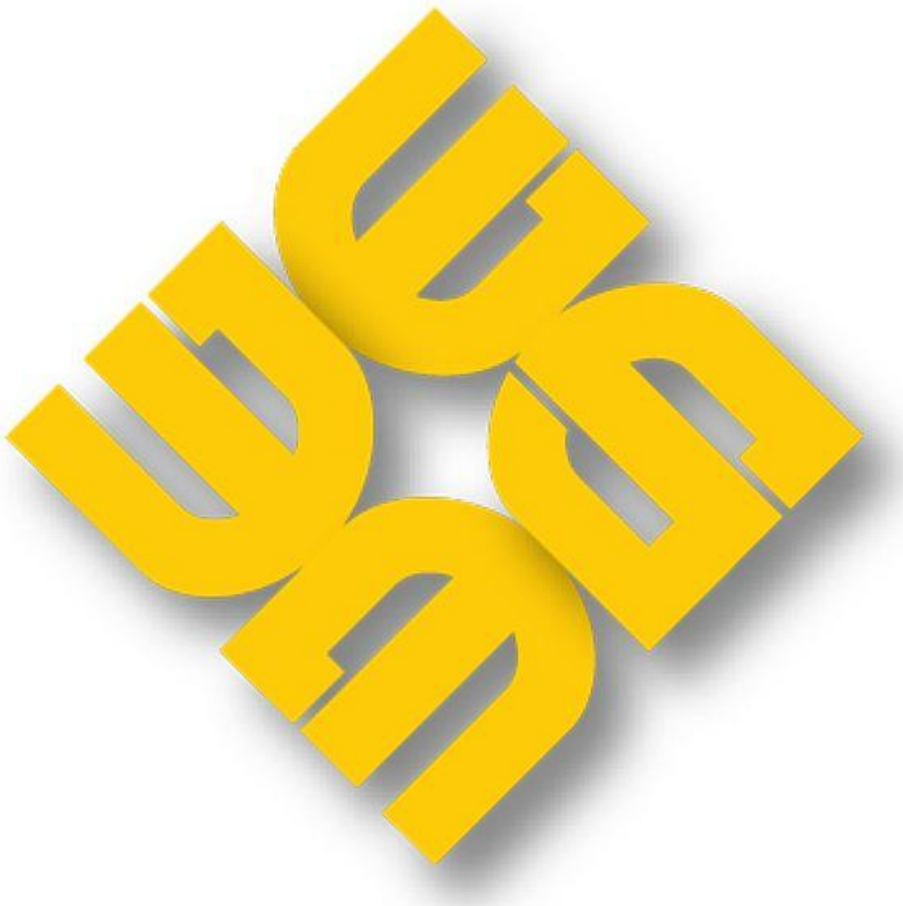
MAG-MMAR-2018-08

MONTHLY MARKET ASSESSMENT REPORT

For the Billing Period 26 July to 25 August 2018



PHILIPPINE ELECTRICITY MARKET CORPORATION

MARKET ASSESSMENT GROUP (MAG)

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EXECUTIVE SUMMARY

This monthly report assesses the results of the WESM operation for the August 2018 billing period (26 July to 25 August 2018) and how the market performed compared with the previous billing month. No yearly comparison was conducted in view of the market suspension in the Visayas region from 6 July to 1 August 2017 due to the power system disturbance brought about by the intensity scale 5 earthquake in the Visayas. In addition, the Luzon-Leyte HVDC Interconnection remained unavailable for the whole billing month of August 2017 which resulted in the physical separation of the market into two pricing regions – Luzon and Visayas.

The August 2018 billing month observed a wider average supply margin at 2,408 MW from previous month's 1,964 MW.

System demand decreased to an average of 9,593 MW, which was 0.2 percent lower than previous month's 9,614 MW following the slightly cooler temperatures this billing month. System-wide reserve schedule averaged at 893 MW this month from 827 MW in July. Accordingly, the demand plus reserve schedule averaged at 10,486 MW, posting an increase of 0.4 percent from last month's 10,442 MW.

Meanwhile, effective supply increased by 3.9 percent to an average of 12,894 MW this month from previous month's 12,406 MW due to lower level of outage capacity which averaged at 1,861 MW from 2,432 MW in July with the resumption of Pagbilao CFTPP units 2 and 3, SMC Limay CFTPP unit 2, and Malaya TPP unit 1. Consequently, the improved demand and supply situation brought the market prices down to an average of PhP2,713/MWh from PhP3,794/MWh in the previous month.

The market shares when calculated based on registered capacity remained to be dominated by four (4) major participant groups, namely San Miguel Corporation (SMC), Aboitiz Power (AP), First Gen Corporation (FGC), and Power Sector Asset and Liabilities Management (PSALM).

Correspondingly, the Herfindahl-Hirschman Index (HHI) calculated by major participant grouping indicated a moderately concentrated market based on registered capacity throughout the August billing month.

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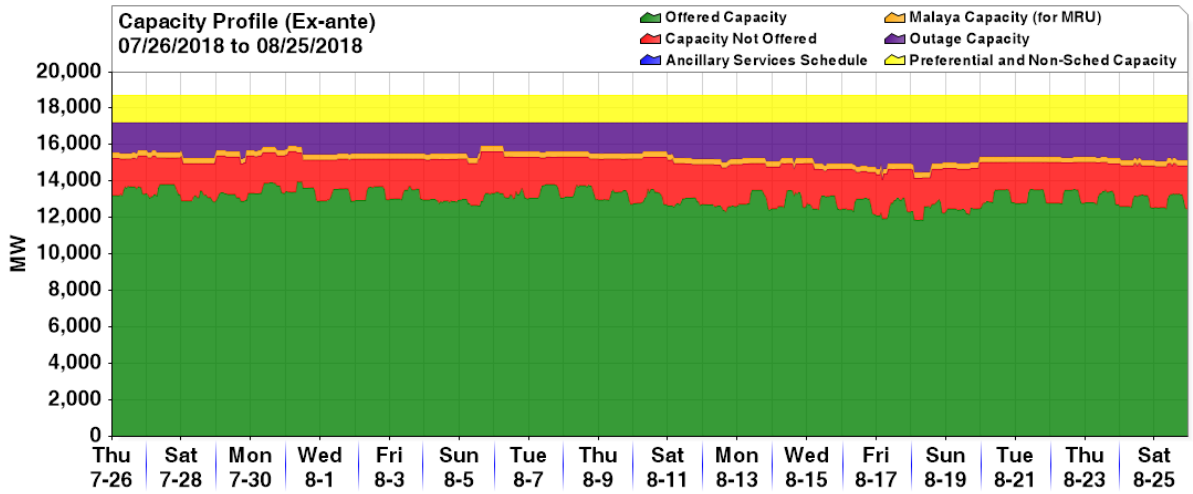
I. Capacity Profile

The WESM registered capacity remained at 18,738 MW by the end of the August billing month. Of the said registered capacity, about 70 percent (previous month's 66 percent) or an average of 13,087 MW was offered in the market during the month. Outage capacity (10 percent) posted a lower average this month at 1,861 MW coming from 2,432 MW in the previous month. Meanwhile, 11 percent was attributable to capacity not offered in the market which averaged at 1,990 MW.

On the other hand, preferential[1] and non-scheduled capacities averaged 1,500 MW, comprising about 8 percent of the total registered capacity. Lastly, an average of 300 MW or about 2 percent of the WESM registered capacity was attributed to the capacity designation of Malaya TPP as Must Run Unit (MRU), in cases of supply shortfall and to address system security.

Figure 1. Capacity Profile (Ex-ante), August 2018



[1] Preferential capacity refers to the combined registered capacities of priority dispatch and must dispatch generating units.

Table 1. Capacity Profile (Ex-ante), August 2018 and July 2018

	August 2018 (In MW)		July 2018 (In MW)		% M-on-M Change (Jul 2018 - Aug 2018)
	Avg MW	% of RegCap	Avg MW	% of RegCap	
Registered Capacity (end of month)	18,738		18,738		0.0
Offered Capacity	13,087	70	12,416	66	5.4
Outage Capacity	1,861	10	2,432	13	(23.5)
Capacity Not Offered	1,990	11	2,238	12	(11.1)
Malaya Capacity for MRU	300	2	300	1	0.0
Preferential and Non-Scheduled Capacity	1,500	8	1,500	8	0.0

II. Demand and Supply Situation

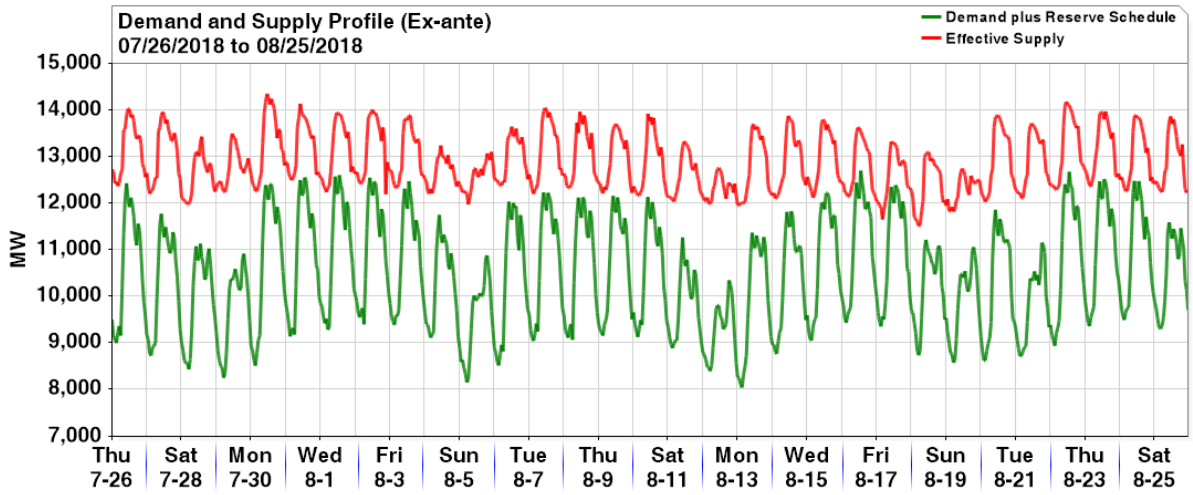
System demand[2] decreased to an average of 9,593 MW from previous month's 9,614 MW following the cooler temperatures this billing month. Weekly average system demand ranged from 9,303 MW (first week of the billing month) to 9,804 MW (second week of the billing month).

For this period, the reserve schedule averaged at 893 MW. Consequently, the demand plus reserve schedule averaged at 10,486 MW, demonstrating a 0.4 percent increase from last month's 10,442 MW.

Effective supply[3] similarly posted a higher average at 12,894 MW compared to previous month's 12,406 MW attributable to the lower level of outage capacity. Weekly average effective supply ranged from 12,676 MW (13 to 19 August) up to 13,027 MW (20 to 25 August).

Driven by the increase in effective supply, supply margin[4] widened by 22.6 percent this month at 2,408 MW coming from previous month's 1,964 MW. Weekly average supply margin ranged from 2,187 MW (13 to 19 August) to 2,729 MW (26 to 29 July).

Figure 2. Demand and Effective Supply (Ex-ante), August 2018



[2] Demand is equal to the total scheduled MW of all load resources in Luzon and Visayas plus losses.
[3]The system effective supply is equal to the offered capacity of all scheduled generator resources, nominated loading level of non-scheduled generating units and projected output of preferential dispatch generating units adjusted for any security limit and ramp rates. Scheduled output of plants on testing and commissioning, through the imposition of security limit by SO, are accounted for in the effected supply. Likewise included is the scheduled output of Malaya plant when it is called to run as Must Run Unit (MRU).
[4]The supply margin is equal to the effective supply less system demand requirement plus reserve schedule.

Table 2. Demand and Supply Summary (Ex-ante), August 2018 and July 2018

	August 2018 (In MW)			July 2018 (In MW)			% M-on-M Change (Jul 2018 - Aug 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	11,654	7,216	9,593	11,792	6,726	9,614	(1.2)	7.3	(0.2)
Reserve Schedule	1,209	596	893	1,274	358	827	(5.0)	66.4	7.9
Demand plus R/S	12,702	8,052	10,486	12,652	7,567	10,442	0.4	6.4	0.4
Effective Supply	14,350	11,515	12,894	14,010	10,688	12,406	2.4	7.7	3.9
Supply Margin	4,044	677	2,408	4,028	199	1,964	0.4	241.2	22.6

Note: The derived values were non-coincident.

Table 3. Weekly Demand and Supply Summary (Ex-ante), August 2018

	26 July to 29 July 2018 (in MW)			30 July to 5 August 2018 (in MW)			6 to 12 August 2018 (in MW)			13 to 19 August 2018 (in MW)			20 to 25 August 2018 (in MW)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	11,331	7,402	9,303	11,654	7,335	9,804	11,349	7,465	9,519	11,641	7,216	9,537	11,562	7,667	9,694
Reserve Schedule	1,105	627	884	1,119	596	857	1,077	621	845	1,209	672	953	1,207	737	928
Demand plus R/S	12,431	8,261	10,187	12,606	8,162	10,661	12,237	8,403	10,363	12,702	8,052	10,489	12,677	8,630	10,622
Effective Supply	14,032	11,983	12,916	14,350	11,978	13,023	14,045	11,993	12,857	13,878	11,515	12,676	14,179	12,036	13,027
Supply Margin	3,996	1,446	2,729	4,044	1,228	2,362	3,902	1,326	2,494	3,947	677	2,187	3,601	1,282	2,405

III. Power Plant Outages

Average system-wide outage capacity decreased to 1,861 MW this month from 2,432 MW in July. This was driven by the lower outage capacity involving coal plants, from previous month's 1,087 MW to current month's 689 MW with the resumption of Pagbilao CFTPP units 2 (382 MW) and 3 (436 MW) and SMC Limay CFTPP unit 2 (150 MW). Still, coal plants accounted for about 37 percent of the system-wide outage capacity which was mainly attributable to the forced outages of SLPGC CFTPP unit 1 (150 MW) since 6 March, SLTEC CFTPP unit 2 (122.9 MW) since 18 June, and Calaca CFTPP unit 2 (300 MW) from 6 to 17 August.

Oil-based plants likewise recorded a decrease in its average outage capacity from 577 MW to 478 MW this month attributable to the resumption of operations of Malaya TPP unit 1 (300 MW) from its forced outage. This month's outage from oil-based plants was attributable to the forced outage of Malaya TPP unit 2 (350 MW) for the whole billing month (since 19 May) and planned outages of Limay unit 2 (60 MW, since 23 July) and unit 3 (60 MW, since 22 June).

Geothermal plants' outage capacity averaged at 301 MW (previous month's 354 MW) related to the forced outages of units of Tiwi GPP unit A (2 x 59 MW) on top of the prevailing outages of Makban GPP unit C (2 x 55 MW) and Tiwi GPP unit B (43.7 MW). Hydro plants' outage capacity averaged at 248 MW (previous month's 263 MW) related to the planned outages of San Roque HEP unit 3 (145 MW) and unit of Angat Main HEP (50 MW) and forced outages of Pantabangan HEP unit 2 (60 MW) and Kalayaan PSPP unit 2 (180 MW).

Natural gas plants had the least capacity on outage which averaged at 145 MW attributed to the maintenance outage of Sta. Rita NGPP unit 2 (255.7 MW) since 17 August until the end of the billing month and planned outage of Sta. Rita NGPP unit 3 (265.5 MW) from 11 to 17 August.

