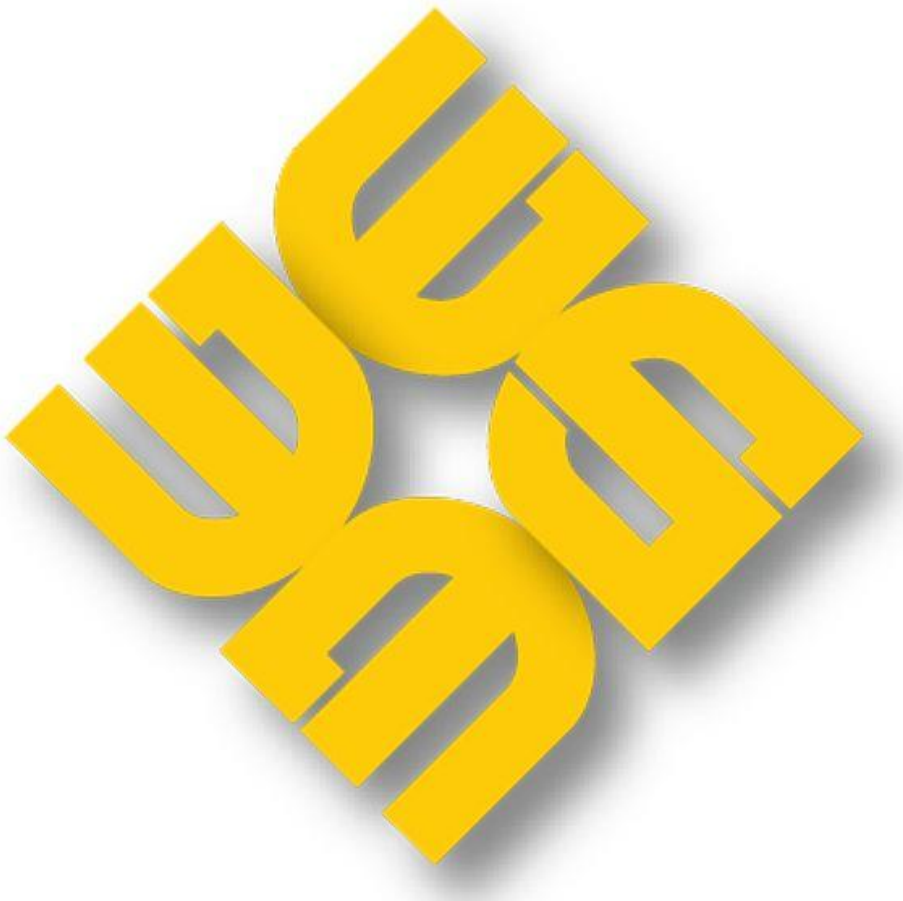
MAG-MMAR-2018-07

MONTHLY MARKET ASSESSMENT REPORT

For the Billing Period 26 June to 25 July 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 July 2018 billing period (26 June to 25 July 2018) and how the market performed compared with the previous billing month. No yearly comparison of the same 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 region.

The July 2018 billing month observed a tighter supply margin at 1,964 MW from previous month's 2,050 MW with the higher level of outage capacity recorded this month. This notwithstanding, market prices decreased to an average of PhP3,794/MWh coming from PhP4,073/MWh in the previous month.

System demand decreased to an average of 9,614 MW, which was 2.9 percent lower than previous month's 9,898 MW following the slightly cooler temperatures this billing month. System-wide reserve schedule averaged at 827 MW. Accordingly, the demand plus reserve schedule averaged at 10,442 MW, posting a decrease of 2.8 percent from last month's 10,743 MW.

Meanwhile, effective supply decreased by 3 percent to an average of 12,406 MW this month from previous month's 12,794 MW due to higher level of outage capacity which averaged at 2,432 MW from 2,122 MW in June. Likewise, the total WESM registered capacity went down by 36 MW with the deregistration of the SPC Power Corporation's Cebu DPP units 1 and 2 effective 13 July.

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 July billing month.

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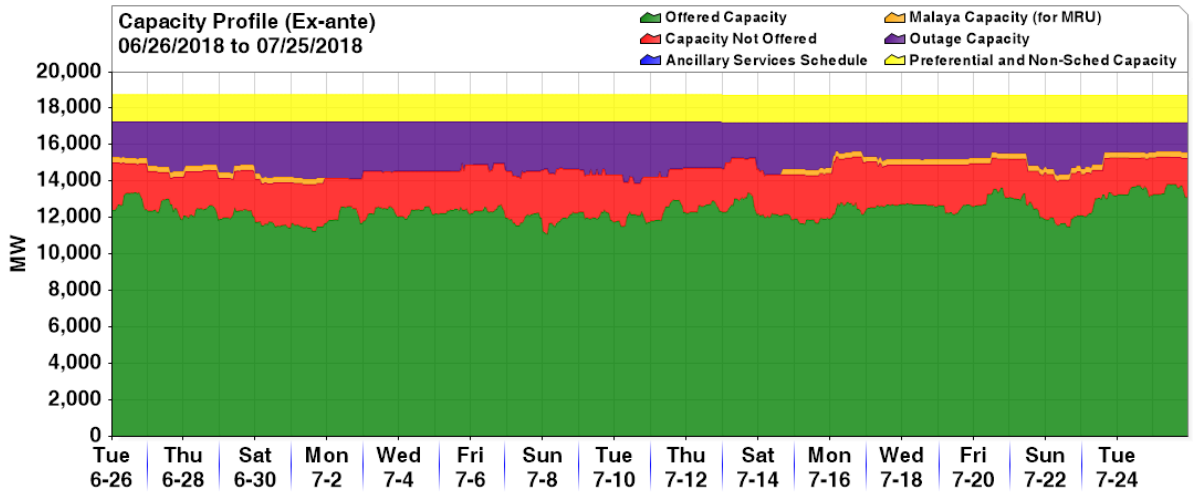
I. Capacity Profile

The WESM recorded a registered capacity of 18,738 MW by the end of July billing month, lower than last month by 36 MW, related to the deregistration of SPC Power Corporation's Cebu DPP units 1 and 2 effective 13 July.

Of the said WESM registered capacity, about 66 percent (previous month's 68 percent) or an average of 12,416 MW was offered in the market. Outage capacity (13 percent) posted a higher average at 2,432 MW coming from 2,122 MW in the previous month. Meanwhile, 12 percent was attributable to capacity not offered in the market which averaged at 2,238 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 1 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), July 2018



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

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

	July 2018 (In MW)		June 2018 (In MW)		% M-on-M Change (Jun 2018 - Jul 2018)
	Avg MW	% of RegCap	Avg MW	% of RegCap	
Registered Capacity (end of month)	18,738		18,774		(0.2)
Offered Capacity	12,416	66	12,735	68	(2.5)
Outage Capacity	2,432	13	2,122	11	14.6
Capacity Not Offered	2,238	12	2,303	12	(2.8)
Malaya Capacity for MRU	300	1	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 9,614 MW from previous month's 9,898 MW following the slightly cooler temperatures felt in July. Week-on-week, system demand posted a decreasing trend from about 9,792 MW during the first week down to 9,369 MW during the last week of the billing month.

For this period, the reserve schedule averaged at 827 MW. Consequently, the demand plus reserve schedule averaged at 10,442 MW, demonstrating a 2.8 percent decrease from last month's 10,743 MW.

Effective supply[3] similarly posted a lower average at 12,406 MW compared to previous month's 12,794 MW attributable to the higher level of outage capacity. Weekly average effective supply ranged from 12,226 MW (26 June to 1 July) up to 12,972 MW (23 to 25 July).

Following the higher rate of decrease in supply than demand, supply margin[4] narrowed by 4.2 percent this month at 1,964 MW coming from previous month's 2,050 MW. Lowest supply margin recorded was 199 MW on 6 July at 1400H following a high demand requirement. Weekly average supply margin ranged from 1,603 MW (2 to 8 July) to 2,659 MW (23 to 25 July).

[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.

