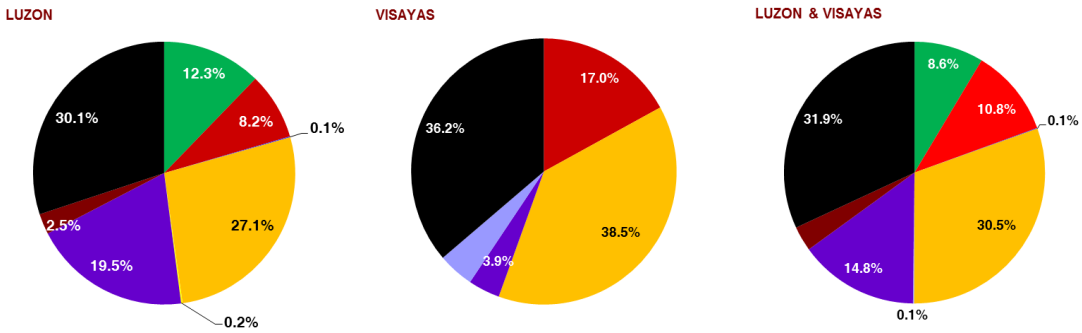


Table 26. Generator-Trading Intervals with Capacity Gap by Reason, March 2012

	Luzon		Visayas		Luzon and Visayas	
	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total
Limitation on Water Elevation	2814	12.3%			2814	8.6%
Ancillary Services	1891	8.2%	1658	17.0%	3549	10.8%
Start-up/Shutdown	26	0.1%			26	0.1%
Equipment-related Failure	6235	27.1%	3754	38.5%	9989	30.5%
Commercial Test	42	0.2%			42	0.1%
Steam Pressure and Temperature Variation	4473	19.5%	376	3.9%	4849	14.8%
Others	580	2.5%	427	4.4%	1007	3.1%
No Reason	6906	30.1%	3531	36.2%	10437	31.9%

Table 27 shows the level of capacity gap for the whole system during the three billing periods. In general, the average capacity gap increased by 5.4 percent from the previous billing period and decreased by 27.2 percent from the same billing period last year. The hydro plants had the largest average capacity gap in the 3 billing periods and essentially showed significant increase in month-on-month comparison while it displayed significant

[10] Gathered from the reasons provided in the generator trading participantsqoffers.

decrease in year-on-year comparison. On the other hand, natural gas plants showed the smallest average capacity gaps in the 3 billing periods.

Table 27. Summary of Capacity Gap by Plant Type (MW), March 2012

Resource Type	March 2012 (In MW)			February 2012 (In MW)			March 2011 (In MW)			% M-on-M Change (Feb - Mar 2012)			% Y-on-Y Change (Mar 2011 - Mar 2012)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	942	18	161	971	75	183	781	13	171	(3.1)	(75.5)	(12.2)	24.4	497.6	7.0
Natural Gas	391	19	52	410	32	54	321	12	51	(4.6)	(41.4)	(2.8)	27.9	161.0	5.2
Geothermal	438	293	371	534	211	371	487	123	323	(18.0)	38.8	(0.1)	9.7	72.2	14.9
Hydro	1,639	950	1,346	1,510	836	1,143	1,897	1,193	1,638	8.5	13.6	17.8	(20.4)	(29.9)	(30.2)
Oil Based	1,086	572	950	1,101	570	982	1,780	1,383	1,570	(1.4)	0.4	(3.3)	(38.1)	(58.8)	(37.4)
TOTAL	**3,732**	**2,189**	**2,881**	**3,791**	**2,074**	**2,733**	**4,773**	**3,122**	**3,753**	(1.6)	5.5	5.4	(20.6)	(33.6)	(27.2)

Compliance to RTD Schedule

About 16.7 percent and 7.6 percent of the total generator-trading intervals in Luzon and Visayas, respectively, have observed deviations between real time ex-ante dispatch (RTD) schedule[11] and actual dispatch[12] exceeding the +/-3% tolerance limit[13] during the billing period. Figure 27 and table 28 show the summary of the generator-trading intervals with deviations distributed by resource type. The hydro and geothermal plants have the highest shares at 37.7 percent and 31.1 percent in Luzon, respectively. In Visayas, the coal plants contributed more than half of the generator-trading intervals with deviations with 53.6 percent.