Outage capacity reached a high of 2,829 MW on 17 August at 0500H following the maintenance outage of Sta. Rita unit 2 (255.7 MW) on top of the existing outages of coal plants Mariveles CTFPP unit 1 (316 MW), Calaca CFTPP unit 2 (300 MW), SLTEC CFTPP units 1 (121 MW) and 2 (122.9 MW), SLPGC CFTPP unit 1 (150 MW), SMC Limay CFTPP unit 2 (150 MW), and PCPC CFTPP (135 MW), natural gas plant Sta. Rita NGPP unit 3 (265.5 MW), and oil-based plant Malaya TPP unit 2 (350 MW).

Figure 3. Plant Outage Capacity (by Plant Type), August 2018

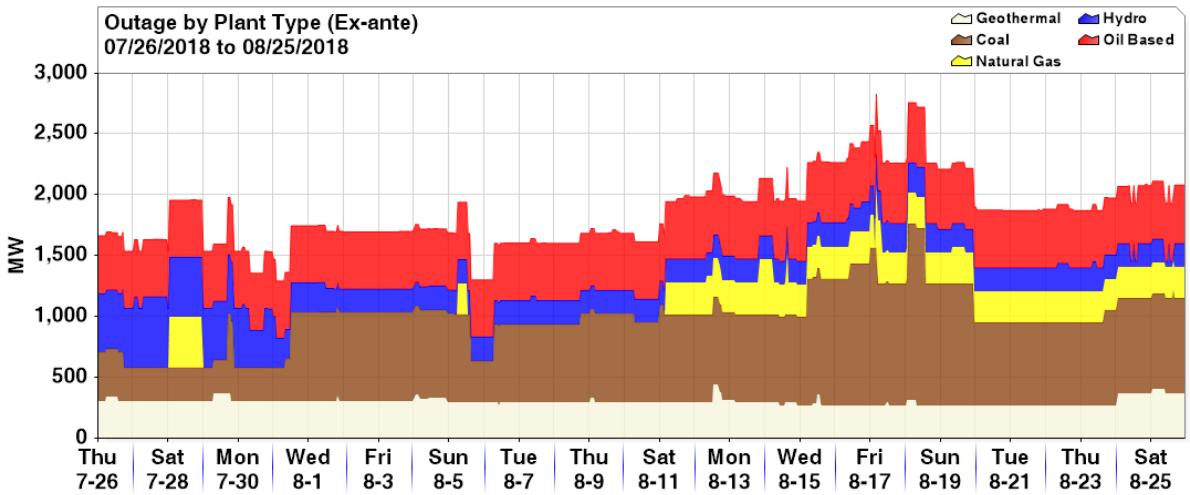


Table 4. Outage Summary (Ex-ante), August 2018 and July 2018

Resource Type	August 2018 (In MW)			July 2018 (In MW)			% M-on-M Change (Jul 2018 - Aug 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	1,454	273	689	1,706	394	1,087	(14.8)	(30.7)	(36.6)
Natural Gas	521	0	145	677	0	151	(23.0)		(4.1)
Geothermal	439	273	301	465	310	354	(5.6)	(11.9)	(15.0)
Hydro	580	50	248	485	195	263	19.6	(74.4)	(6.0)
Oil Based	520	470	478	855	410	577	(39.2)	14.6	(17.1)
TOTAL	**2,829**	**1,293**	**1,861**	**3,361**	**1,567**	**2,432**	(15.8)	(17.5)	(23.5)

Table 5. Major Plant Outages – August 2018

Region	Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
LUZON	GEO	Tiwi 3	43.7	10/23/2005 13:26			Deactivated Shutdown	Tiwi 3 decommissioned since May 26 2009
LUZON	GEO	Makban 6	55	04/11/2013 22:44			Deactivated Shutdown	Conducted gas compressor test
VISAYAS	GEO	PGPP2 Unit 4	20	06/27/2014 6:07			Forced Outage	Steam being utilized by Nasulo plant
LUZON	GEO	Makban 5	55	03/12/2017 1:55			Forced Outage	High turbine vibration
VISAYAS	GEO	Upper Mahiao 1	32	12/07/2017 9:10	08/04/2018 21:59	240.53	Forced Outage	Cut out from the system to facilitate PMS. Foced outage since no approved PUSSR
LUZON	HYD	Angat M 3	50	01/29/2018 0:01			Planned Outage	Annual overhauling until 29 July 2018
LUZON	COAL	SLPGC 1	150	03/06/2018 5:02			Forced Outage	On emergency shutdown due to turbine vibration
LUZON	HYD	San Roque 3	145	03/12/2018 16:15			Planned Outage	Planned Outage. ETI 8 September 2018
VISAYAS	GEO	Mahanagdong B1	5	04/05/2018 22:32	07/30/2018 20:17	115.91	Forced Outage	Due to high vibration
LUZON	OIL	Malaya 2	350	05/19/2018 13:01			Forced Outage	Burn air heater 2A
LUZON	GEO	Makban 8	20	06/05/2018 13:21			Forced Outage	On reserve shutdown pending availability of steam supply (steam optimization)
LUZON	GEO	Makban 8	20	06/05/2018 13:21			Maintenance Outage	Maintenance outage until December 2018
LUZON	GEO	Tiwi 2	59	06/05/2018 15:29	08/12/2018 11:04	67.82	Forced Outage	Low steam supply
LUZON	COAL	SLTEC 2	122.9	06/18/2018 6:14			Forced Outage	Isolated due to trippng Calaca-Salong Line
LUZON	OIL	Limay 3	60	06/22/2018 8:01			Planned Outage	Maintenance outage until 23 October 2018
LUZON	GEO	Makban 10	20	07/10/2018 12:32	08/06/2018 9:49	26.89	Maintenance Outage	Maintenance outage
LUZON	COAL	SLTEC 1	121	07/14/2018 0:38	07/26/2018 17:44	12.71	Forced Outage	Boiler tube leak
LUZON	HYD	Kalayaan 2	180	07/17/2018 9:51	07/31/2018 1:50	13.67	Forced Outage	Exploded Pothead Phase Reversal Switch Phase B
LUZON	HYD	Angat M 4	50	07/20/2018 15:02	08/01/2018 11:04	11.83	Forced Outage	Unit transformer B trouble
LUZON	OIL	Limay 2	60	07/23/2018 0:02			Planned Outage	Maintenance outage until 6 September 2018
LUZON	HYD	Pantabangan 2	60	07/25/2018 18:10			Forced Outage	Not available due to unit transformer trouble with restricted earth fault indication
LUZON	NATG	San Gabriel	420	07/28/2018 0:01	07/29/2018 0:04	1.00	Forced Outage	Emergency maintenance
LUZON	COAL	Pagbilao 2	382	07/29/2018 16:36	07/29/2018 20:17	0.15	Forced Outage	Tripped due to PLC control trouble
LUZON	COAL	ANDA 1	72	07/31/2018 4:45	08/10/2018 8:37	10.16	Forced Outage	Clogged coal feeder
LUZON	COAL	Pagbilao 2	382	07/31/2018 11:50	08/05/2018 14:13	5.10	Forced Outage	Boiler tube leak
LUZON	GEO	Bacman 3	20	08/03/2018 23:47	08/14/2018 8:40	10.37	Planned Outage	Maintenance outage until 14 August 2018
LUZON	NATG	Sta. Rita 2	255.7	08/05/2018 6:39	08/05/2018 12:48	0.26	Maintenance Outage	Compressor washing
LUZON	COAL	Calaca 2	300	08/06/2018 6:17	08/17/2018 4:07	10.91	Forced Outage	Tripped with 197 MW load
LUZON	GEO	Makban 9	20	08/06/2018 10:22			Maintenance Outage	Maintenance outage
VISAYAS	SOLR	San Carlos 1	19.8	08/06/2018 12:17			Forced Outage	Auto tripping of 69 kV PCB. Cause of tripping under investigation
VISAYAS	COAL	PEDC 2	83.7	08/08/2018 16:12	08/11/2018 2:01	2.41	Forced Outage	Auto tripped. Cause under investigation
LUZON	COAL	SMC 2	150	08/10/2018 23:23			Planned Outage	Maintenance outage until 24 August 2018
LUZON	NATG	Sta. Rita 3	265.5	08/11/2018 4:43	08/17/2018 2:24	5.90	Planned Outage	Maintenance outage until 15 August 2018
LUZON	NATG	Avion 1	50.3	08/12/2018 8:01	08/12/2018 17:00	0.37	Maintenance Outage	Maintenance outage
LUZON	GEO	Tiwi 1	59	08/12/2018 11:11			Forced Outage	Low steam supply
LUZON	NATG	Ilijan A1	190	08/13/2018 19:50	08/14/2018 8:41	0.54	Maintenance Outage	Maintenance outage until 0800H of 14 August 2018
LUZON	OIL	SLPGC 4	25	08/14/2018 7:14	08/20/2018 0:01	5.70	Forced Outage	Declared unavailable dueto leak at seal gasket
LUZON	NATG	Sta. Rita 2	255.7	08/14/2018 14:19	08/14/2018 15:48	0.06	Forced Outage	GT protection actuated

Region	Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
LUZON	COAL	GN Power 1	316	08/15/2018 4:29	08/19/2018 22:32	4.75	Forced Outage	Submerged scrapper conveyor trouble
LUZON	COAL	SLTEC 1	121	08/16/2018 9:32			Forced Outage	Boiler tube leak
LUZON	HYD	Angat M 4	50	08/16/2018 16:34	08/18/2018 21:55	2.22	Forced Outage	High turbine bearing temperature
VISAYAS	COAL	PALM 1	135	08/17/2018 0:01			Planned Outage	Annual preventive maintenance
LUZON	NATG	Sta. Rita 3	265.5	08/17/2018 3:22	08/17/2018 7:19	0.16	Forced Outage	Fuel gas leak
LUZON	NATG	Sta. Rita 2	255.7	08/17/2018 4:53			Maintenance Outage	Maintenance outage
LUZON	COAL	QPPL	459	08/18/2018 1:47	08/18/2018 13:05	0.47	Forced Outage	Pulverizer trouble
LUZON	NATG	Avion 2	50.3	08/19/2018 8:01	08/19/2018 16:00	0.33	Maintenance Outage	Maintenance outage
VISAYAS	COAL	Kepco Salcon 1	103	08/23/2018 15:01			Forced Outage	Boiler tube leak
VISAYAS	GEO	Upper Mahiao 1	32	08/24/2018 0:09			Forced Outage	To rectify defective main steam line pressure control valve and replacement of moto
VISAYAS	GEO	Upper Mahiao 2	32	08/24/2018 0:10			Forced Outage	To rectify defective main steam line pressure control valve and replacement of moto
VISAYAS	GEO	Upper Mahiao 4	32	08/24/2018 0:12			Forced Outage	To rectify defective main steam line pressure control valve and replacement of moto
VISAYAS	OIL	PB102 Unit 3	6	08/24/2018 8:44			Forced Outage	Unusual sound at cylinder 2L
VISAYAS	COAL	TPC Sangi 1	60	08/25/2018 13:51	08/25/2018 17:50	0.17	Forced Outage	Affected by tripping of TPC-Carcon L1
VISAYAS	OIL	Bohol 4	4	08/25/2018 15:48			Forced Outage	Fuel leak at cylinder no 6
VISAYAS	COAL	CEDC 1	82	08/25/2018 23:11			Forced Outage	Manually cut out due to possible tube leak

a. Outage Capacity by Outage Category

About 63 percent of this month's system-wide outage capacity were related to forced outages. Overall, an average capacity of 1,173 MW went on forced outages, posting a decrease from previous month's 1,368 MW (Table 6). This month's forced outage capacity mainly involved Malaya TPP unit 2, SLPGC CFTPP unit 1, SLTEC CFTPP unit 2, and Calaca CFTPP unit 2. Similarly, lower maintenance outage capacity was recorded this month at an average of 110 MW, which involved Sta. Rita NGPP unit 2 and Makban GPP unit D, coming from previous month's 515 MW.

On the other hand, planned outage capacity recorded a higher average at 484 MW this month (from previous month's 455 MW) which was attributable to San Roque HEP unit 3, SMC Limay CFTPP unit 2, and Limay CCGT units 2 and 3.

Meanwhile, deactivated shutdown outage capacity remained at an average of 99 MW which involved units of Makban GPP unit C and Tiwi GPP unit B.

Figure 4. Plant Outage Capacity (by Outage Category), August 2018

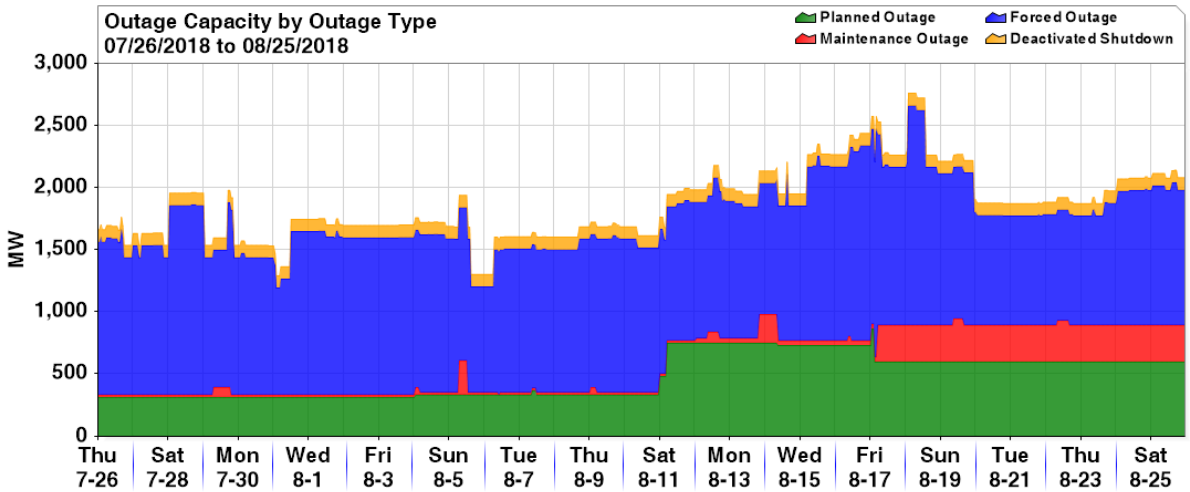


Table 6. Outage Summary, by Outage Category, August 2018 and July 2018

Resource Type	August 2018 (In MW)			July 2018 (In MW)			% M-on-M Change (Jul 2018 - Aug 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	866	315	484	637	255	455	35.9	23.5	6.4
Maintenance	346	0	110	1,396	20	515	(75.2)	(100.0)	(78.7)
Forced	1,834	849	1,173	2,105	922	1,368	(12.9)	(7.9)	(14.2)
Deactivated Shutdown	99	99	99	99	99	99	0.0	0.0	(0.0)
Total	**2,760**	**1,293**	**1,866**	**3,426**	**1,565**	**2,436**	(19.4)	(17.4)	(23.4)

b. Outage Factor

Consistent with the discussion on outage capacity in the preceding sections, the system-wide total outage factor was lower this month at 10.5 percent when compared to previous month's 13.3 percent driven by the decreases in maintenance outage factor, from previous month's 2.7 percent to current month's 0.6 percent and forced outage factor, from previous month's 7.6 percent to current month's 6.8 percent (Table 7).