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

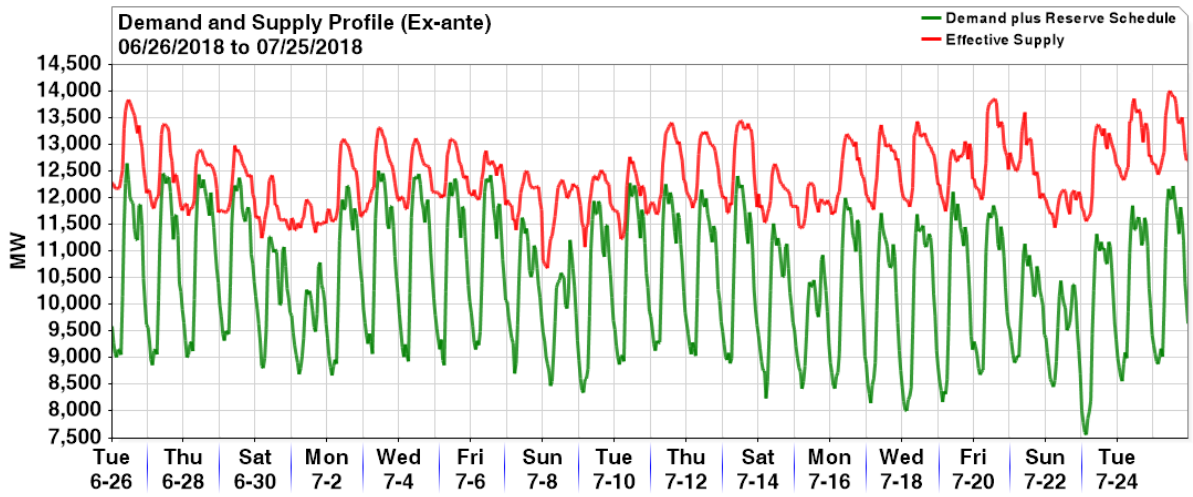


Table 2. Demand and Supply Summary (Ex-ante), July 2018 and June 2018

	July 2018 (In MW)			June 2018 (In MW)			% M-on-M Change (Jun 2018 - Jul 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	11,792	6,726	9,614	12,751	7,127	9,898	(7.5)	(5.6)	(2.9)
Reserve Schedule	1,274	358	827	1,321	386	846	(3.6)	(7.2)	(2.2)
Demand plus R/S	12,652	7,567	10,442	13,605	7,855	10,743	(7.0)	(3.7)	(2.8)
Effective Supply	14,010	10,688	12,406	13,980	11,590	12,794	0.2	(7.8)	(3.0)
Supply Margin	4,028	199	1,964	4,265	118	2,050	(5.6)	68.6	(4.2)

Note: The derived values were non-coincident.

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

	26 June to 1 July 2018 (in MW)			2 to 8 July 2018 (in MW)			9 to 15 July 2018 (in MW)			16 to 22 July 2018 (in MW)			23 to 25 July 2018 (in MW)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	11,792	7,866	9,792	11,790	7,831	9,925	11,417	7,479	9,640	11,239	7,252	9,232	11,256	6,726	9,369
Reserve Schedule	1,274	358	800	1,120	526	752	1,167	480	818	1,181	584	885	1,208	703	944
Demand plus R/S	12,652	8,700	10,592	12,515	8,483	10,677	12,416	8,248	10,458	12,118	8,016	10,117	12,228	7,567	10,313
Effective Supply	13,843	11,249	12,226	13,314	10,688	12,281	13,450	11,082	12,280	13,859	11,446	12,569	14,010	11,565	12,972
Supply Margin	3,301	417	1,634	3,160	199	1,603	3,321	305	1,822	3,947	789	2,452	4,028	1,590	2,659

III. Power Plant Outages

System-wide outage capacity posted a higher average this month at 2,432 MW from previous month's 2,122 MW. This was driven by the increase in average outage capacity involving coal plants, from previous month's 663 MW to current month's 1,087 MW. Moreover, coal plants accounted for about 45 percent of the system-wide outage capacity which was mainly attributable to the maintenance outages of Pagbilao CFTPP unit 3 from 27 June to 11 July and SMC Limay CFTPP unit 2 from 25 June to 21 July, forced outages of SLPGC CFTPP unit 1 starting 6 March and SLTEC CFTPP unit 2 starting 18 June, and planned outage of Pagbilao CFTPP unit 2 from 7 June to 5 July.

Meanwhile, oil-based plants recorded an average outage capacity at 577 MW (from previous month's 558 MW) attributable to the forced outage of Malaya TPP unit 2 for the whole billing month (since 19 May) and Malaya TPP unit 1 on 1 to 14 July. In addition, Limay CCGT unit 3 underwent planned outage beginning 22 June.

Geothermal plants' outage capacity averaged at 354 MW (previous month's 380 MW) related to the forced outages of Tiwi GPP unit A and unit of Upper Mahiao of Leyte A GPP on top of the prevailing outages of Makban GPP unit C and Tiwi GPP unit B. Hydro plants' outage capacity averaged at 263 MW (previous month's 385 MW) related to the planned outage of San Roque HEP unit 3 and unit of Angat Main HEP and forced outage of Kalayaan PSPP unit 2.

Natural gas plants had the least capacity on outage which averaged at 151 MW attributed to the planned outage of Sta. Rita NGPP unit 4 and San Gabriel NGPP.

Outage capacity reached a high of 3,361 MW on 10 July from 1400H to 1800H following the forced outage of Masinloc CFTPP unit 1 on top of the existing outages of other coal plants Pagbilao CFTPP unit 3, Calaca CFTPP unit 2, SLPGC CFTPP unit 1, SMC Limay CFTPP unit 2, SLTEC CFTPP unit 2, CEDC CFTPP unit 2, PEDC CFTPP unit 2 and oil-based plants Malaya TPP units 1 and 2 and Limay CCGT unit 6.

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

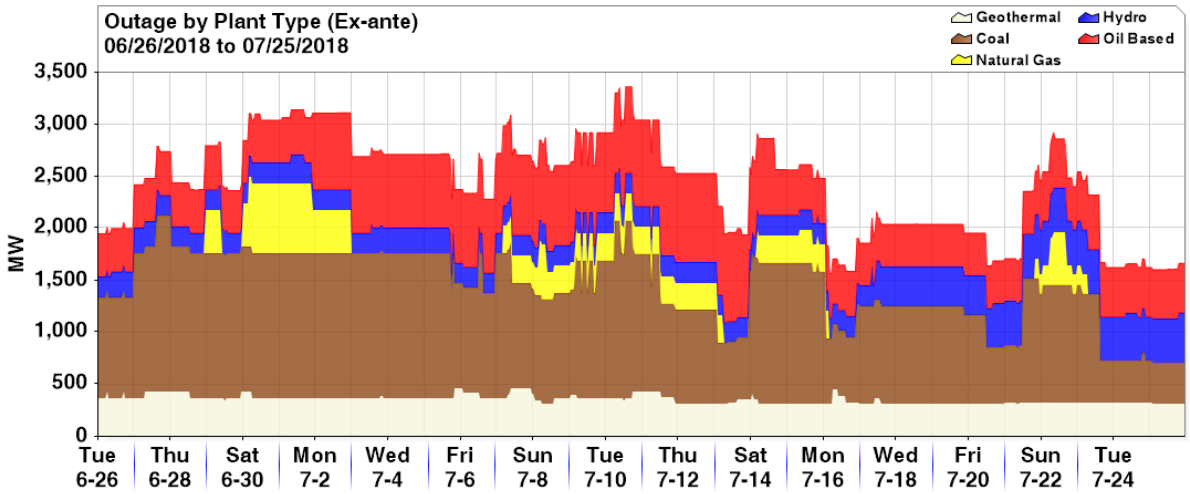


Table 4. Outage Summary (Ex-ante), July 2018 and June 2018

Resource Type	July 2018 (In MW)			June 2018 (In MW)			% M-on-M Change (Jun 2018 - Jul 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	1,706	394	1,087	1,474	150	663	15.7	162.6	64.0
Natural Gas	677	0	151	627	0	136	8.0		10.7
Geothermal	465	310	354	533	367	380	(12.8)	(15.5)	(6.9)
Hydro	485	195	263	815	195	385	(40.5)	0.0	(31.6)
Oil Based	855	410	577	770	350	558	11.0	17.1	3.4
TOTAL	**3,361**	**1,567**	**2,432**	**2,739**	**1,612**	**2,122**	22.7	(2.8)	14.6

Table 5. Major Plant Outages – July 2018

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
GEO	Tiwi 3	43.7	10/23/2005 13:26			Deactivated Shutdown	Tiwi 3 decommissioned since May 26 2009
GEO	Makban 6	55	04/11/2013 22:44			Deactivated Shutdown	Conducted gas compressor test
GEO	PGPP2 Unit 4	20	06/27/2014 6:07			Forced Outage	Steam being utilized by Nasulo plant
GEO	Makban 5	55	03/12/2017 1:55			Forced Outage	High turbine vibration
GEO	Upper Mahiao 1	32	12/07/2017 9:10			Forced Outage	Cut out from the system to facilitate PMS. Foced outage since no approved PUSSR
HYD	Angat M 3	50	01/29/2018 0:01			Planned Outage	Annual overhauling until 29 July 2018
COAL	SLPGC 1	150	03/06/2018 5:02			Forced Outage	On emergency shutdown due to turbine vibration
HYD	San Roque 3	145	03/12/2018 16:15			Planned Outage	Planned Outage. ETI 8 September 2018
GEO	Mahanagdong B1	5	04/05/2018 22:32			Forced Outage	Due to high vibration
GEO	Tiwi 5	57	05/18/2018 5:05	07/07/2018 22:12	50.71	Maintenance Outage	Maintenance outage
OIL	Malaya 2	350	05/19/2018 13:01			Forced Outage	Burn air heater 2A