Figure 27. Generator-Trading Intervals with RTD Deviation by Resource, March 2012

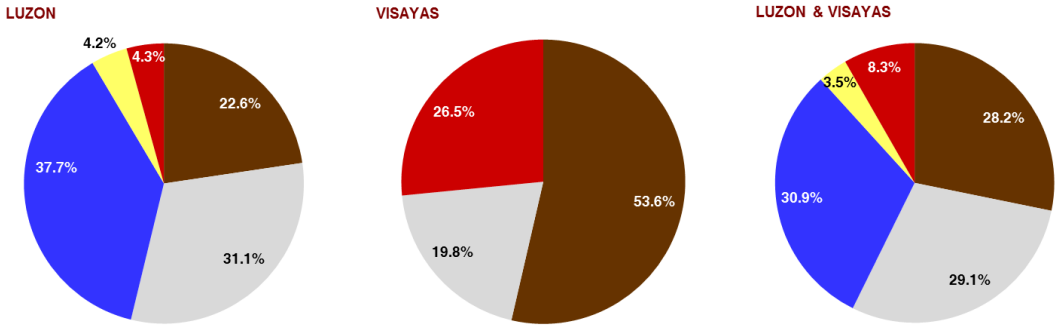


Table 28. Generator-Trading Intervals with RTD Deviation by Resource, March 2012

	Luzon		Visayas		Luzon and Visayas	
	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total
Coal	1,424	22.6%	735	53.6%	2,159	28.2%
Geothermal	1,958	31.1%	272	19.8%	2,230	29.1%
Hydro	2,369	37.7%		0.0%	2,369	30.9%
Natural Gas	265	4.2%		0.0%	265	3.5%
Oil-based	271	4.3%	364	26.5%	635	8.3%
Total	**6,287**	**100%**	**1,371**	**100%**	**7,658**	**100%**

Figure 28 and Table 29 show the summary of the generator-trading intervals with deviations categorized based on the reasons provided by NGCP-SO. In Luzon, the intra-hour deviation

[11] RTD schedule - target loading level of each generator resource node at the end of the trading interval.
[12] Actual dispatch - actual loading of each generator resource node at the end of the trading interval (based on minute 59 snapshot data.
[13] +/-3% tolerance limit - initial dispatch tolerance limits adopted per PEM Board Resolution No. 2005-15.

in demand and reserve utilization accounts to about 16.4 percent and 15.3 percent of the deviations, respectively. Similarly, the intra-hour variation in demand was the primary reason for the observed deviations in Visayas. The must run unit and reserve utilization accounts to 5.6 percent and 2.7 percent of the deviations in Visayas, respectively. Meanwhile, the reasons for about 58.8 percent and 63.3 percent in Luzon and Visayas of deviations have yet to be determined.

Figure 28. Generator-Trading Intervals with RTD Deviation by Reason, March 2012

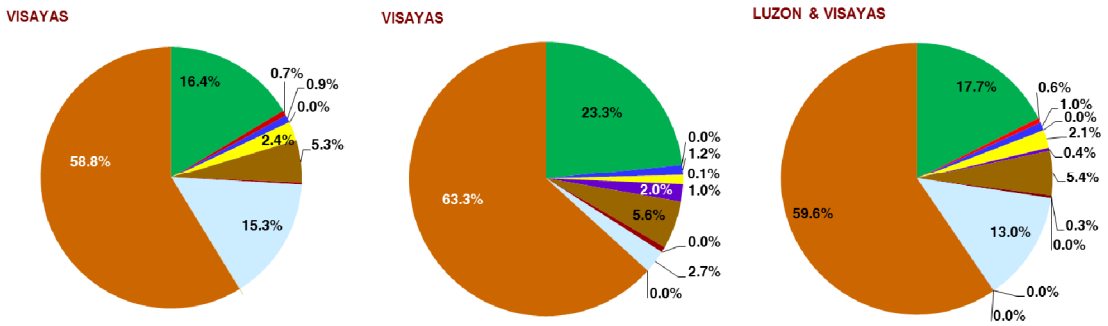


Table 29. Generator-Trading Intervals with RTD Deviation by Reason, March 2012

	Luzon		Visayas		Luzon and Visayas	
	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total	Generator-Trading Intervals	% of Total
Intra-hour Variation	1,032	16.4%	320	23.3%	1,352	17.7%
Affected by Non-Compliance of Other Generators	43	0.7%		0.0%	43	0.6%
Start-up/Shutdown, Generator/Load Tripping	56	0.9%	17	1.2%	73	1.0%
Island Grid		0.0%	1	0.1%	1	0.0%
Generator Problem	148	2.4%	14	1.0%	162	2.1%
Non-Compliance to Dispatch Instruction	1	0.0%	28	2.0%	29	0.4%
Must Run Units	334	5.3%	77	5.6%	411	5.4%
Line Limitation	15	0.2%	9	0.7%	24	0.3%
Import/Export						
Reserve Utilization	961	15.3%	37	2.7%	998	13.0%
RTD Discrepancy	3	0.0%		0.0%	3	0.0%
Visayas Requirement		0.0%			0	0.0%
No Category	3,694	58.8%	868	63.3%	4,562	59.6%
Total	**6,287**	**100%**	**1,371**	**100%**	**7,658**	**100%**