On the other hand, it was observed that planned outage factor increased from previous month's 2.4 percent to current month's 2.6 percent. Meanwhile, deactivated shutdown outage factor remained at 0.5 percent.

Figure 5. Outage Factor (by Plant Type), August 2018 and July 2018

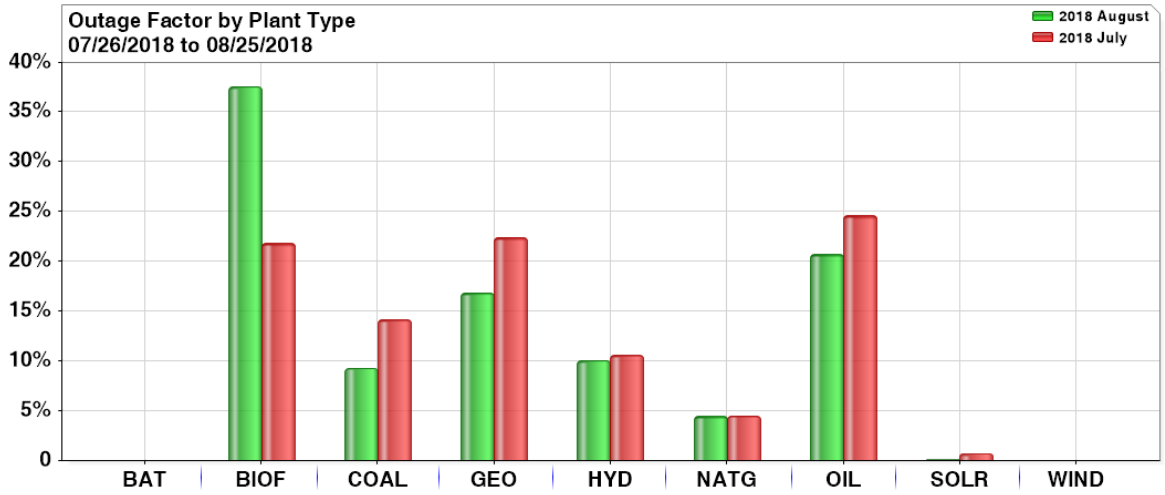


Figure 6. Outage Factor (by Outage Category), August 2018 and July 2018

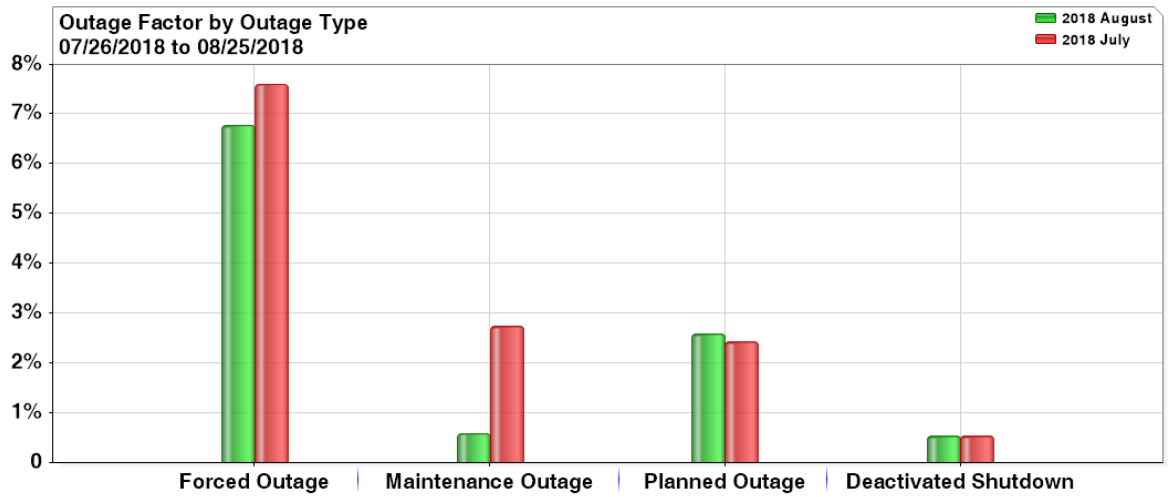


Table 7. Outage Factor, August 2018 and July 2018

Plant Type	Total Outage Factor		Forced Outage Factor		Maintenance Outage Factor		Planned Outage Factor		D/S Outage Factor	
	July 2018	June 2018	July 2018	June 2018	July 2018	June 2018	July 2018	June 2018	July 2018	June 2018
BAT										
BIOF	37.6	21.8	37.6	21.8						
COAL	9.3	14.1	7.8	7.9		4.6	1.5	1.7		
GEO	16.8	22.4	9.2	12.1	1.7	4.8	0.4		5.5	5.5
HYD	10.1	10.6	2.2	2.6	0.0	0.2	7.8	7.8		
NATG	4.4	4.5	0.5	0.2	2.4	2.1	1.5	2.1		
OIL	20.7	24.6	15.5	21.3		0.5	5.2	2.8		
SOLR	0.2	0.7	0.2	0.6				0.1		
WIND										
Total	**10.5**	**13.3**	**6.8**	**7.6**	**0.6**	**2.7**	**2.6**	**2.4**	**0.5**	**0.5**

IV. Market Price Outcome[5]

A. Market Prices

Market prices recorded a 28.5 percent decrease from previous month's PhP3,794/MWh to current month's PhP2,713/MWh following the wider supply margin observed this month. It was noted that no price went beyond PhP8,000/MWh throughout the billing month. In particular, the maximum price on record this month was at PhP7,805/MWh on 25 August at 1900H. Weekly average prices ranged from PhP2,408/MWh to PhP2,926/MWh.

[5]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, and (iv) estimated load reference price (ELRP) for trading intervals where the ERC-approved Price Substitution Mechanism (PSM) was applied.

Figure 7. Market Price Trend, August 2018

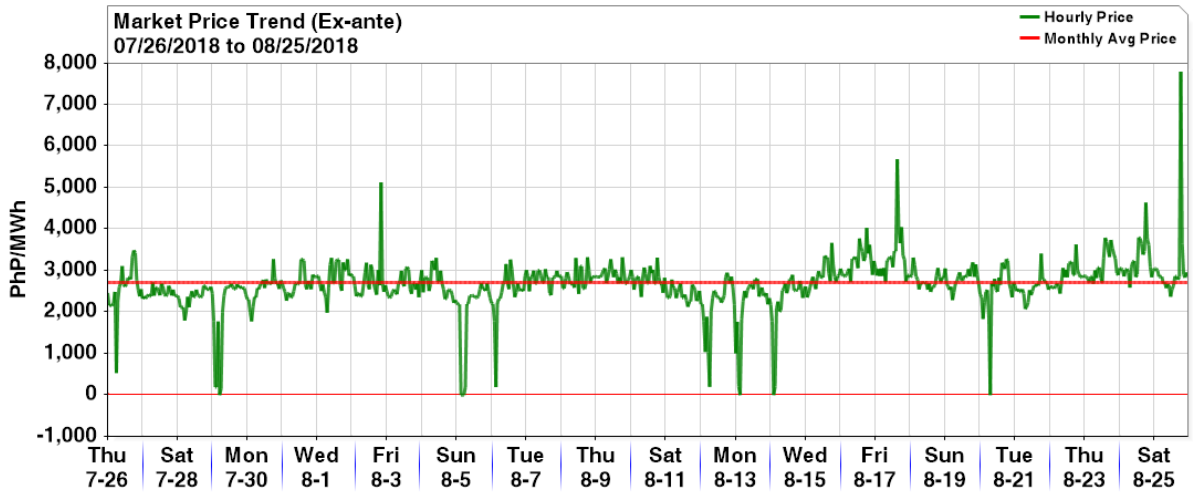


Table 8. Market Price Summary, August 2018 and July 2018

	August 2018 (In PhP/MWh)			July 2018 (In PhP/MWh)			% M-on-M Change (Jul 2018 - Aug 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	7,805	0	2,713	17,473	-1,737	3,794	(55.3)	(100.0)	(28.5)
Luzon	5,415	0	2,661	17,478	0	3,804	(69.0)		(30.0)
Visayas	29,620	-10,109	2,983	17,473	-10,305	3,744	69.5	1.9	(20.3)

Table 9. Weekly Market Price Summary, August 2018

	26 July to 29 July 2018 (in PhP/MWh)			30 July to 5 August 2018 (in PhP/MWh)			6 to 12 August 2018 (in PhP/MWh)			13 to 19 August 2018 (in PhP/MWh)			20 to 25 August 2018 (in PhP/MWh)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	3,492	0	2,408	5,131	0	2,641	3,324	192	2,663	5,691	0	2,823	7,805	1	2,926

The market prices in Luzon averaged at PhP2,661/MWh, lower by 10.8 percent than the PhP2,983/MWh recorded in the Visayas region. It may be noted that the Visayas region recorded market price at a high of PhP29,620/MWh on 25 August at 1900H attributable to the high level of outage in Visayas involving KSPC CFTPP unit 1 and units of Leyte A GPP from 24-25 August. In addition, high demand requirement as well as maximized HVDC was noted during the peak hour of 1900H. On the other hand, market prices in Visayas reached a low of PhP-10,109/MWh on 26 July at 0700H when wide supply margin was observed and the HVDC was unavailable.

Figure 8. Market Price Trend - Luzon, August 2018

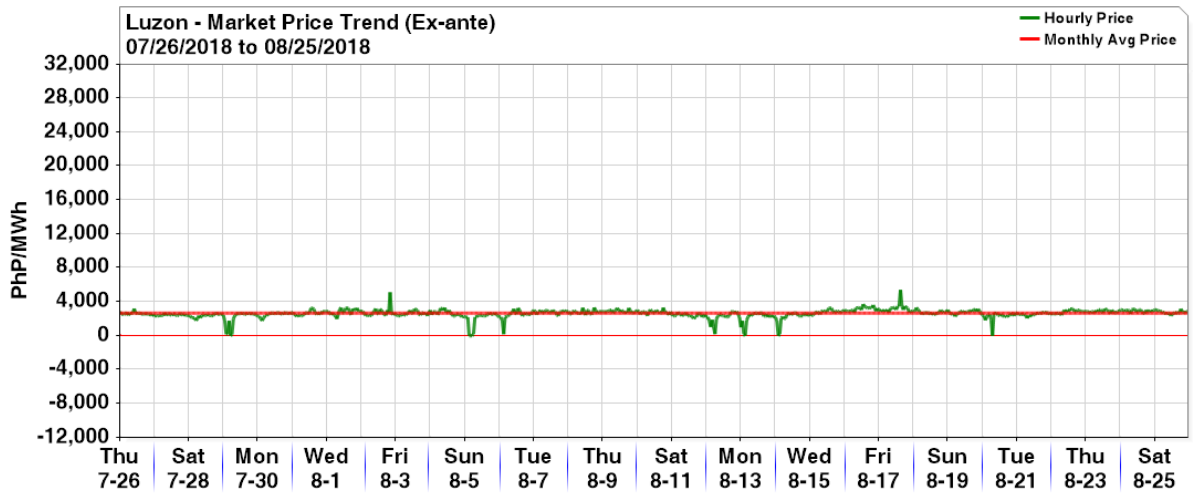


Figure 9. Market Price Trend - Visayas, August 2018

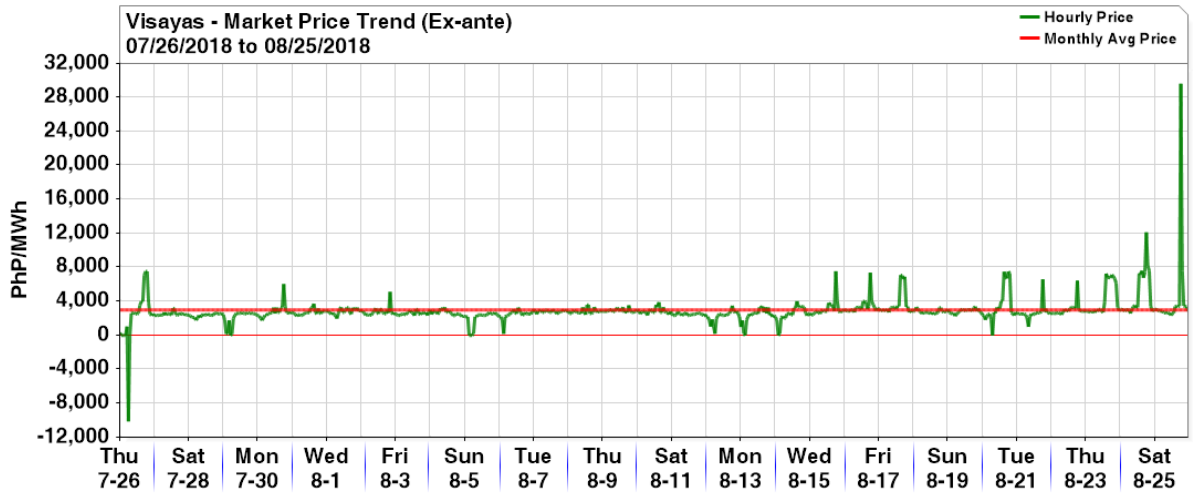


Table 10. Regional Price Summary – August 2018 and July 2018

	Luzon (In PhP/MWh)			Visayas (In PhP/MWh)			% Difference		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
August 2018	5,415	0	2,661	29,620	-10,109	2,983	(81.7)	(100.0)	(10.8)
July 2018	17,478	0	3,804	17,473	-10,305	3,744	0.0	(100.0)	1.6

B. Price Distribution

Consistent with the decrease in average price, the frequency of prices below PhP4,000/MWh increased to 99.1 percent from previous month's 83.8 percent. Also, no market price was recorded above PhP8,000/MWh from 4.7 percent in the previous month.

In addition, lower frequency of prices ranging from PhP4,000/MWh to PhP8,000/MWH was recorded this month at 0.9 percent coming from 11.5 percent in the previous month.