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
GEO	Makban 9	20	05/23/2018 14:08	06/29/2018 11:52	36.91	Forced Outage	On reserve shutdown pending availability of steam supply
GEO	Makban 8	20	06/05/2018 13:21			Forced Outage	On reserve shutdown pending availability of steam supply (steam optimization)
GEO	Tiwi 2	59	06/05/2018 15:29			Forced Outage	Low steam supply
COAL	Pagbilao 2	382	06/07/2018 2:52	07/05/2018 16:51	28.58	Planned Outage	Maintenance outage until 5 July 2018
COAL	SLTEC 2	122.9	06/18/2018 6:14			Forced Outage	Isolated due to trippng Calaca-Salong Line
OIL	Limay 3	60	06/22/2018 8:01			Planned Outage	Maintenance outage until 23 October 2018
COAL	CEDC 2	82	06/23/2018 22:18	07/15/2018 16:24	21.75	Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
OIL	Cebu Diesel 5	6	06/25/2018 18:24	06/29/2018 12:29	3.75	Forced Outage	Abnormal sound at turbo charger b-bank
COAL	PEDC 2	83.7	06/25/2018 19:45	07/19/2018 20:10	24.02	Forced Outage	Shutdown for maintenance and repair due to multiple hot spot at cyclone inlet and c
COAL	SMC 2	150	06/25/2018 23:46	07/21/2018 22:22	25.94	Maintenance Outage	Maintenance outage until 18 July 2018
COAL	Pagbilao 3	436	06/27/2018 0:54	07/11/2018 12:08	14.47	Maintenance Outage	Maintenance outage until 1 July 2018. Repair of high economizer gas temperature
COAL	Calaca 2	300	06/27/2018 14:12	06/27/2018 23:58	0.41	Forced Outage	Generator lock out activated due to signal from high side PCB24
NATG	San Gabriel	420	06/28/2018 23:21	06/29/2018 10:04	0.45	Forced Outage	Emergency shutdown due to natural gas supply restriction from Malampaya Onshor
GEO	Makban 9	20	06/29/2018 12:22	07/10/2018 11:38	10.97	Forced Outage	On reserve shutdown pending availability of steam supply (steam optimization)
NATG	San Gabriel	420	06/30/2018 0:45	07/02/2018 23:50	2.96	Maintenance Outage	Maintenance outage until 2 July 2018
NATG	Sta. Rita 1	257.3	06/30/2018 4:29	07/01/2018 21:31	1.71	Maintenance Outage	GT offline compressor washing
OIL	SLPGC 4	23	07/01/2018 1:00	07/03/2018 19:00	2.75	Forced Outage	Generator circuit breaker trouble
OIL	Malaya 1	300	07/01/2018 21:41	07/14/2018 15:50	12.76	Forced Outage	Excessive packing leat at MV1-B (secondary inlet valve)
HYD	Angat M 1	50	07/03/2018 13:02	07/05/2018 16:39	2.15	Forced Outage	Generator breaker trouble (failed to close)
GEO	PGPP1 Unit 3	37.5	07/05/2018 19:02	07/06/2018 1:49	0.28	Forced Outage	Emergency shutdown due to oil leak at main oil pump
COAL	Pagbilao 2	382	07/06/2018 11:28	07/06/2018 15:49	0.18	Forced Outage	Emergency shutdown for hotspot correction at unit transformers lightning arrester p
COAL	Pagbilao 2	382	07/06/2018 23:35	07/07/2018 9:16	0.40	Forced Outage	Emergency shutdown for hotspot correction at unit transformers lightning arrester p
OIL	Limay 5	60	07/07/2018 0:19	07/12/2018 13:21	5.54	Maintenance Outage	Maintenance outage until 13 July 2018
NATG	Sta. Rita 4	264	07/07/2018 4:36	07/13/2018 5:34	6.04	Planned Outage	Maintenance outage until 11 July 2018
GEO	Leyte 1	35	07/07/2018 6:22	07/08/2018 5:07	0.95	Forced Outage	Emergency cut out from the system due to high differential steam pressure
NATG	San Lorenzo 1	264.8	07/08/2018 4:48	07/08/2018 8:24	0.15	Forced Outage	Corrective maintenance of static excitation equipment
GEO	Tiwi 6	57	07/08/2018 14:29	07/11/2018 12:38	2.92	Maintenance Outage	Steam supply to unit 5
GEO	PGPP1 Unit 2	37.5	07/09/2018 0:04	07/09/2018 4:02	0.17	Forced Outage	Offline to conduct replacement of defective module 1 AVR controller
COAL	Masinloc 1	315	07/09/2018 2:58	07/09/2018 7:47	0.20	Forced Outage	Master fuel detector trip actuation
COAL	Masinloc 1	315	07/09/2018 8:18	07/09/2018 11:57	0.15	Forced Outage	Tripped by furnace draft high
COAL	Masinloc 1	315	07/09/2018 12:20	07/09/2018 15:05	0.11	Forced Outage	Tripped by furnace draft high
COAL	Masinloc 1	315	07/09/2018 17:17	07/10/2018 17:00	0.99	Forced Outage	Boiler trouble
COAL	Pagbilao 2	382	07/10/2018 5:00	07/10/2018 18:05	0.55	Forced Outage	Hotspot correction at high side of Transformer phase A & B
OIL	Limay 6	60	07/10/2018 8:33	07/13/2018 17:33	3.38	Forced Outage	Stator earth fault trouble
GEO	Makban 10	20	07/10/2018 12:32			Maintenance Outage	Maintenance outage
COAL	Masinloc 1	315	07/10/2018 18:09	07/11/2018 5:25	0.47	Forced Outage	Primary air fan malfunction
COAL	Masinloc 1	315	07/11/2018 6:23	07/13/2018 1:13	1.78	Forced Outage	Primary air fan malfunction
OIL	SLPGC 4	23	07/11/2018 11:30			Forced Outage	Generator breaker trouble
GEO	PGPP1 Unit 1	37.5	07/13/2018 14:27	07/14/2018 1:04	0.44	Forced Outage	Auto tripped simultaneous with the tripping of 138 kV Amlan-Mabinay L2
GEO	PGPP1 Unit 2	37.5	07/13/2018 14:27	07/13/2018 17:30	0.13	Forced Outage	Auto tripped simultaneous with the tripping of 138 kV Amlan-Mabinay L2
COAL	Sual 1	647	07/13/2018 23:41	07/16/2018 1:27	2.07	Maintenance Outage	Maintenance outage until 18 July 2018
GEO	Nasulo	48.3	07/14/2018 0:11	07/14/2018 4:35	0.18	Forced Outage	Offline to conduct maintenance activities
COAL	SLTEC 1	121	07/14/2018 0:38			Forced Outage	Boiler tube leak
NATG	Sta. Rita 3	265.5	07/14/2018 4:26	07/16/2018 3:35	1.96	Planned Outage	Maintenance outage until 15 July 2018
NATG	Avion 2	50.3	07/15/2018 8:01	07/15/2018 17:00	0.37	Maintenance Outage	Maintenance outage
COAL	GN Power 1	316	07/16/2018 21:59	07/20/2018 11:13	3.55	Forced Outage	Derailed submerge scraper conveyor and Mills A and B trouble
HYD	Kalayaan 2	180	07/17/2018 9:51			Forced Outage	Exploded Pothead Phase Reversal Switch Phase B
HYD	Angat M 4	50	07/20/2018 15:02			Forced Outage	Unit transformer B trouble
COAL	Sual 2	647	07/21/2018 11:16	07/23/2018 14:31	2.14	Forced Outage	Boiler tube leak
OIL	Bohol 1	4	07/21/2018 17:34	07/25/2018 13:14	3.82	Forced Outage	Excessive exhaust gas leak on cylinder no 12
NATG	Ilijan A2	190	07/21/2018 19:39	07/23/2018 6:39	1.46	Maintenance Outage	Maintenance outage until 23 July 2018
COAL	TPC Sangi 2	85	07/22/2018 0:02	07/22/2018 22:03	0.92	Maintenance Outage	Emergency shutdown. Replacement of the cracked CT PT at TPC 1A
NATG	San Lorenzo 1	264.8	07/22/2018 6:35	07/22/2018 16:33	0.42	Maintenance Outage	GT off line compressor washing
NATG	Avion 1	50.3	07/22/2018 8:01	07/22/2018 17:00	0.37	Maintenance Outage	Maintenance outage
GEO	Makban 7	20	07/22/2018 17:34	07/25/2018 3:19	2.41	Forced Outage	Energization of Makban tie line CD was deferred due to NGCP requirements
COAL	TPC Sangi 2	85	07/22/2018 22:55	07/23/2018 2:18	0.14	Forced Outage	Auto tripped due to furnace pressure very high
OIL	Limay 2	60	07/23/2018 0:02			Planned Outage	Maintenance outage until 6 September 2018
COAL	CEDC 1	82	07/24/2018 18:09	07/24/2018 21:27	0.14	Forced Outage	Isolated due to auto opening of tie breaker
OIL	PB102 Unit 1	6	07/25/2018 11:43			Forced Outage	Busted fresh water line
HYD	Pantabangan 2	60	07/25/2018 18:10			Forced Outage	Not available due to unit transformer trouble with restricted earth fault indication

a. Outage Capacity by Outage Category

About 56 percent of this month's outage capacity were related to forced outages. Overall, an average capacity of 1,368 MW went on forced outages, up from previous month's 952 MW (Table 6). On a similar note, increase in maintenance outage capacity was recorded this month at an average of 515 MW, which involved Pagbilao CFTPP unit 3, SMC Limay CFTPP unit 2, Sual CFTPP unit 1, and San Gabriel NGPP, coming from previous month's 435 MW.