Figure 10. Price Distribution, August 2018 and July 2018

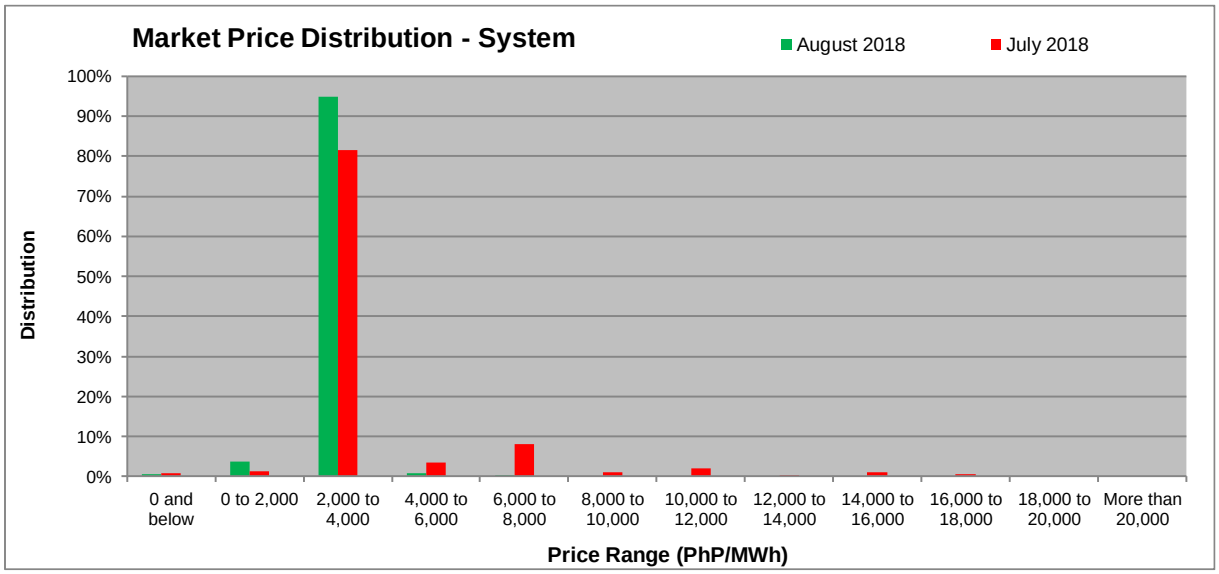


Table 11. Price Distribution – August 2018 and July 2018

Price Range (PhP/MWh)	% Distribution	
	August 2018	July 2018
0 and below	0.7	0.8
0 to 2,000	3.6	1.4
2,000 to 4,000	94.8	81.5
4,000 to 6,000	0.8	3.5
6,000 to 8,000	0.1	8.1
8,000 to 10,000	0.0	1.0
10,000 to 12,000	0.0	1.9
12,000 to 14,000	0.0	0.3
14,000 to 16,000	0.0	1.0
16,000 to 18,000	0.0	0.6

C. Price Duration Curve

The price duration curves for both the off-peak[6] and peak[7] hours demonstrate the higher market prices, especially in peak hours, during the August billing month when compared to the previous month.

Bulk of the market prices during the off-peak hours of the billing month, at 92.4 percent, were within the price range PhP2,000/MWh to PhP4,000/MWh (Figure 11). About 6.4 percent was from PhP0/MWH to PhP2,000/MWh while the remaining 1.2 percent were PhP0/MWh and below.

On the other hand, market prices during peak hours were higher than the off-peak hours as denoted by higher frequency of prices above PhP4,000/MWh. In Figure 12, it was noted that only 97.8 percent was above PhP2,000/MWH up to PhP4,000/MWh while 2.2 percent was between PhP4,000/MWh and PhP8,000/MWh.

[6]Off-peak hours include 0100H to 0900H and 2200H to 2400H from Mondays to Sundays and 0100H to 1800H and 2100H to 2400H on Sundays and Holidays

[7]Peak hours include 1000H-2100H from Mondays to Sundays and 1900H-2000H on Sundays and Holidays

Figure 11. Price Duration Curve (Off-Peak Period), August 2018

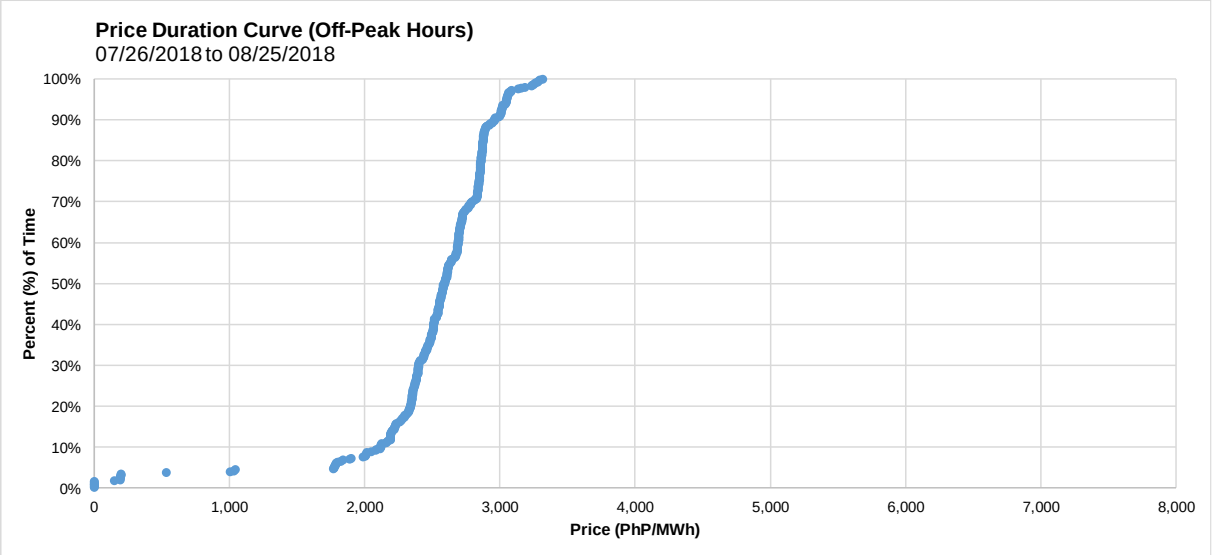
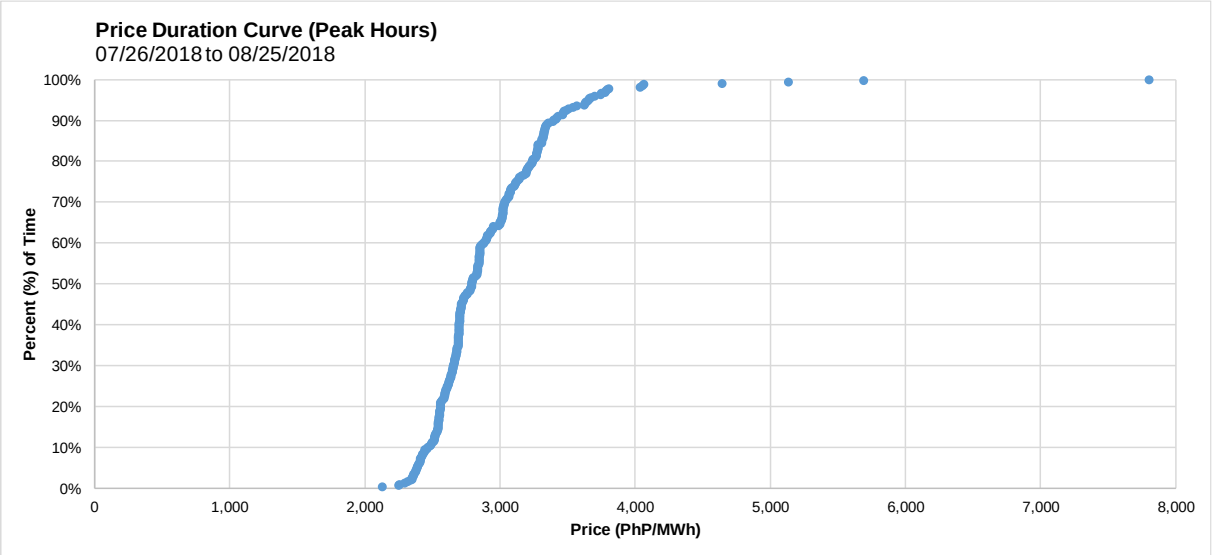


Figure 12. Price Duration Curve (Peak Period), August 2018

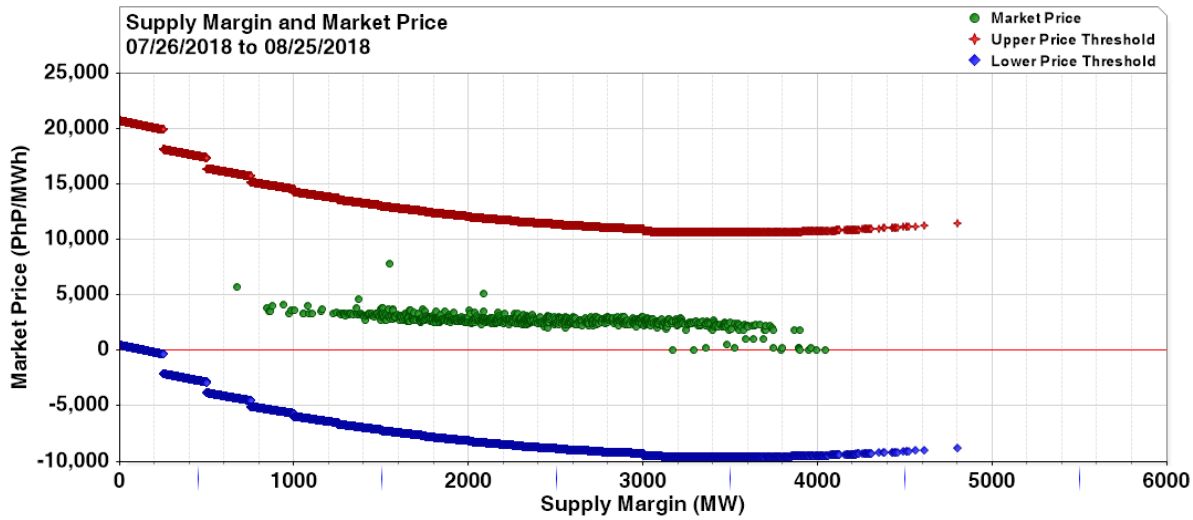


D. Interesting Pricing Event

Interesting pricing events refer to intervals determined to have price outliers based on the relationship of market price and supply margin. Prices within the upper and lower reference price thresholds are considered as “normal prices”, while prices outside or beyond the thresholds are tagged as “interesting pricing events”. Annex A provides details on the MSC-approved methodology in determining interesting pricing events.

Market prices during the August billing month were within the upper and lower reference price thresholds indicating that no interesting pricing event was recorded.

Figure 13. Supply Margin and Market Price, August 2018



V. Pricing Errors and Market Intervention

System-wide non-congestion pricing errors affected 145 trading intervals or 19.5 percent of the time in the ex-ante and 130 trading intervals or 17.5 percent of the time in the ex-post during the August billing month, related to inappropriate input data which affected the prices and schedules. This posted an increase from previous month's non-congestion pricing error occurrences that affected six (6) trading intervals or 0.8 percent of the time during the ex-ante and four (4) trading intervals or 0.6 percent of the time during the ex-post.

In Luzon, the frequency of issuances of non-congestion pricing errors affected three (3) trading intervals or 0.4 percent of the time in the ex-ante related to the localized constraint violation on Paco and Kalayaan transformers. This month's figure was lower than previous month's five (5) trading intervals or 0.7 percent of the time in the ex-ante. On the other hand, it may be recalled that no non-congestion pricing error was observed in the ex-post in the previous month.

In Visayas, non-congestion pricing errors affected 31 trading intervals or 4.2 percent of the time, higher than last month's 14 trading intervals or 1.9 percent of the time in the ex-ante. Meanwhile 28 trading intervals or 3.8 percent of the time were affected in the ex-post, higher than last month's 14 trading intervals or 1.9 percent of the time. These were mainly on account of the localized constraint violation on Amlan transformers.

Meanwhile, a decrease in the system-wide application of Price Substitution Methodology (PSM) was observed this month, affecting a total of 16 trading intervals or 2.2 percent of the time (previous month's 80 trading intervals or 11.1 percent of the time) in the ex-ante and 28 trading intervals or 3.8 percent of the time (previous month's 72 trading intervals or 10 percent of the time) in the ex-post. PSM application this month was mainly due to constraint on Samboan-Amlan Line 1 (Cebu-Negros submarine cable) and (Daan Bantayan- Tabango line) Leyte-Cebu submarine cable.

Table 12. PEN, PSM and MI Summary, August 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	145	19.5	3	0.4	31	4.2	179	24.1
PEN (RTX)	130	17.5	1	0.1	28	3.8	159	21.4
PSM (RTD)	16	2.2	-	-	-	-	16	2.2
PSM (RTX)	28	3.8	-	-	-	-	28	3.8
MI	-	-	-	-	-	-	-	-

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

Shown in Table 13 below are the non-congestion pricing errors by type during the month. It was noted that system-wide non-congestion pricing errors, affecting a total of 145 trading intervals in the ex-ante and 130 trading intervals in the ex-post were related to inappropriate input data.

In Luzon, regional contingency-related pricing errors affected 11 trading intervals in the ex-ante and one (1) trading interval in the ex-post while load shedding affected three (3) trading intervals in the ex-ante.

On the other hand, in the Visayas region, pricing error due to load shedding affected 31 trading intervals during the ex-ante and 28 trading intervals during the ex-post.

Table 13. PEN Type Summary, August 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	**145**	**19.5**	**14**	**1.9**	**31**	**4.2**	**190**	**25.5**
Contingency	-	-	11	1.5	-	-	11	1.5
Base Case	-	-	-	-	-	-	-	-
Over-generation	-	-	-	-	-	-	-	-
VoLL	-	-	3	0.4	31	4.2	34	4.6
Inappropriate Input Data	145	19.5	-	-	-	-	145	19.5
PEN (RTX)	**130**	**17.5**	**1**	**0.1**	**28**	**3.8**	**159**	**21.4**
Contingency	-	-	-	-	-	-	-	-
Base Case	-	-	-	-	-	-	-	-
Over-generation	-	-	-	-	-	-	-	-
VoLL	-	-	-	-	28	3.8	28	3.8
Inappropriate Input Data	130	17.5	1	0.1	-	-	131	17.6

VI. HVDC Scheduling

Power flow through the HVDC Interconnection was generally directed towards the Luzon region for 468 trading intervals in the ex-ante during the billing month, with schedules ranging from 0.3 MW to 403 MW.

On the other hand, the HVDC power flow was directed towards the Visayas for the 253 trading intervals in the ex-ante during the billing month, with schedules ranging from 0.2 MW to 250 MW. It was noted that the 250-MW limit was maximized for 9 trading intervals during the billing month.

Moreover, HVDC link was unavailable on 26 July from 0100H to 2200H affecting 22 trading intervals related to the annual preventive maintenance of the HVDC link. In addition, HVDC link unavailable on 21 August at 0900H related to the conduct of open line test of HVDC Line 2 and reconfiguration of L1-ground to Line 2-Ground scheme.

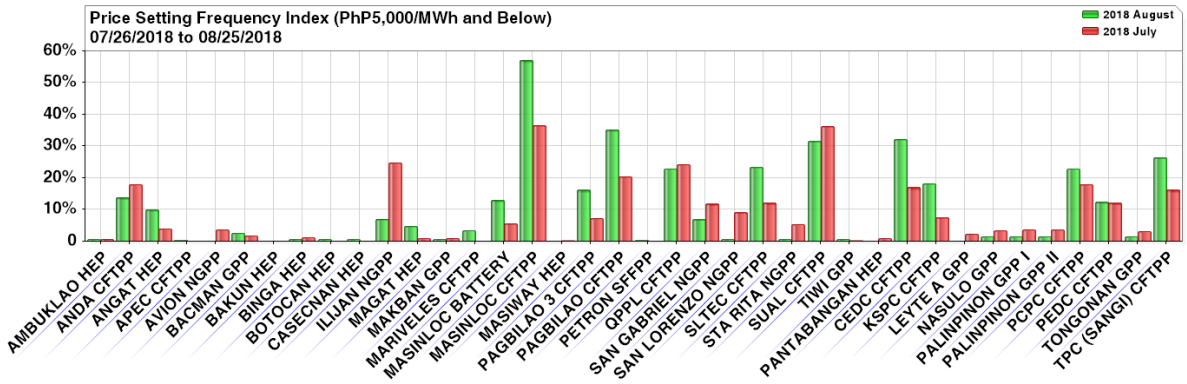
Table 14. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), August 2018

Results of HVDC Scheduling	HVDC Limit during Ex-ante (Visayas/Luzon) (No. of Trading Intervals)				HVDC Limit during Ex-post (Visayas/Luzon) (No. of Trading Intervals)			
	0/0	250/400	250/420	Total	0/0	250/400	250/420	Total
Visayas to Luzon	**-**	**17**	**451**	**468**	**-**	**18**	**454**	**472**
Limit Not Maximized		*17*	*451*	*468*		*18*	*454*	*472*
Limit Maximized [1]				-				-
Luzon to Visayas	**-**	**9**	**244**	**253**	**-**	**8**	**241**	**249**
Limit Not Maximized		*9*	*235*	*244*		*8*	*234*	*242*
Limit Maximized [1]			*9*	*9*			*7*	*7*
No Flow [1]	**23**			***23***	**23**			***23***
TOTAL	**23**	**26**	**695**	**744**	**23**	**26**	**695**	**744**

VII. Price Setting Plants[8]

Almost all of the market prices, at 99.6 percent, during the billing month were below PhP5,000/MWh with coal plants as frequent price setters, namely Masinloc CFTPP at 57 percent, Pagbilao CFTPP at 34.9 percent, CEDC CFTPP at 32.1 percet, Sual CFTPP at 31.5 percent, and TPC Sangi CFTPP at 26.2 percent.

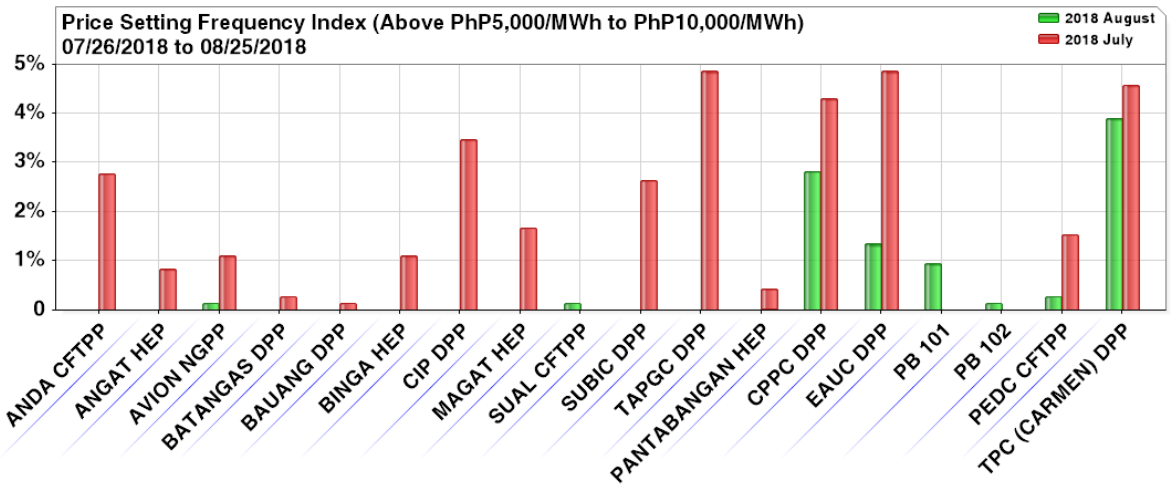
Figure 14. Price Setting Frequency Index (PhP5,000/MWh and Below), August 2018 and July 2018



The market prices ranged between PhP5,000/MWh to PhP10,000/MWh at 0.4 percent of the time. Visayas oil-based plants obtained the highest frequencies in setting the prices including TPC Carmen DPP at 3.9 percent, CPPC DPP at 2.8 percent, EAUC DPP at 1.3 percent, and PB 101 at 0.9 percent. Coal plant PEDC CFTPP is also noted as price setter at 0.3 percent of the time.

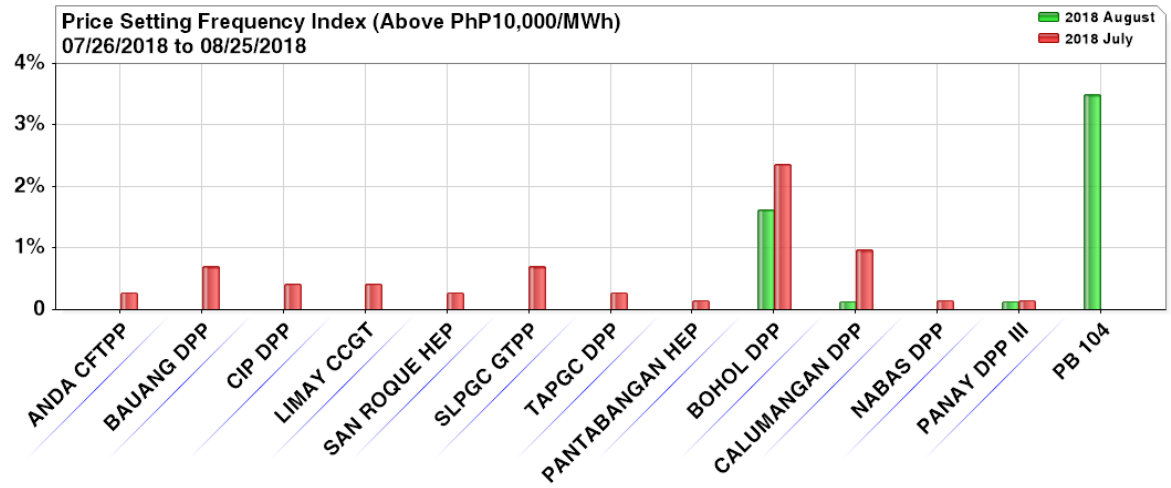
[8] A generator trading node is considered as a price setter when its last accepted offer price is between 95% to 100% of its nodal price. A generating plant is considered as price setter if at least one of its trading nodes was price setter in a given trading hour. The determination of the price setter/s in a trading interval factors in the prevailing pricing condition for the same. The price setters are determined from: (i) ex-ante for trading intervals without pricing error during ex-ante, (ii) ex-post with pricing error during ex-ante but without pricing error during ex-post, (iii) market re-run results for trading intervals with pricing error both in ex-ante and ex-post, and (iv) trading intervals where the price substitution methodology (PSM) was applied. For trading intervals affected by PSM, the unconstrained marginal plants are considered price setters. Further, in instances of regional price separation, price setters are determined separately for each region.

Figure 15. Price Setting Frequency Index (Above PhP5,000/MWh to PhP10,000/MWh), August 2018 and July 2018



In addition, market prices above PhP10,000/MWh were also observed in Visayas which were set by oil-based plants led by PB 104 at 3.5 percent and Bohol DPP at 1.6 percent. Calumangan DPP and Panay DPP III were also able to set at the said level for 0.1 percent of the time each.

Figure 16. Price Setting Frequency Index (Above PhP10,000/MWh to PhP20,000/MWh), August 2018 and July 2018



VIII. Residual Supply

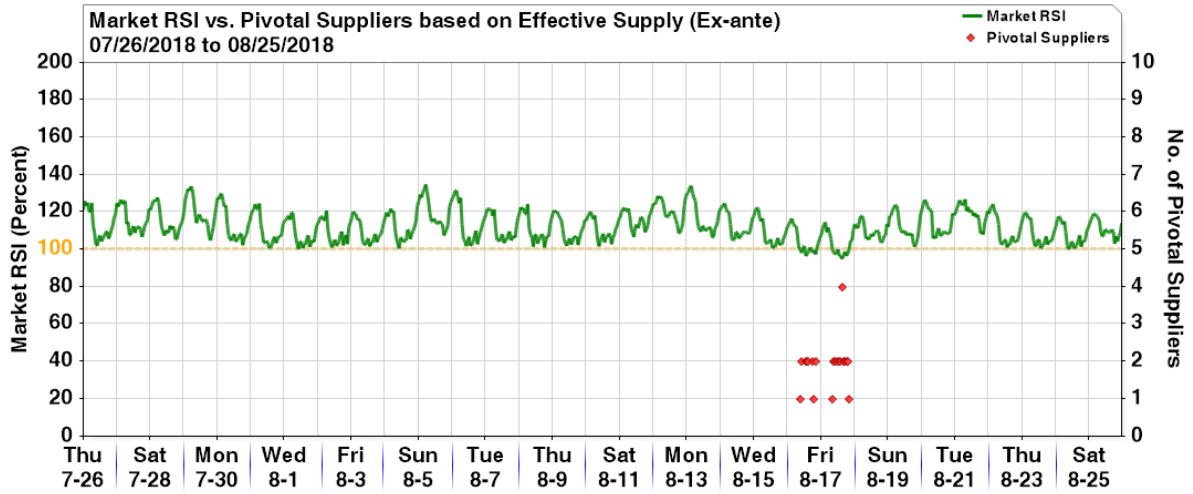
The succeeding figure below show the hourly trend of the Market Residual Supply Index (Market RSI)[9] plotted against the number of pivotal supplier/s.

Consistent with the wide supply margin this month, the market RSI was above the 100 percent mark for 97 percent of the time or in 724 trading intervals (previous month's 75 percent or 540

[9] For a generator, the Residual Supply Index (RSI) is a dynamic continuous index measured as ratio of the available generation without that generator to the total generation required to supply the demand. The Market RSI is measured as the lowest RSI among all generators in the market. A Market RSI less 100% indicates the presence of pivotal generator/s or supplier/s.

trading intervals), indicating that there were no pivotal suppliers for the majority of the trading intervals during the billing month.

Figure 17. Market RSI vs. Pivotal Suppliers (Ex-Ante), August 2018



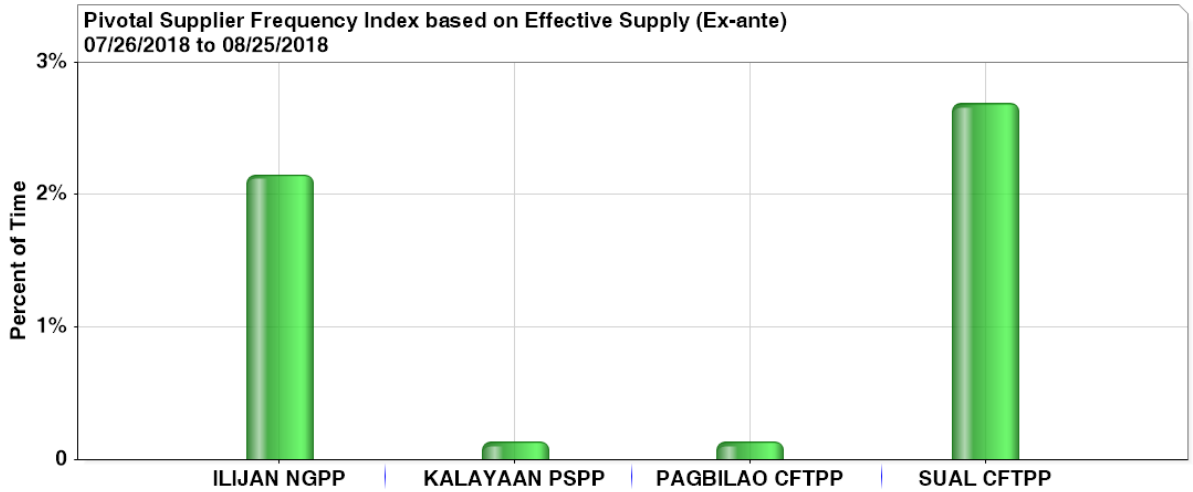
IX. Pivotal Suppliers[10]

A total of 4 Luzon plants emerged as pivotal suppliers during the August billing month led by Sual CFTPP for having been pivotal for 2.7 percent of the time and natural gas plants Ilijan NGPP for 2.2 percent.

Kalayaan PSPP (0.1 percent) and Pagbilao CFTPP (0.1 percent) also figured in as most frequent pivotal suppliers.

No Visayas plant emerged as pivotal supplier this billing month.

Figure 18. Pivotal Supplier Frequency Index - Luzon, August 2018

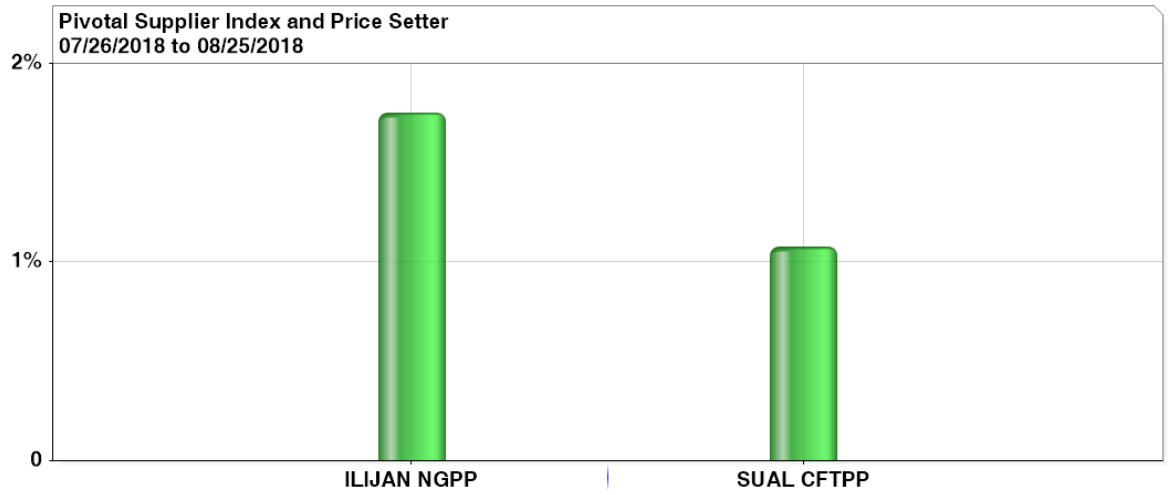


[10] The Pivotal Supply Index (PSI) measures how critical a particular generator is in meeting the total demand at a particular time. It is a binary variable (1 for pivotal and 0 for not pivotal) which measures the frequency that a generating is pivotal for a particular period.

X. Price-Setters and Pivotal Plants

Only two (2) Luzon plants became price setters at the same time that they were pivotal namely Ilijan NGPP at 1.7 percent and Sual CFTPP at 1.1 percent.

Figure 19. PSI vs. PSFI, August 2018

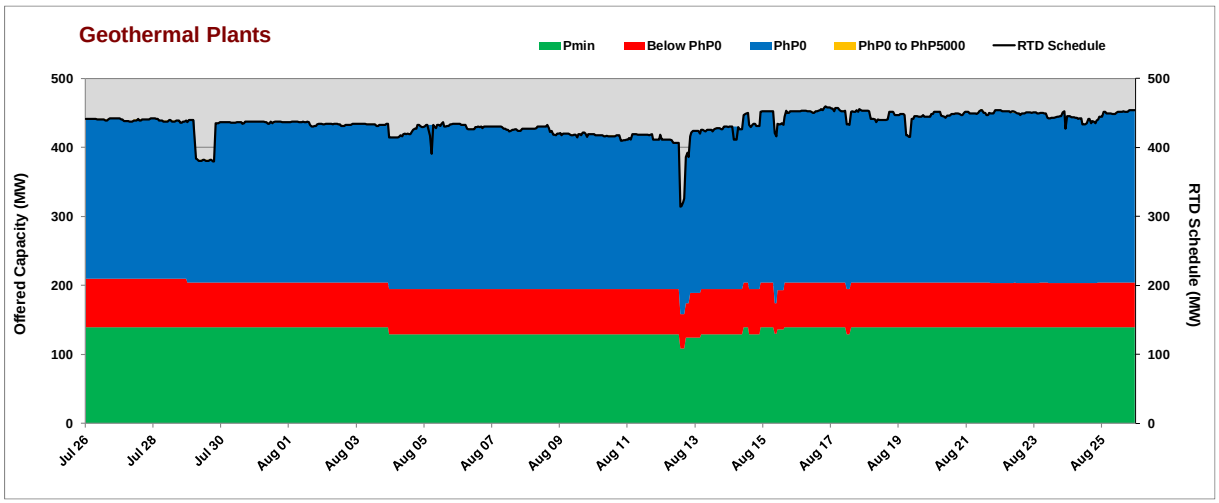


XI. Generator Offer Pattern

Luzon geothermal plants offered almost its entire capacity (99.9 percent) at PhP0/MWh and below. In particular, about 53.7 percent was priced at exactly PhP0/MWh while the remaining 46.2 percent was priced below PhP0/MWh (Figure 21). The remaining 0.1 percent was offered at PhP0/MWh to PhP5,000/MWh.