Planned outage capacity recorded an average of 455 MW this month (from previous month's 607 MW) which was attributable to San Roque HEP unit 3, Pagbilao CFTPP unit 2, Limay CCGT unit 3, Sta. Rita NGPP unit 4, and Angat Main HEP unit 3.

On the other hand, deactivated shutdown outage capacity recorded an average of 99 MW which involved units of Makban GPP unit C and Tiwi GPP unit B. This posted a decrease from previous month's 119 MW due to the resumption of operations of a unit of Tiwi GPP unit A on 5 June.

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

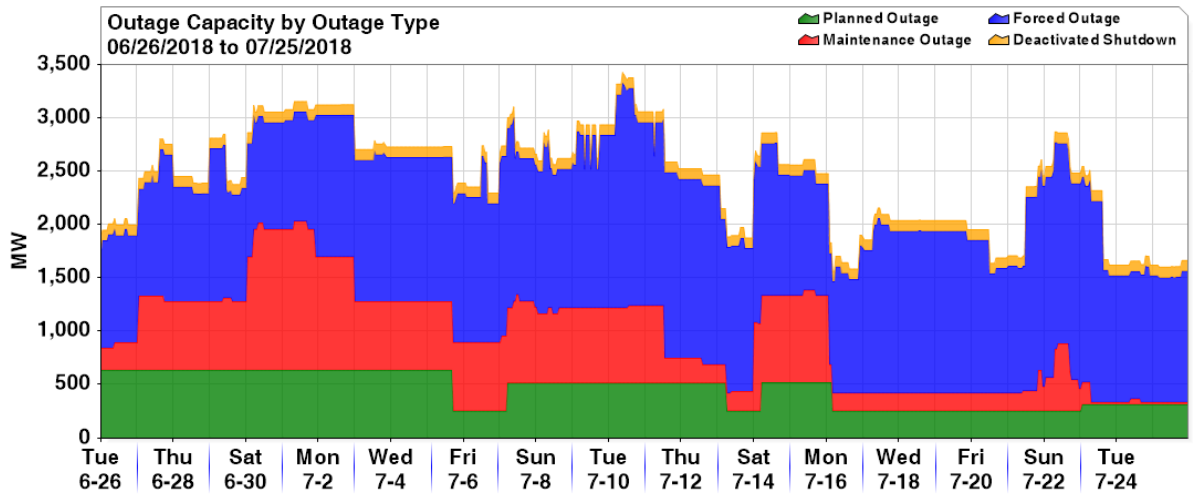


Table 6. Outage Summary, by Outage Category, July 2018 and June 2018

Resource Type	July 2018 (In MW)			June 2018 (In MW)			% M-on-M Change (Jun 2018 - Jul 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	637	255	455	785	375	607	(18.9)	(32.0)	(25.0)
Maintenance	1,396	20	515	966	57	435	44.6	(64.9)	18.5
Forced	2,105	922	1,368	1,978	668	952	6.5	37.9	43.6
Deactivated Shutdown	99	99	99	158	99	119	(37.4)	0.0	(17.1)

b. Outage Factor

Consistent with the discussion on outage capacity in the preceding sections, the system-wide total outage factor was higher this month at 13.3 percent when compared to previous month's 11.4 percent driven by the increases in forced outage factor, from previous month's 5.3 percent to current month's 7.6 percent, and maintenance outage factor, from previous month's 2.3 percent to current month's 2.7 percent (Table 7).

On the other hand, it was observed that planned outage factor decreased from previous month's 3.2 percent to current month's 2.4 percent as well as deactivated shutdown outage factor which decreased from previous month's 0.6 percent to current month's 0.5 percent.

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

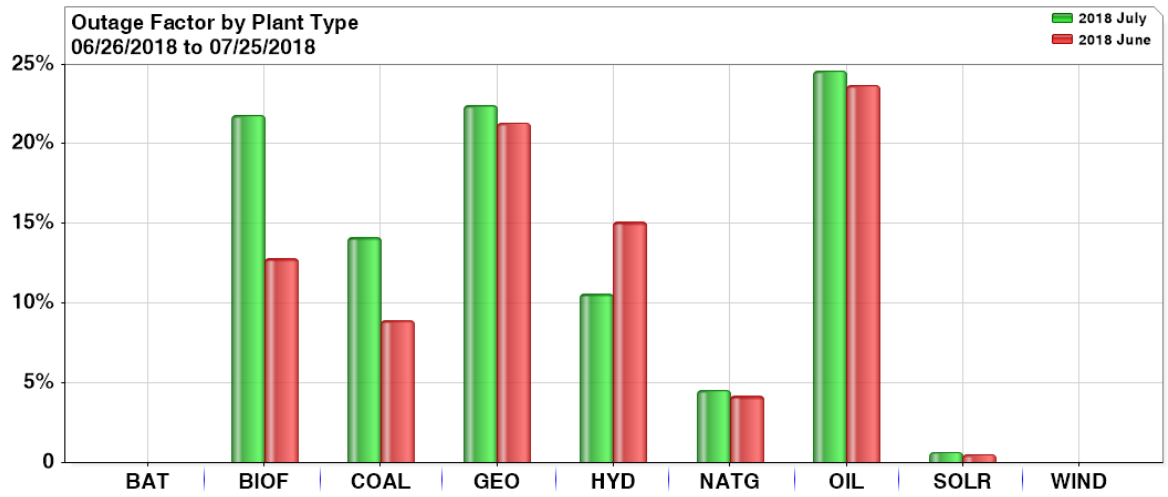


Figure 6. Outage Factor (by Outage Category), July 2018 and June 2018

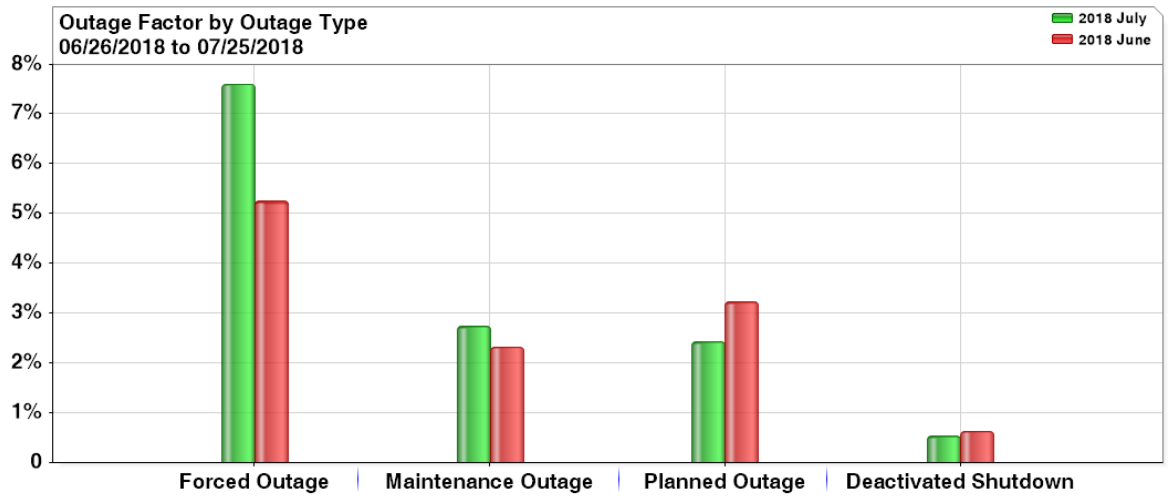


Table 7. Outage Factor, July 2018 and June 2018

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	21.8	12.8	21.8	12.0		0.8				
COAL	14.1	8.9	7.9	5.0	4.6	0.8	1.7	3.1		
GEO	22.4	21.3	12.1	11.4	4.8	3.3			5.5	6.7
HYD	10.6	15.1	2.6	0.0	0.2	0.4	7.8	14.7		
NATG	4.5	4.2	0.2	0.7	2.1	3.5	2.1			
OIL	24.6	23.7	21.3	15.2	0.5	8.1	2.8	0.3		
SOLR	0.7	0.5	0.6	0.5			0.1			
WIND										
Total	**13.3**	**11.4**	**7.6**	**5.3**	**2.7**	**2.3**	**2.4**	**3.2**	**0.5**	**0.6**

IV. Market Price Outcome[5]

A. Market Prices

Market prices recorded a 6.8 percent decrease from previous month's PhP4,073/MWh to current month's PhP3,794/MWh.