Accordingly, all of its submitted capacity offers, at 99.8 percent, were scheduled for dispatch in the market.

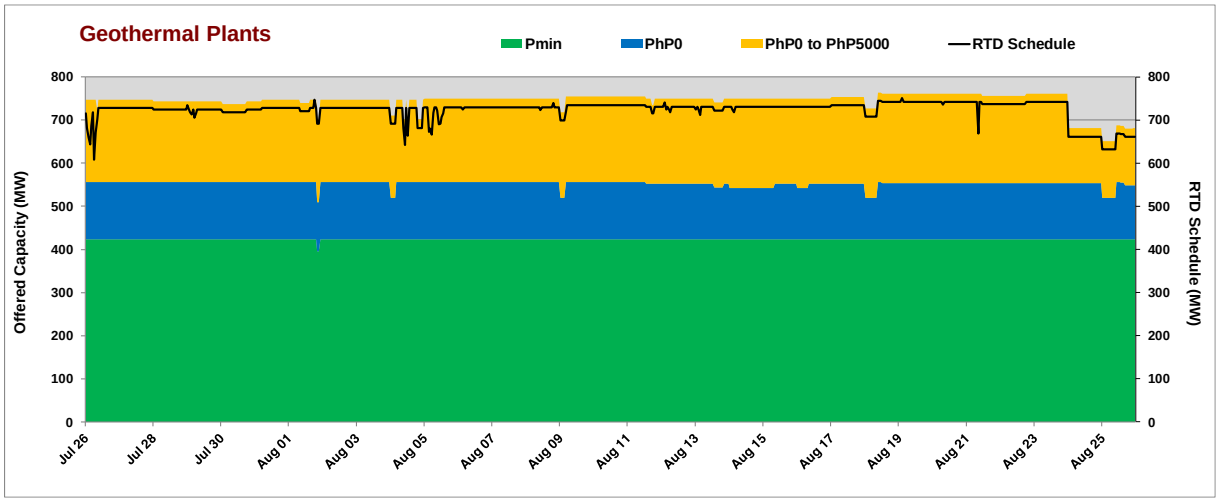
Figure 20. Geothermal Plants Offer Pattern, Luzon – August 2018



On the other hand, Visayas geothermal plants had slightly higher-priced offers compared to Luzon geothermal plants. It was noted that about 25.7 percent of Visayas geothermal plants' offered capacity was priced at above PhP0/MWh up to PhP5,000/MWh while the remaining

74.3 percent was priced at PhP0/MWh and below (Figure 22). It was noted that about 97 percent of these capacity offers were scheduled for dispatch.

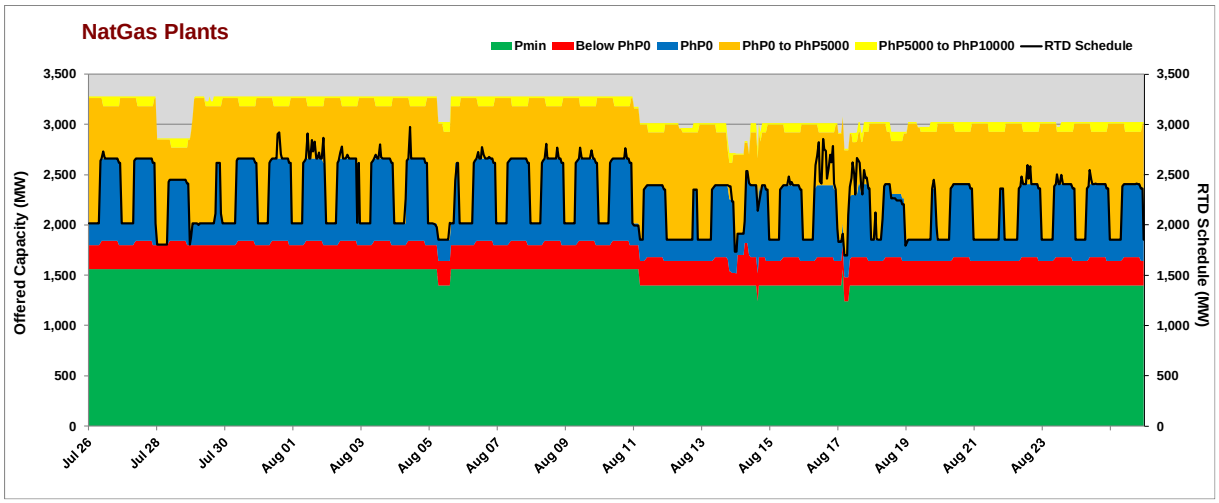
Figure 21. Geothermal Plants Offer Pattern, Visayas – August 2018



About 72.4 percent of the natural gas plants' capacity offers were priced at PhP0/MWh and below, 25.9 percent was priced above PhP0/MWh to PhP5,000/MWh and 1.7 percent was priced at above PhP5,000/MWh to PhP10,000/MWh (Figure 23).

Accordingly, about 72.8 percent of the offers of natural gas plants were scheduled for dispatch within the month.

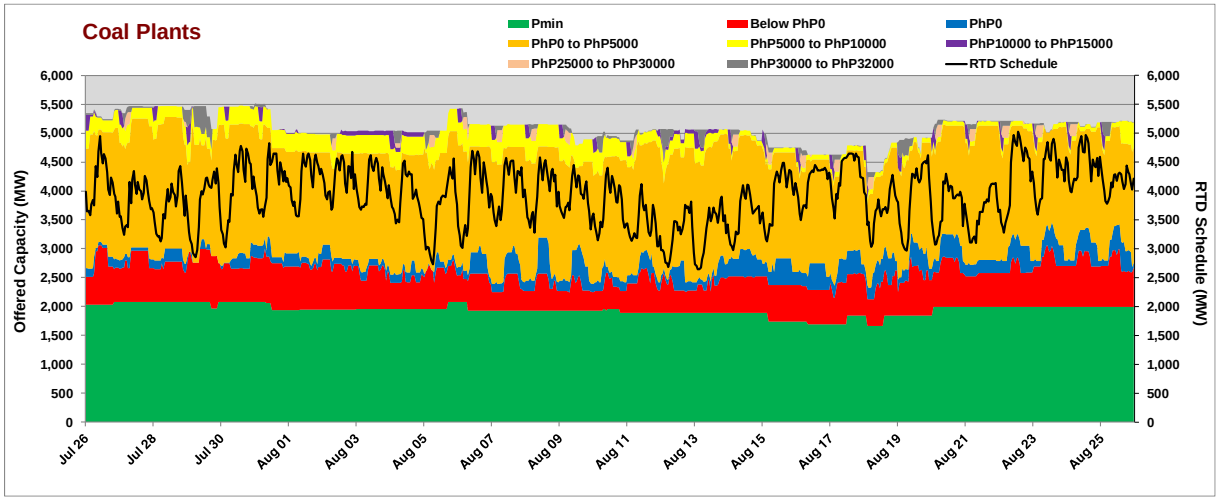
Figure 22. Natural Gas Plants Offer Pattern, Luzon – August 2018



Luzon coal plants submitted 55.4 percent of its capacity offers at prices ranging from PhP0/MWh and below while 38.3 percent was submitted at prices above PhP0/MWh to PhP5,000/MWh (Figure 24). About 5.1 percent of their offered capacity were priced between PhP5,000/MWh to PhP15,000/MWh. The remaining 1.2 percent of the capacity offers were priced at PhP25,000/MWh to PhP32,000/MWh which were mostly submitted by, Anda CFTPP.

About 77.1 percent of the capacity offers of Luzon coal plants were scheduled for dispatch within the month.

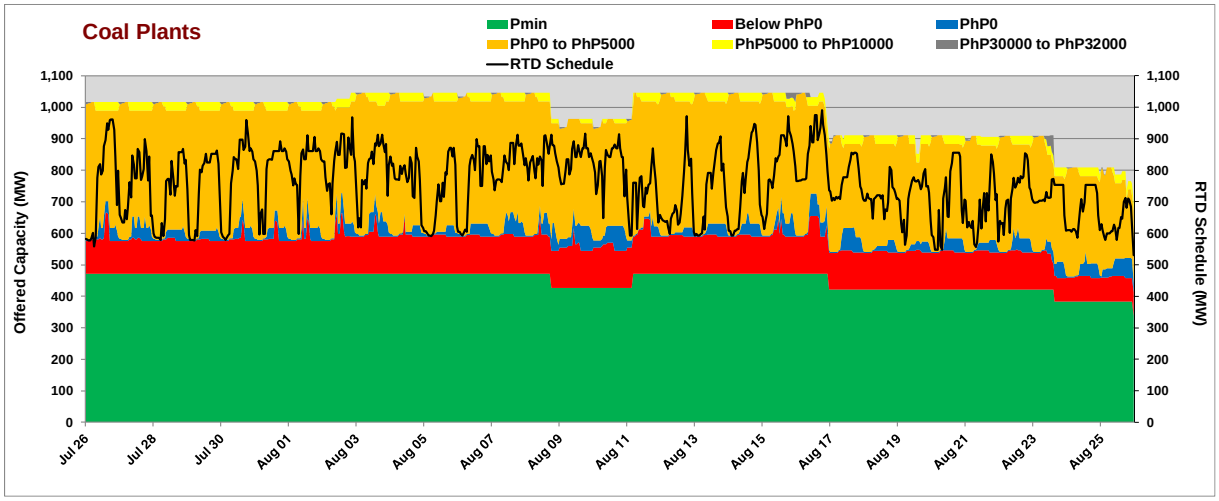
Figure 23. Coal Plants Offer Pattern – Luzon, August 2018



Meanwhile, 60.6 percent of Visayas coal plants' capacity offers was priced at PhP0/MWh and below, 39.3 percent at above PhP0/MWh to PhP10,000/MWh. A minimal percentage, at 0.1 percent, was offered at prices ranging between PhP30,000/MWh and PhP32,000/MWh which were mostly from KSPC CFTPP units 1 and 2 (Figure 25).

About 77 percent of the offered capacity from Visayas coal plants was scheduled for dispatch.

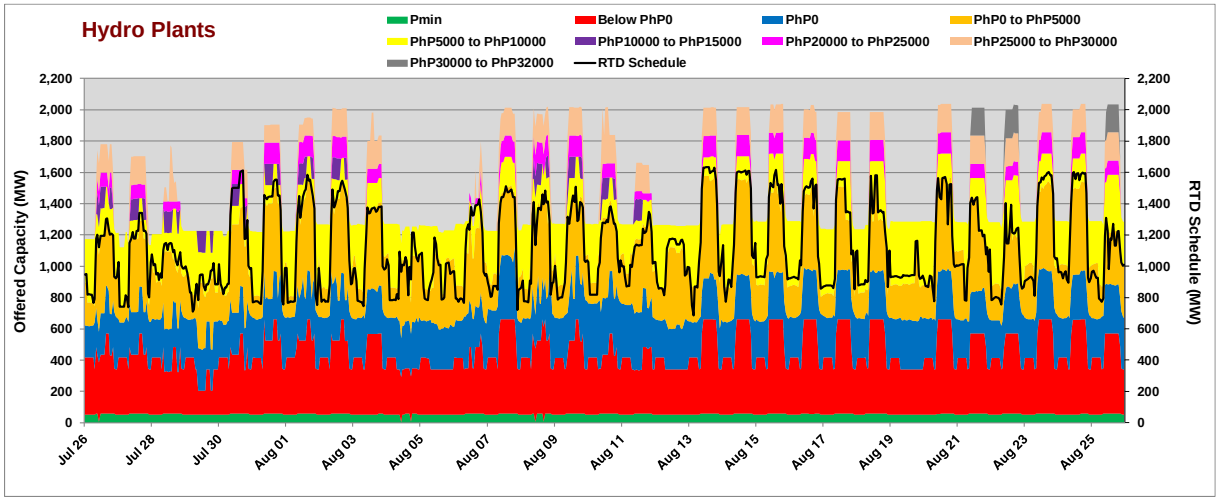
Figure 24. Coal Plants Offer Pattern, Visayas – August 2018



Offer prices of Luzon hydro plants shifted to lower level this month with 27.1 percent offered at prices above PhP5,000/MWh from previous month's 55.2 percent (Figure 26). In particular, decreases were noted in offers prices at above PhP5,000/MWh to PhP10,000/MWh from previous month's 30.4 percent to current month's 17.6 percent and at above PhP30,000/MWh to PhP32,000/MWH from previous month's 12.2 percent to current month's 0.5 percent.

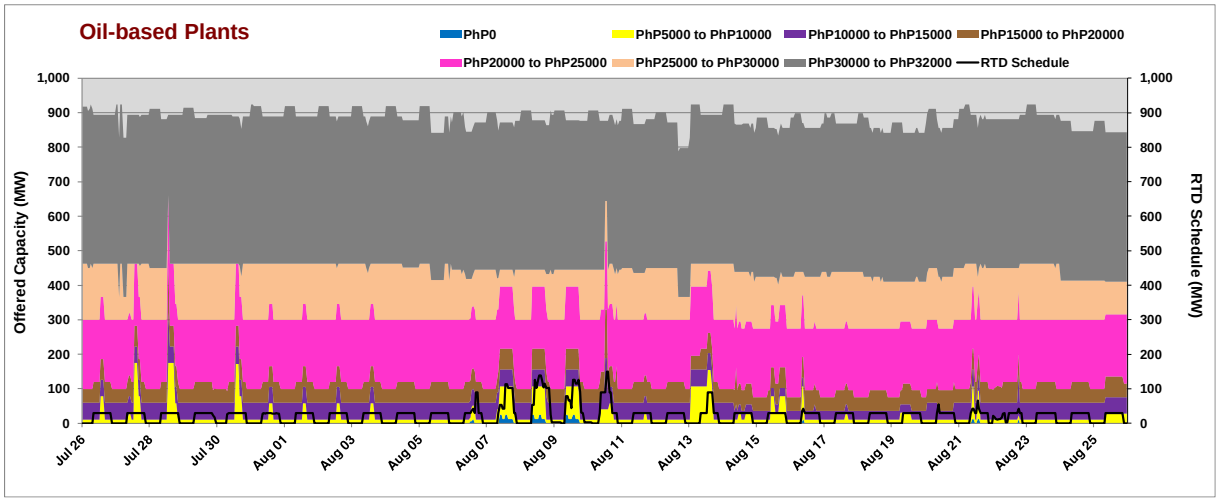
Offers priced below PhP5,000/MWh was recorded at 72.9 percent this month coming from 44.8 percent in July.

Figure 25. Hydro Plants Offer Pattern, Luzon – August 2018



Luzon oil-based plants submitted the highest offer prices with bulk of their offers, at 49.6 percent, priced at above PhP30,000/MWh up to PhP32,000/MWh. Moreover, 10.8 percent (previous month's 33.9 percent) was offered at PhP10,000/MWh to PhP20,000/MWh while 36.8 percent (previous month's 12.6 percent) at PhP20,000/MWh to PhP30,000/MWh (Figure 27). It was noted that only 2.8 percent of its capacity offers priced at PhP10,000/MWh and below.

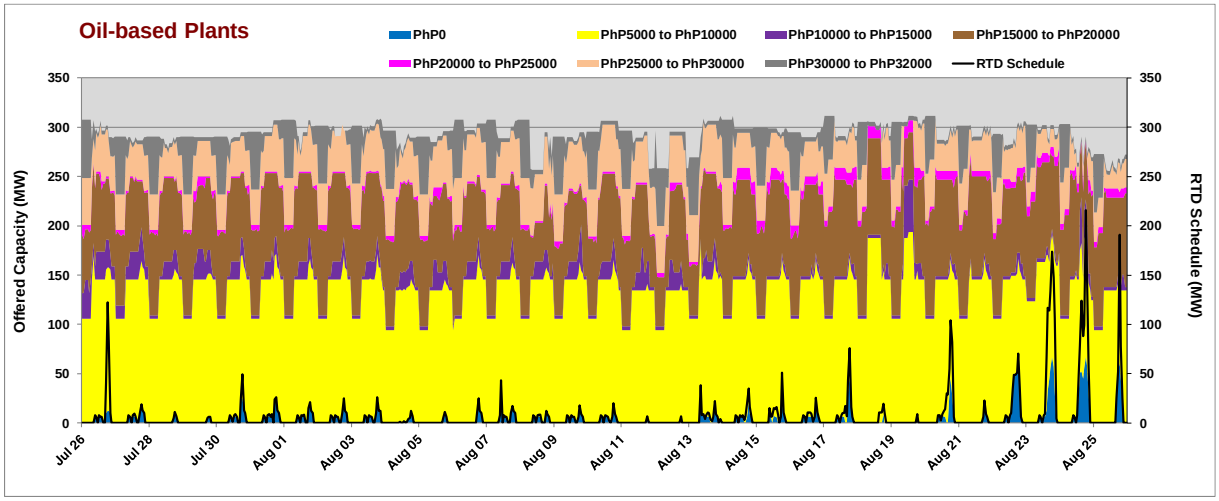
Figure 26. Oil-based Plants Offer Pattern, Luzon – August 2018



Similarly, Visayas oil-based plants offered their capacities at relatively higher prices when compared with other plant types with 22.5 percent priced above PhP20,000/MWh (Figure 28). About 44.7 percent was offered at PhP5,000/MWh to PhP10,000/MWh, 3.4 percent at PhP10,000/MWh to PhP15,000/MWh and 28 percent at PhP15,000/MWh to PhP20,000/MWh. Only 1.4 percent of their capacity offers were priced at PhP0/MWh and below.

About 2.3 percent of Visayas oil-based plants' capacity offered were scheduled for dispatch during the billing month.

Figure 27. Oil-based Plants Offer Pattern, Visayas – August 2018



XII. Capacity Factor

Luzon

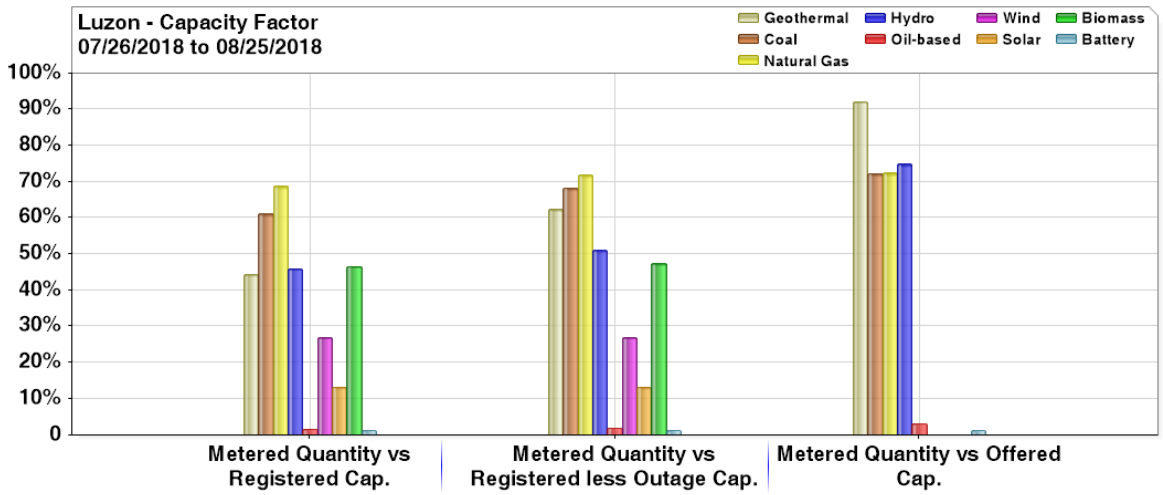
Natural gas plants observed the highest utilization when measured in terms of registered capacity among resource types with capacity factor at 69 percent. Coal and hydro plants followed with capacity factors of 61 percent and 46 percent, respectively. Geothermal and oil-based plants came next at 44 percent and 1 percent, respectively. On the other hand, when measured in terms of registered capacity net of outage, natural gas and coal plants obtained the highest utilization at 72 percent and 68 percent, respectively. Geothermal plants followed with a capacity factor of 62 percent, hydro plants with 51 percent, and oil-based plants with 2 percent.

Utilization among lower-priced plants was highest when measured in terms of offered capacity, indicating that capacities, when offered, are generally scheduled for dispatch. Geothermal plants posted the highest capacity factor at 92 percent. Hydro plants followed with 75 percent while coal and natural gas plants recorded capacity factors at 72 percent each. Oil-based plants had lower capacity factor, at 3 percent.

Meanwhile, preferential dispatch plants – biomass plants' capacity factors were posted at 47 percent when measured based on registered capacity and based on registered less outage capacity while wind plants recorded the same capacity factors at 27 percent each. On the other hand, lower utilization level was noted for Luzon solar plants with their capacity factors based on registered capacity, and registered less outage capacity each at 13 percent.

On the other hand, sole battery energy storage facility in the WESM, Masinloc Battery, posted a capacity factor of 1 percent each when measured in terms of registered capacity, registered capacity net of outage, and offered capacity.

Figure 28. Capacity Factor – Luzon Plants, August 2018

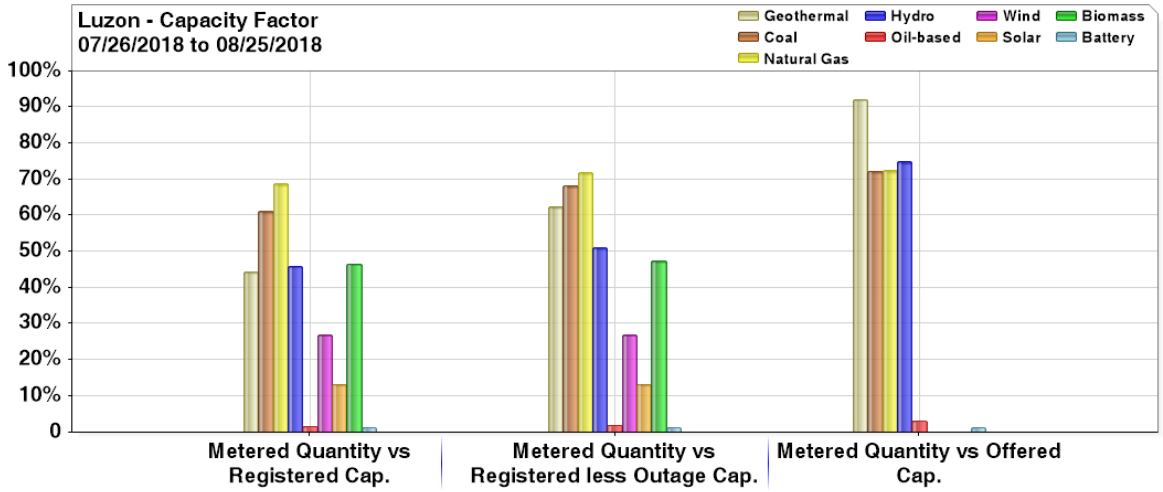


In Visayas, geothermal plants obtained the highest utilization among resource types in terms of registered capacity with capacity factors at 76 percent. Hydro and coal plants then followed with capacity factors at 44 percent and 43 percent, respectively. In terms of registered capacity net of outage, geothermal recorded its capacity factors at 80 percent, coal plants at 45 percent and hydro plants had 44 percent. Oil-based plants recorded the lowest utilization each at 4 percent when measured in terms of registered capacity and percent when measured in terms of registered capacity net of outage.

In terms of offered capacity, geothermal plants recorded a capacity factor at 91 percent while coal plants' capacity factor was at 61 percent. Meanwhile, oil-based plants posted a capacity factor of 7 percent.

Wind plants' capacity factors based on registered capacity and based on registered capacity net of outage in the region was recorded at 33 percent while solar plants recorded the same at 19 percent. No utilization was recorded from biomass plants this billing month.

Figure 29. Capacity Factor, Visayas Plants – August 2018

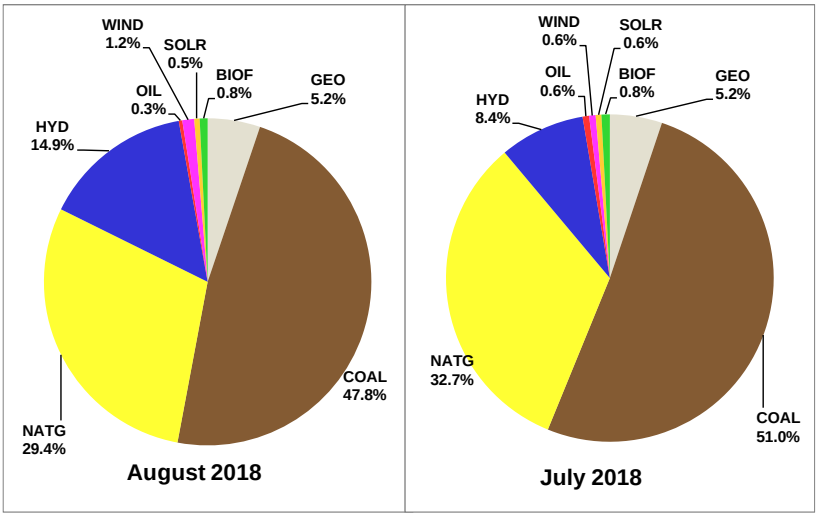


XIII. Generation Mix

Coal plants contributed the largest chunk of the metered quantity at 47.8 percent (previous month's 51 percent). Natural gas plants followed with 29.4 percent (previous month's 32.7

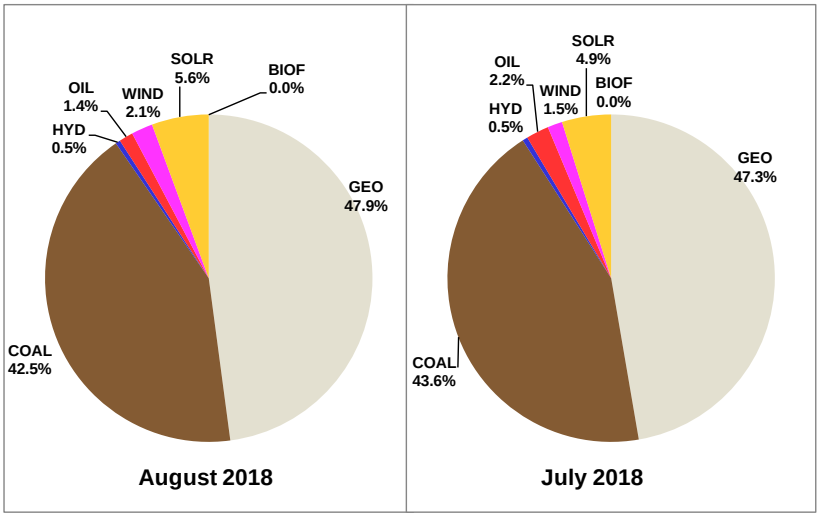
percent). Hydro and geothermal plants came next with 14.9 percent and 5.2 percent, respectively. Oil-based plants' contribution was recorded at 0.3 percent. Meanwhile, the contribution of preferential and must-dispatch generating units was recorded at 2.5 percent.

Figure 30. Generation Mix (Based on Metered Quantity) – Luzon, August 2018 and July 2018



In the Visayas region, geothermal plants had the highest contribution at 47.9 percent (previous month's 47.3 percent) of total metered quantity this month followed by coal plants with 42.5 percent (previous month's 43.6 percent). Oil-based and hydro plants came next with 1.4 percent and 0.5 percent respectively. Meanwhile, solar plants' contribution was recorded at 5.6 percent while wind plants had 2.1 percent. No generation from Visayas biofuel plants was noted this month following the end of the milling season.

Figure 31. Generation Mix (Based on Metered Quantity), Visayas – August 2018 and July 2018

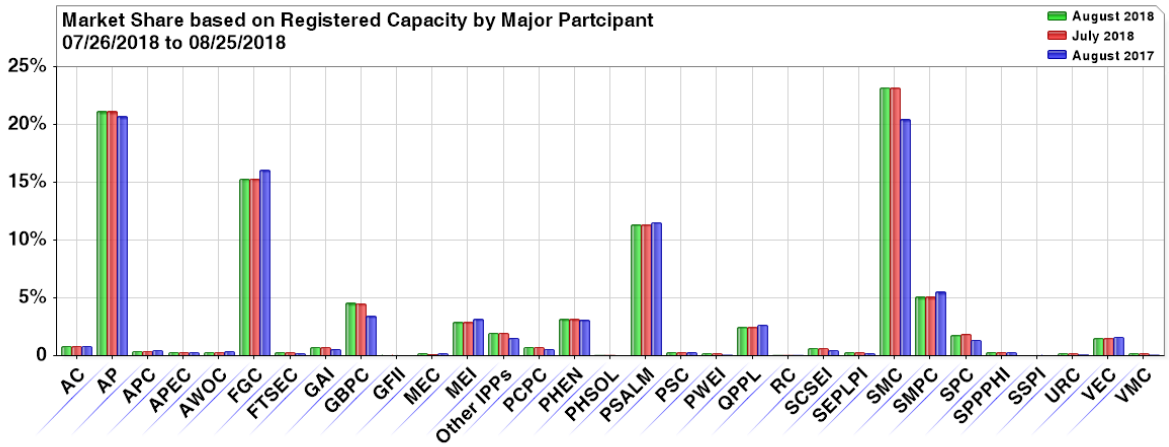


XIV. Market Concentration

a. Market Share

The integrated Luzon and Visayas market remained to be dominated by four (4) major participant groups based on registered capacity led by San Miguel Corporation (SMC) with a market share of 23.1 percent and Aboitiz Power (AP) with market share of 21.1 percent. First Gen Corporation (FGC) and Power Sector Asset and Liabilities Management (PSALM) followed with 15.3 percent and 11.3 percent, respectively. Semirara Mining Power Corporation (SMPC) and Global Business Power Corporation (GBPC) came next with market shares of 5.1 percent and 4.5 percent, respectively. No change was noted in the month-on-month comparison of the figures for the market shares based on registered capacity.