The first half of the billing month recorded relatively higher prices as well as frequent occurrences of prices above PhP8,000/MWh. Tight supply and demand condition was observed during the period as a result of the high level of capacity on outage and high demand requirement. Weekly average prices during the said period ranged from PhP4,668/MWh during 26 June to 1 July down to PhP3,681/MWh during 9 to 15 July. Price spikes were noted on 27 to 29 June ranging from PhP14,199/MWh to PhP17,473/MWh and on 10 July from PhP15,148/MWh to PhP16,021/MWh.

Prices then went down towards the latter half of the billing month following the wider supply margin. Weekly average prices were relatively lower at PhP2,678/MWh on 16 to 22 July and PhP2,118/MWh on 23 to 25 July. Negative prices were noted on 23 July, reaching as low as PhP-1,737/MWh at 0200H.

Figure 7. Market Price Trend, July 2018

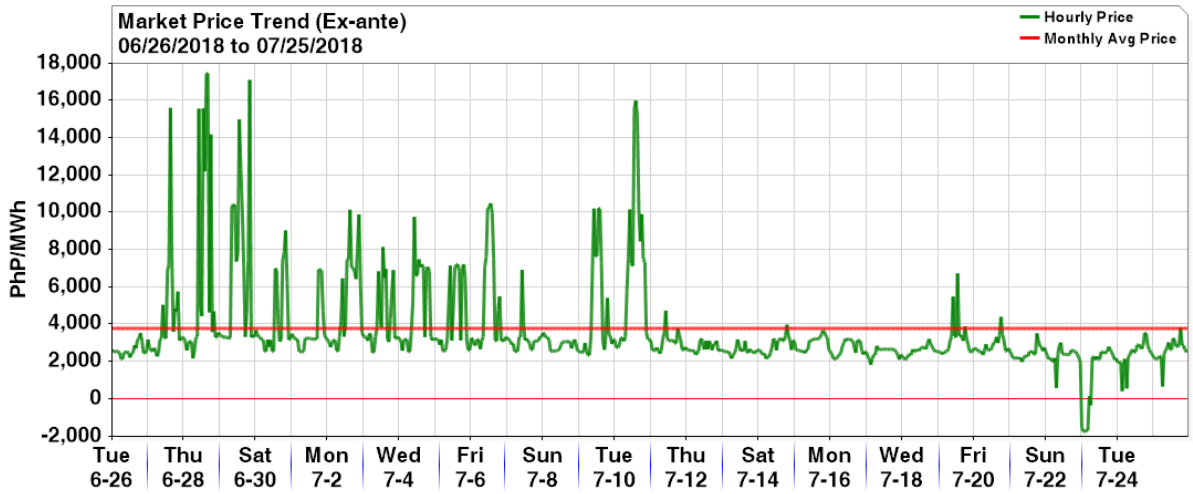


Table 8. Market Price Summary, July 2018 and June 2018

	July 2018 (In PhP/MWh)			June 2018 (In PhP/MWh)			% M-on-M Change (Jun 2018 - Jul 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	17,473	-1,737	3,794	19,211	1,788	4,073	(9.0)	197.1	(6.8)
Luzon	17,478	0	3,804	18,563	1,788	4,077	(5.8)	(100.0)	(6.7)
Visayas	17,473	-10,305	3,744	27,468	667	4,051	(36.4)	1,645.4	(7.6)

[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.

Table 9. Weekly Market Price Summary, July 2018

	26 June to 1 July 2018 (in PhP/MWh)			2 to 8 July 2018 (in PhP/MWh)			9 to 15 July 2018 (in PhP/MWh)			16 to 22 July 2018 (in PhP/MWh)			23 to 25 July 2018 (in PhP/MWh)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	17,473	2,151	4,668	10,505	2,496	4,305	16,021	2,172	3,681	6,744	603	2,678	3,851	-1,737	2,118

The market prices in Luzon averaged at PhP3,804/MWh, slightly higher by 1.6 percent than the PhP3,744/MWh recorded in the Visayas region.

Figure 8. Market Price Trend - Luzon, July 2018

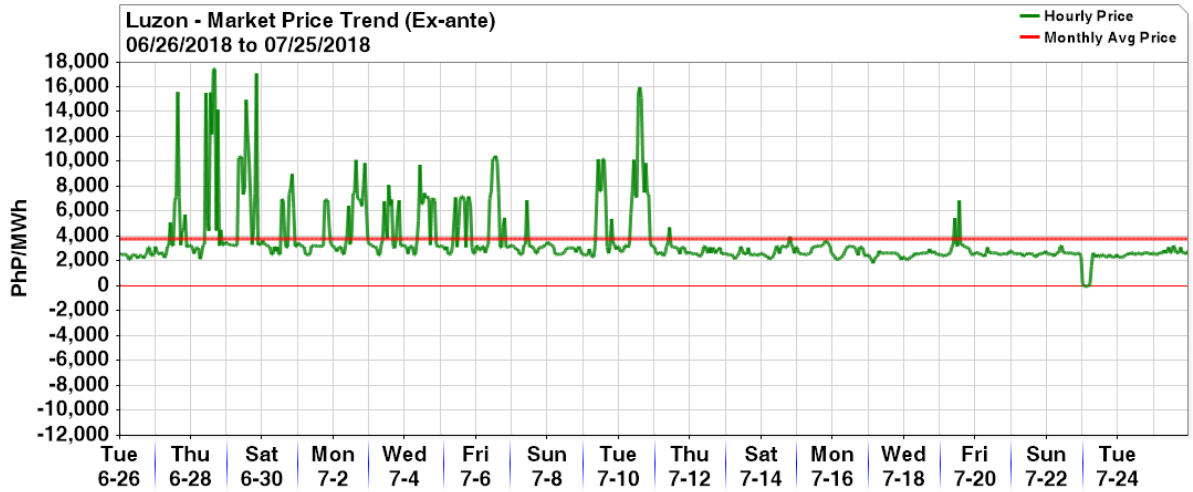


Figure 9. Market Price Trend - Visayas, July 2018

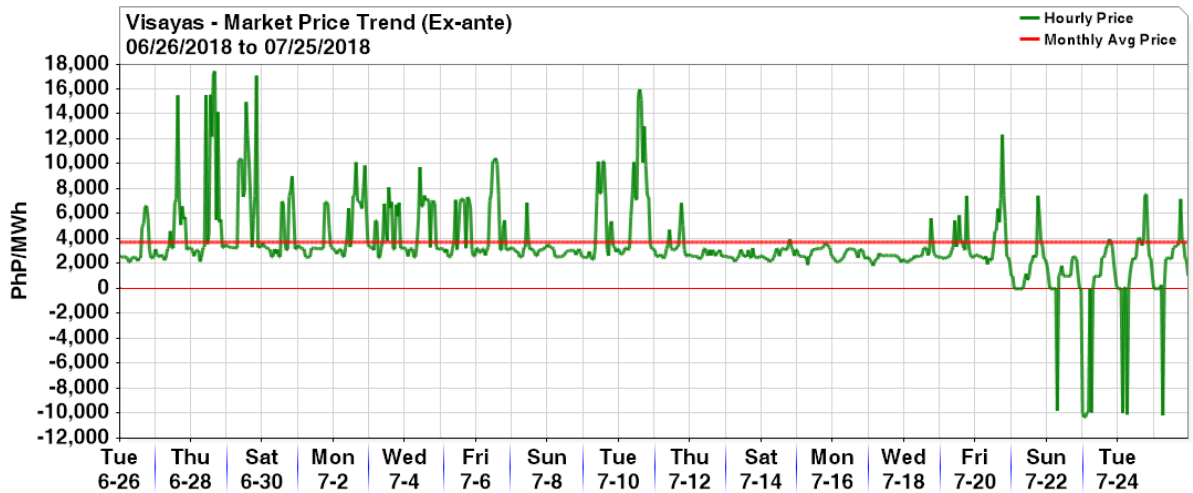


Table 10. Regional Price Summary – July 2018 and June 2018

	Luzon (In PhP/MWh)			Visayas (In PhP/MWh)			% Difference		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
July 2018	17,478	0	3,804	17,473	-10,305	3,744	0.0	(100.0)	1.6
June 2018	18,563	1,788	4,077	27,468	667	4,051	(32.4)	168.1	0.6

B. Price Distribution

Consistent with the decrease in average price, the frequency of prices below PhP4,000/MWh increased to 83.8 percent from previous month's 76.9 percent. Also, only 3.8 percent of the market prices this month were above PhP10,000/MWh from 4.6 percent in the previous month.