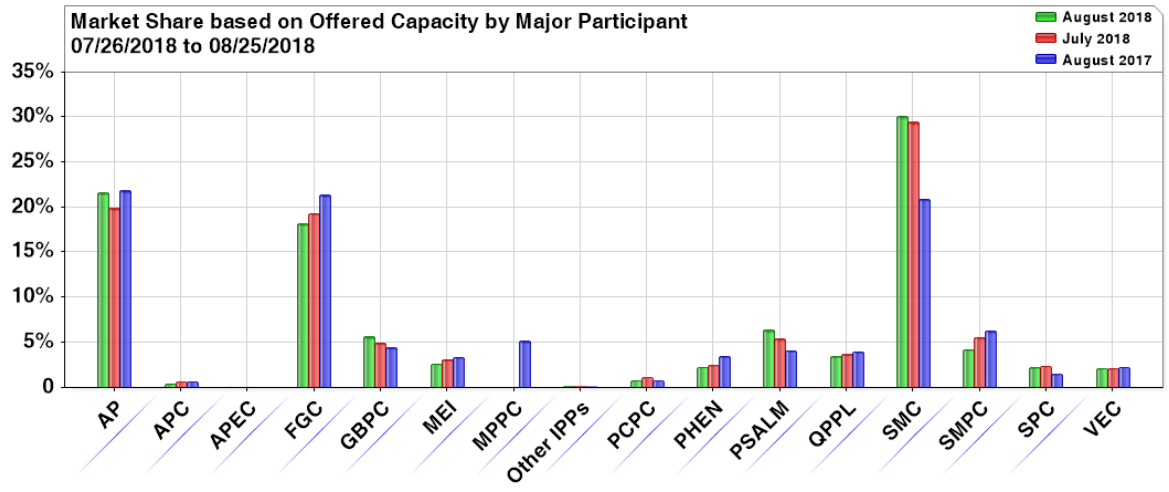
Figure 32. Market Share by Major Participant Group based on Registered Capacity August 2018, July 2018, and August 2017



Similarly, when market share is calculated based on offered capacity of scheduled generators, SMC group held the largest share of the market at 30.1 percent. AP held the second highest share at 21.6 percent while FGC had 18.1 percent.

PSALM and GBPC were also among the highest market shareholders with 6.4 percent and 5.6 percent of the offered capacity, respectively.

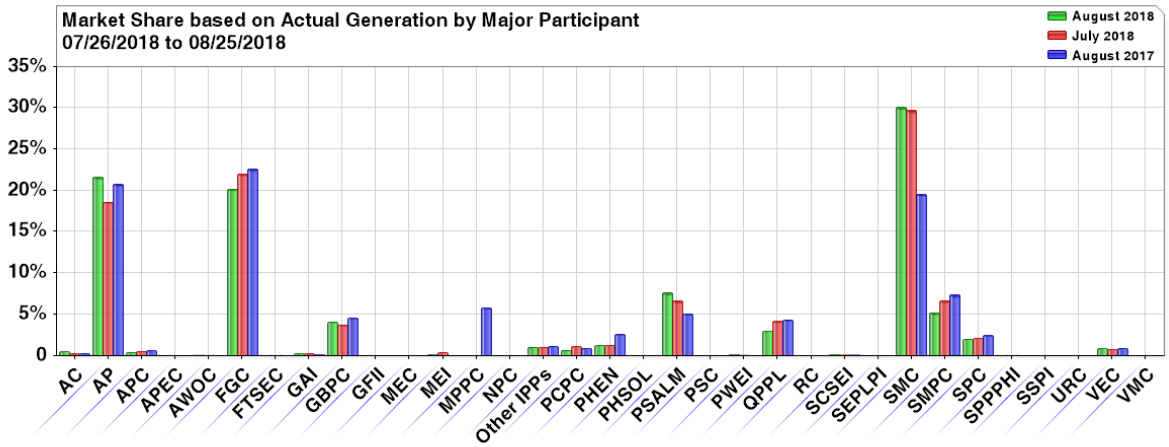
Figure 33. Market Share by Major Participant Group based on Offered Capacity, August 2018, July 2018 and August 2017



Meanwhile, when market share is calculated based on actual generation of scheduled generators, SMC group likewise held the largest share of the market at 30.1 percent. FGC and AP then followed with 21.6 percent and 20.1 percent, respectively.

SMPC and PSALM were also among the highest market shareholders 7.6 percent and 5.1 percent of the actual generation, respectively.

Figure 34. Market Share by Major Participant Group based on Actual Generation, August 2018, July 2018 and August 2017

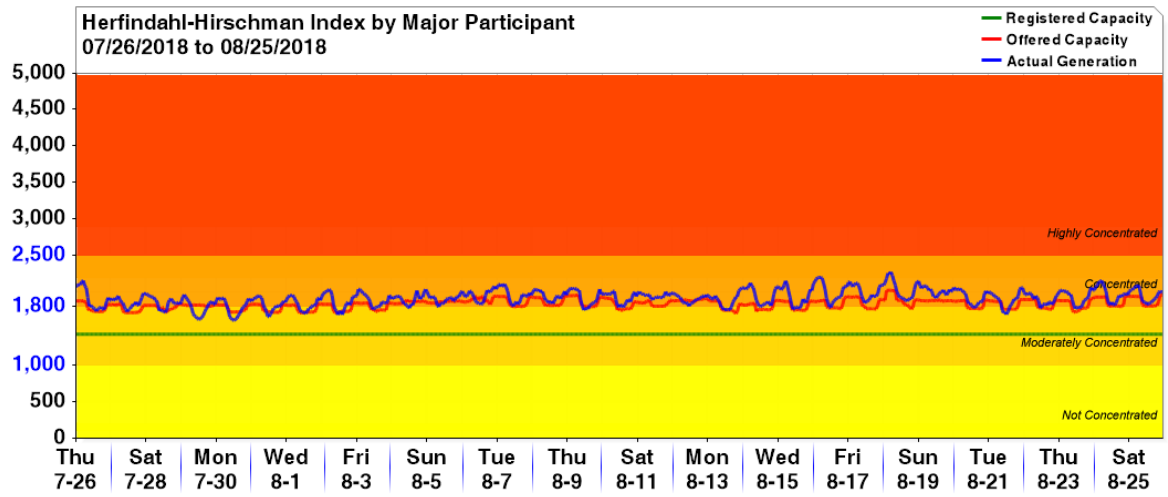


b. Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI)[11] calculated based on registered capacity by major participants' grouping indicated a moderately concentrated market throughout the August billing month. Meanwhile, when measured in terms of offered capacity, 528 trading intervals (71 percent of the time) showed a concentrated market while the remaining 216 trading intervals (29 percent) showed a moderately concentrated market. On the other hand, HHI calculation based on actual generation indicated a concentrated market more frequently at 641 trading intervals (86.2 percent) while the remaining 103 trading intervals (13.8 percent) indicated a moderately concentrated market.

[11] The HHI measures the degree of market concentration, taking into account the relative size and distribution of participants in the monitored market. It is calculated as the sum of squares of the participant's market share. The following are the widely-ised HHI screening numbers: the HHI approaches zero when the market has very large number of participants with each having a relatively small market share. In contrary, the HHI increases as the number of participants in the market decreases, and the disparity in the market shares among the participants increases. The following are the widely-used HHI screening numbers: (1) when HHI is less than 1,000 the market is not concentrated; (2) in the range of 1,000 to 1,800 the market is moderately concentrated; (3) greater than 1,800 to 2,500 the market is concentrated; and (4) greater than 2,500 the market is highly concentrated and signals lack of competition in the market.

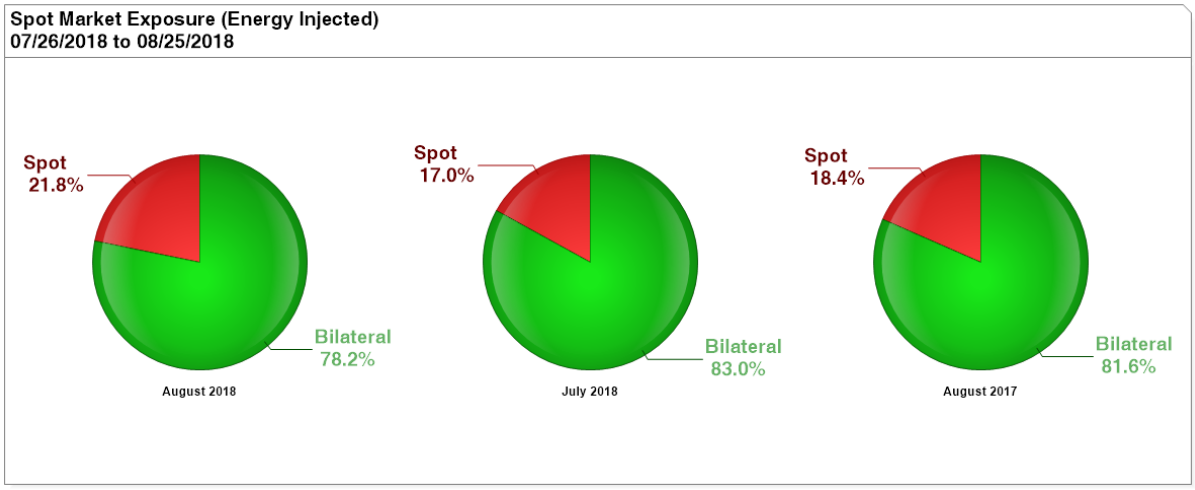
Figure 35. Hourly HHI based by Major Participant Grouping, August 2018



XV. Spot Exposure

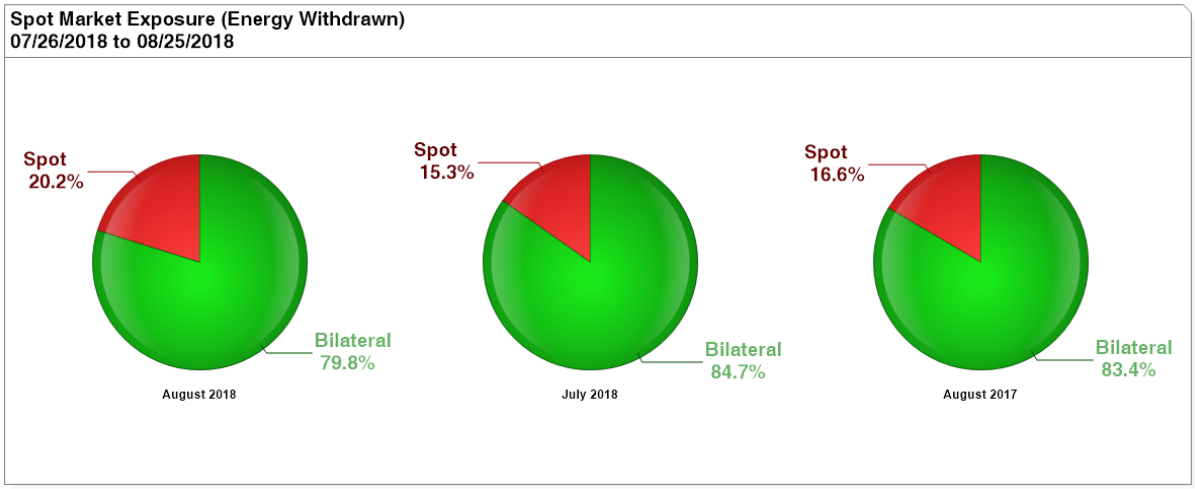
Spot market transaction of generator-trading participants comprised about 21.8 percent of the total energy transaction in the WESM. This was higher than previous month's 17 percent and previous year's 18.4 percent. Still, majority of the total energy injected into the grid was covered by bilateral contracts.

Figure 36. Spot Market Exposure of Generator-Trading Participants, August 2018, July 2018, and August 2017



On the side of the customers, only 20.2 percent of the total energy transaction during the billing month was attributed to spot market transactions. This was similarly higher than previous month's 15.3 percent and previous year's 16.6 percent.

Figure 37. Spot Market Exposure of Customers, August 2018, July 2018, and August 2017



Methodology in Determining Interesting Pricing Events

Supply margin is defined as the MW difference between the system effective supply[1] and demand requirement plus reserve schedules[2].

The market price is represented by the load weighted average of the final prices (LWAP) used for settlements which could either be of the following: (i) ex-ante prices for trading intervals without pricing error during ex-ante, (ii) ex-post prices for trading intervals with pricing error during ex-ante but without pricing error during ex-post, (iii) market re-run prices for trading intervals with pricing error both during ex-ante and ex-post, and (iv) estimated load reference prices (ELRP) for trading intervals where the ERC-approved Price Substitution Mechanism (PSM) was applied.

To determine the interesting pricing events, a combination of statistical methods namely, bandwidth method, ordinary least squares (OLS) method and non-parametric method was used to create the upper and lower reference price thresholds[3]. Further, the following criteria were considered in the determination of thresholds:

1. Market prices and supply margin from 26 December 2013 to 25 December 2017 to only include the periods when the PhP32,000/MWh offer price cap was adopted;
2. Upper and lower reference price thresholds were computed using ±3 percent standard deviations to provide a reasonable tolerance price levels;
3. Exclusion of intervals with market intervention and/or suspension and secondary price cap imposition; and
4. Exclusion of intervals with negative supply margin to ensure normal market conditions (e.g. no under-generation).

The resulting reference price thresholds corresponding to the supply margin range are provided in the Table 1.

Table 1: Fix Reference Price Thresholds

Supply Margin Range (in MW)	Reference Price Threshold	
	Upper (PhP/MWh)	Lower (PhP/MWh)
0 to 250	20,733	515
250 to 500	18,146	(2,072)
500 to 750	16,424	(3,794)
750 to 1000	15,201	(5,017)
1,000 to 1,250	14,305	(5,913)
1,250 to 1,500	13,609	(6,609)
1,500 to 1,750	13,023	(7,195)
1,750 to 2,000	12,501	(7,717)
2,000 to 2,250	12,050	(8,167)
2,250 to 2,500	11,680	(8,538)
2,500 to 2,750	11,374	(8,720)
2,750 to 3,000	11,127	(8,844)
3,000 and above	11,504	(9,091)

Prices within the upper and lower reference price thresholds are considered as “normal prices”, while prices outside or beyond the thresholds are tagged as “interesting pricing events”.

[1] The system effective supply is equal to the offered capacity of all scheduled generator resources, nominated loading level of non-scheduled generating units and projected output of preferential dispatch generating units. Scheduled output of plants on testing and commissioning, through the imposition of security limit by SO, are accounted for in the effective supply. Likewise included is the scheduled output of Malaya plant when it is called to run as Must Run Unit (MRU).

[2] With the implementation of the central scheduling and dispatch of energy and contracted reserves in Luzon beginning 22 December 2015, and in Visayas beginning 07 October 2017, the level that the supply has to fill up is higher as it also has to sufficiently meet the hourly reserve schedule.

[3] The methodology adopted in this report is closely similar to the methodology discussed by the Market Surveillance Administrator of the Alberta Electricity System Operator in their report entitled “Supply Cushion Methodology and Detection of Events of Interest” published at www.albertamsa.ca.