In addition, lower frequency of prices ranging from PhP4,000/MWh to PhP10,000/MWH was recorded this month at 12.5 percent coming from 18.5 percent in the previous month.

Figure 10. Price Distribution, July 2018 and June 2018

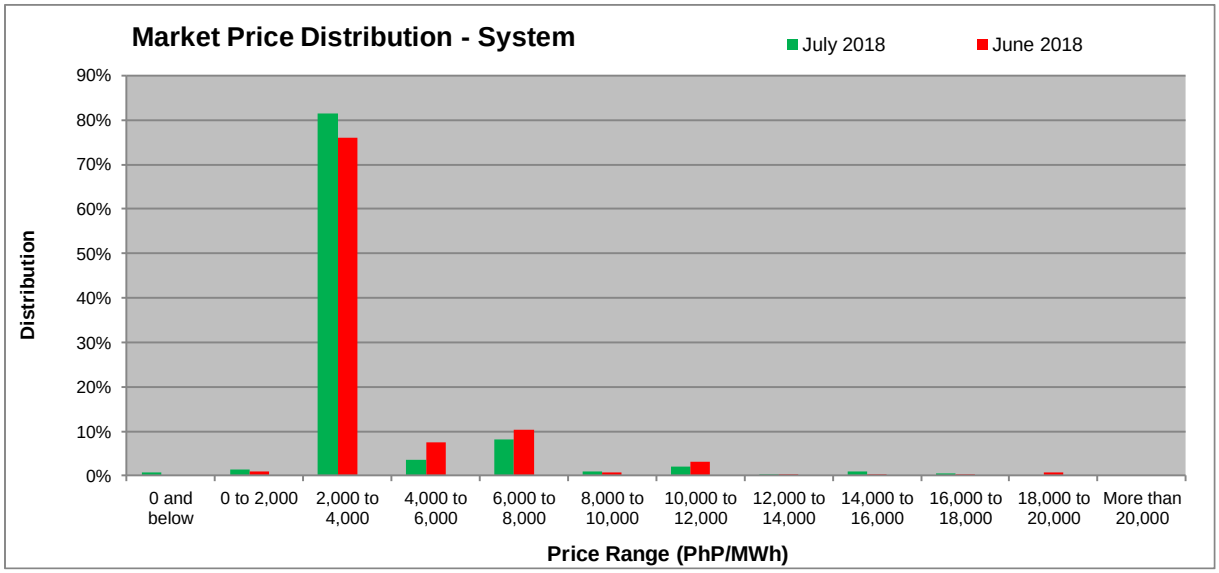


Table 11. Price Distribution – July 2018 and June 2018

Price Range (PhP/MWh)	% Distribution	
	July 2018	June 2018
0 and below	0.8	0.0
0 to 2,000	1.4	0.9
2,000 to 4,000	81.5	75.9
4,000 to 6,000	3.5	7.4
6,000 to 8,000	8.1	10.3
8,000 to 10,000	1.0	0.8
10,000 to 12,000	1.9	3.2
12,000 to 14,000	0.3	0.4
14,000 to 16,000	1.0	0.1
16,000 to 18,000	0.6	0.1
18,000 to 20,000	0.0	0.7
More than 20,000	0.0	0.0

C. Price Duration Curve

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

Bulk of the market prices during the off-peak hours of the billing month, at 94.4 percent, were within the price range PhP2,000/MWh to PhP4,000/MWh (Figure 11). About 4.1 percent was

from PhP0/MWH to PhP2,000/MWh while the remaining 1.5 percent fell within the PhP4,000/MWh to PhP10,000/MWh range.

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 65.8 percent was below PhP4,000/MWh and 25.8 percent was between PhP4,000/MWh and PhP10,000/MWh. In addition, 8.3 percent of the market prices during peak hours were at above PhP10,0000/MWh.

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

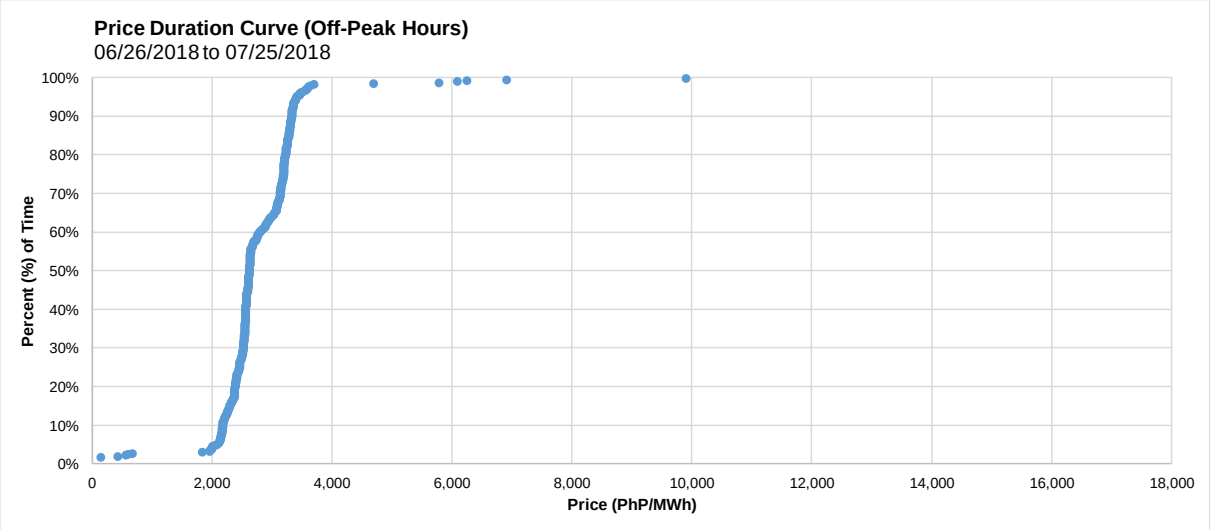
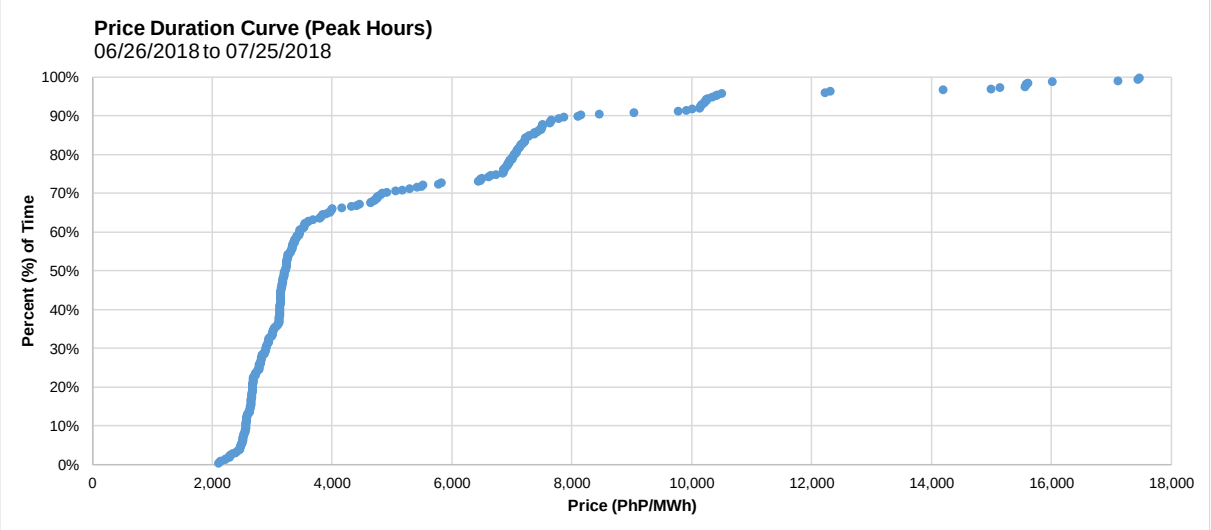


Figure 12. Price Duration Curve (Peak Period), July 2018



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.

As seen in Table 12, prices in three (3) trading intervals (1600H and 1700H of 28 June and 2100H of 29 June), were considered as interesting pricing events during the July billing month. Provided also are the details on the supply margin during the said hour and the corresponding reference price threshold for each interesting pricing event.

Figure 13. Supply Margin and Market Price, July 2018

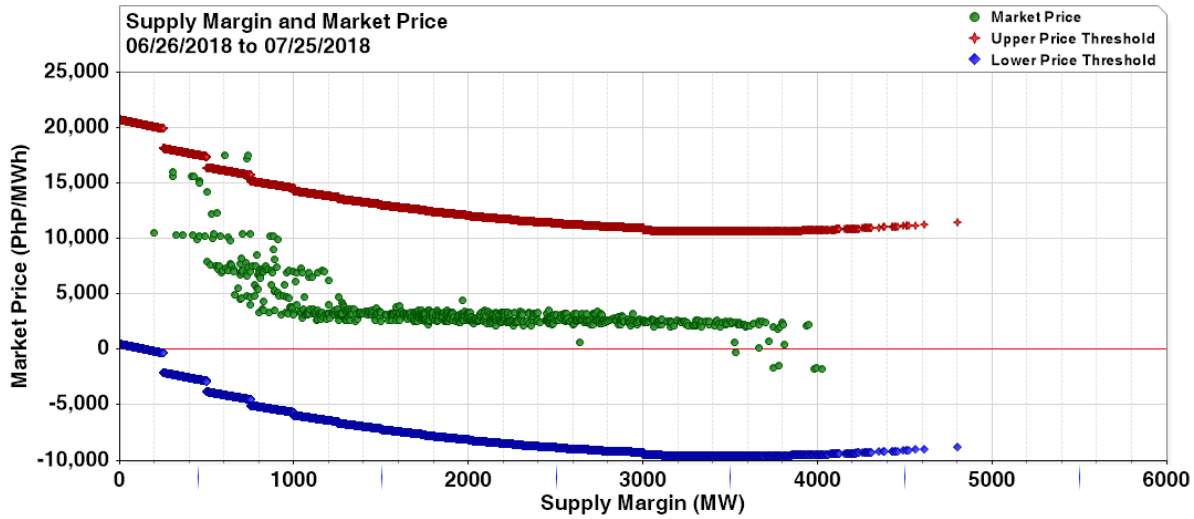


Table 12. Interesting Pricing Events – July 2018

Date	Hour	Market Price (PhP/MWh)	Supply Margin (MW)	Reference Price Threshold (PhP/MWh)
Jun 28, 2018	16	17,453	548	16,132
Jun 28, 2018	17	17,473	721	15,772
Jun 29, 2018	21	17,123	277	15,789

V. Pricing Errors and Market Intervention

System-wide non-congestion pricing errors affected six (6) trading intervals or 0.8 percent of the time in the ex-ante and four (4) trading intervals or 0.6 percent of the time in the ex-post during the July billing month, related to inappropriate input data which affected the generation of prices and schedules. This posted an increase from previous month's non-congestion pricing error occurrences that affected two (2) trading intervals or 0.3 percent of the time during the ex-ante and two (2) trading intervals or 0.3 percent of the time during the ex-post.

In Luzon, the frequency of issuances of non-congestion pricing errors affected five (5) trading intervals or 0.7 percent of the time in the ex-ante related to the localized constraint violation on Paco transformers. This month's figure was similar to previous month's five (5) trading intervals or 0.7 percent of the time in the ex-ante.

In Visayas, non-congestion pricing errors affected 14 trading intervals or 1.9 percent of the time, higher than last month's 10 trading intervals or 1.3 percent of the time in the ex-ante. Meanwhile 14 trading intervals or 1.9 percent of the time were affected in the ex-post, higher than last month's nine (9) trading intervals or 1.2 percent of the time. These were mainly on account of the localized constraint violation on Palinpinon 1 and Amlan transformers.

Meanwhile, a decrease in the system-wide application of Price Substitution Methodology (PSM) was observed this month, affecting a total of 80 trading intervals or 11.1 percent of the time (previous month's 179 trading intervals or 24.1 percent of the time) in the ex-ante and 72 trading intervals or 10 percent of the time (previous month's 164 trading intervals or 22 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).

Table 13. PEN, PSM and MI Summary, July 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	6	0.8	5	0.7	14	1.9	25	3.5
PEN (RTX)	4	0.6	-	-	14	1.9	18	2.5
PSM (RTD)	80	11.1	-	-	-	-	80	11.1
PSM (RTX)	72	10.0	-	-	-	-	72	10.0
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 14 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 six (6) trading intervals in the ex-ante and four (4) trading intervals in the ex-post were related to inappropriate input data.

In Luzon, regional contingency-related pricing errors affected five (5) trading intervals while inappropriate input data affected one (1) trading interval in the ex-ante.

On the other hand, in the Visayas region, pricing error due to load shedding affected six (6) trading intervals during the ex-ante and six (6) trading intervals during the ex-post. In addition, pricing errors due to base case constraint affected three (3) trading intervals during the ex-ante and four (4) trading intervals during the ex-post while pricing errors due to over generation affected three (3) trading intervals in the ex-ante and four (4) trading intervals in the ex-post. Another two (2) trading intervals during the ex-ante were affected by inappropriate input data.

Table 14. PEN Type Summary, July 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	**6**	**0.8**	**6**	**0.8**	**14**	**1.9**	**26**	**3.6**
Contingency	-	-	5	0.7	-	-	5	0.7
Base Case	-	-	-	-	3	0.4	3	0.4
Over-generation	-	-	-	-	3	0.4	3	0.4
VoLL	-	-	-	-	6	0.8	6	0.8
Inappropriate Input Data	6	0.8	1	0.1	2	0.3	9	1.3
PEN (RTX)	**4**	**0.6**	**-**	**-**	**14**	**1.9**	**18**	**2.5**
Contingency	-	-	-	-	-	-	-	-
Base Case	-	-	-	-	4	0.6	4	0.6
Over-generation	-	-	-	-	4	0.6	4	0.6
VoLL	-	-	-	-	6	0.8	6	0.8
Inappropriate Input Data	4	0.6	-	-	-	-	4	0.6

VI. HVDC Scheduling

Power flow through the HVDC Interconnection was generally directed towards the Luzon region for 466 trading intervals in the ex-ante during the billing month, with schedules ranging from 1.2 MW to 367 MW.

On the other hand, the HVDC power flow was directed towards the Visayas for the remaining 118 trading intervals in the ex-ante during the billing month, with schedules ranging from 0.7 MW to 173 MW.

Moreover, no power flowed between Luzon and Visayas grids from 2 July at 0900H until the end of the billing month affecting 136 trading intervals related to the annual preventive maintenance of the HVDC link.

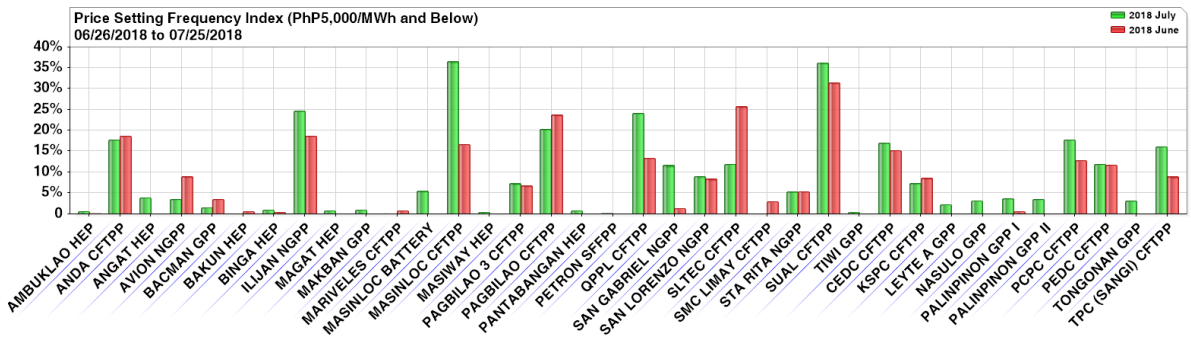
Table 15. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), July 2018

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	250/420	Total	0/0	250/420	Total
Visayas to Luzon	**-**	**466**	**466**	**-**	**467**	**467**
Limit Not Maximized		*466*	*466*		*467*	*467*
Limit Maximized [1]			-			-
Luzon to Visayas	**-**	**118**	**118**	**-**	**117**	**117**
Limit Not Maximized		*118*	*118*		*117*	*117*
Limit Maximized [1]			-			-
No Flow [1]	**136**		***136***	**136**		***136***
TOTAL	**136**	**584**	**720**	**136**	**584**	**720**

VII. Price Setting Plants[6]

Majority of the market prices during the billing month were below PhP5,000/MWh (at 86 percent) with Luzon coal plants as frequent price setters, namely Masinloc CFTPP at 36.5 percent, Sual CFTPP at 36.3 percent, QPPL CFTPP at 24.2 percent, Pagbilao CFTPP at 20.3 percent, Anda CFTPP at 17.8 percent, and PCPC CFTPP at 17.8 percent. Ilijan NGPP is also a frequent price setter at 24.7 percent of the time.

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

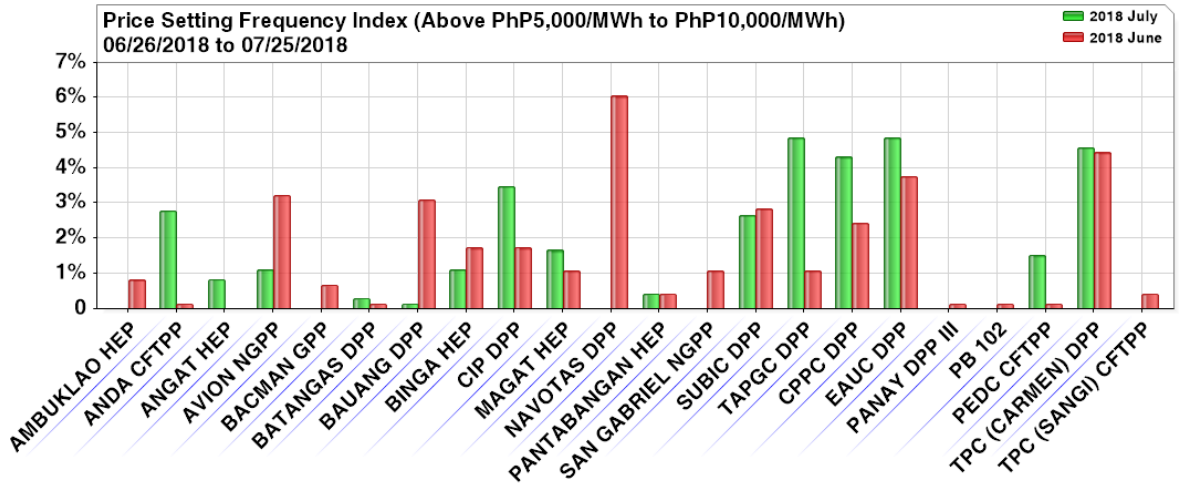


The market prices also ranged between PhP5,000/MWh to PhP10,000/MWh at 10.3 percent of the time. Oil-based plants obtained the highest frequencies in setting the prices including TAPGC DPP at 4.9 percent, EAUC DPP at 4.9 percent, TPC Carmen DPP at 4.6 percent,

[6] 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.

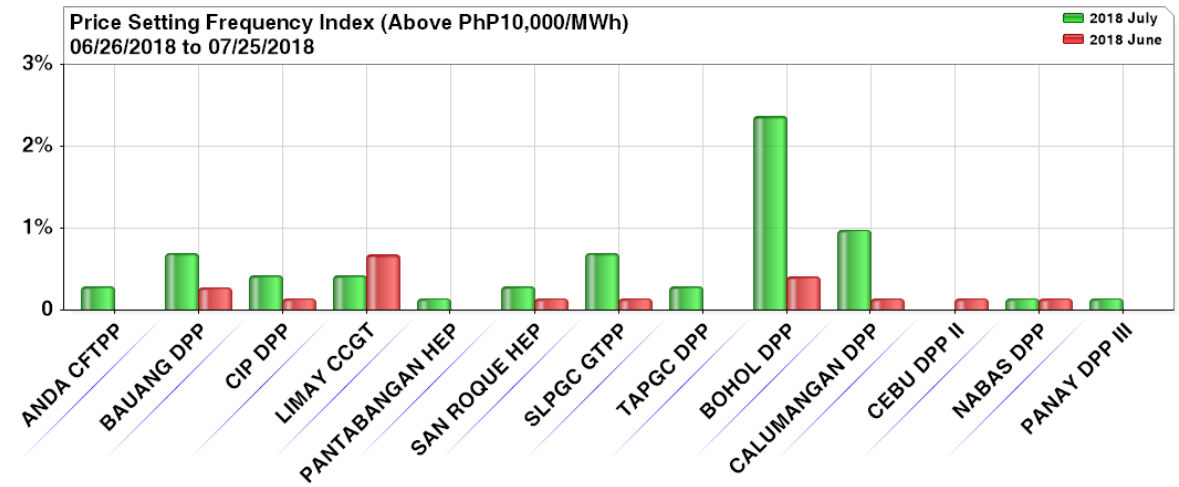
CPPC DPP at 4.3 percent and CIP DPP at 3.5 percent. Coal plant Anda CFTPP is also noted as price setter at 2.8 percent of the time.

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



The rest of the market prices were above PhP10,000/MWh at 3.8 percent of the time. Oil-based plants also set the prices led by Bohol DPP at 2.4 percent. Calumangan DPP, Bauang DPP, SLPGC GTPP, CIP DPP and Limay CCGT were the most frequent price setters at the said level.

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



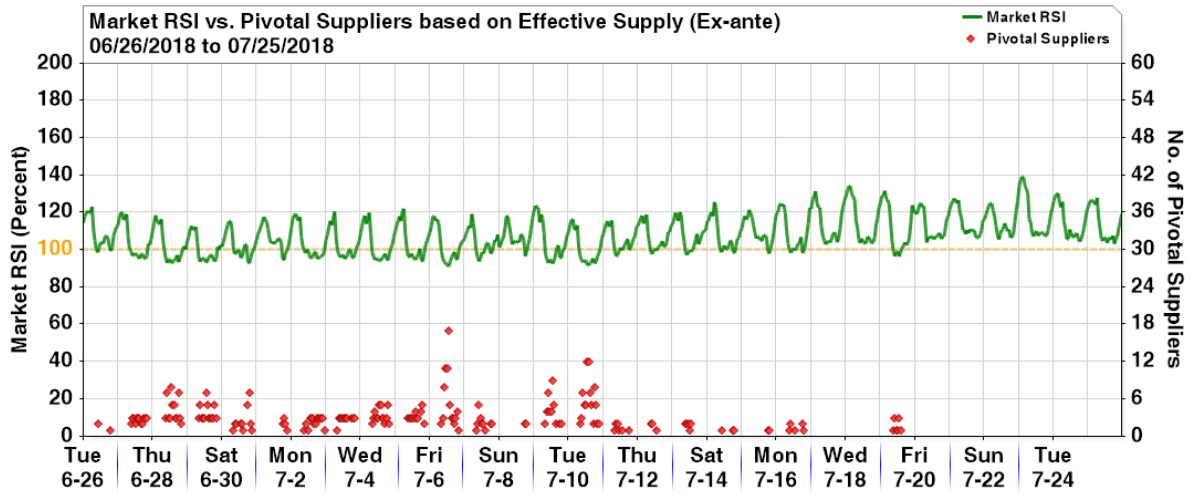
VIII. Residual Supply

The succeeding figure below show the hourly trend of the Market Residual Supply Index (Market RSI)[7] plotted against the number of pivotal supplier/s.

[7] 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.

The market RSI fell below the 100 percent mark for 25 percent of the time or in 180 trading intervals (previous month's 23 percent or 168 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), July 2018

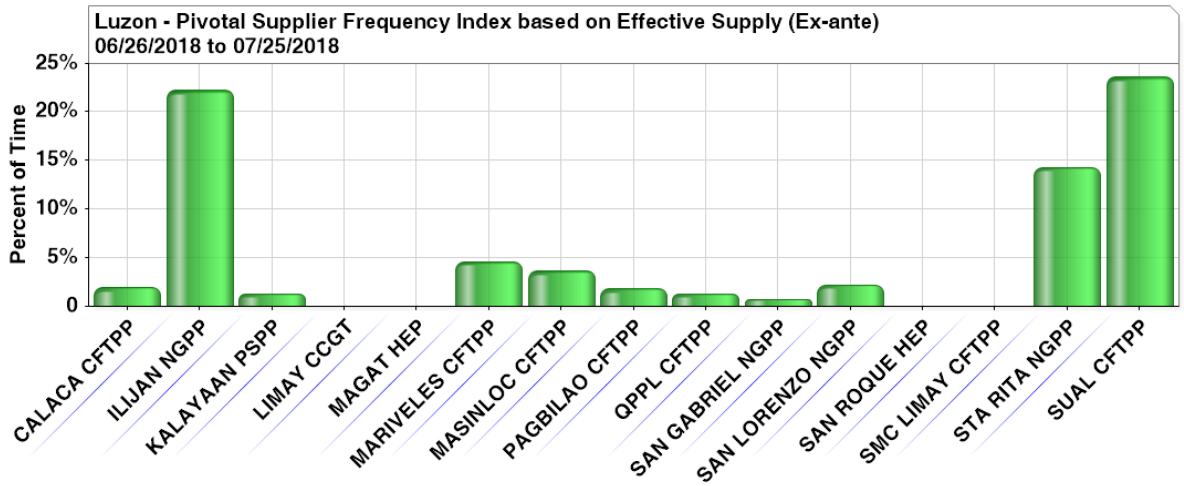


IX. Pivotal Suppliers[8]

A total of 21 Luzon plants emerged as pivotal suppliers during the July billing month led by Sual CFTPP for having been pivotal for 23.6 percent of the time and natural gas plants Ilijan NGPP for 22.2 percent and Sta. Rita NGPP for 14.3 percent.

Coal plants Mariveles CFTPP (4.6 percent) and Masinloc CFTPP (3.6 percent) also figured in as most frequent pivotal suppliers.

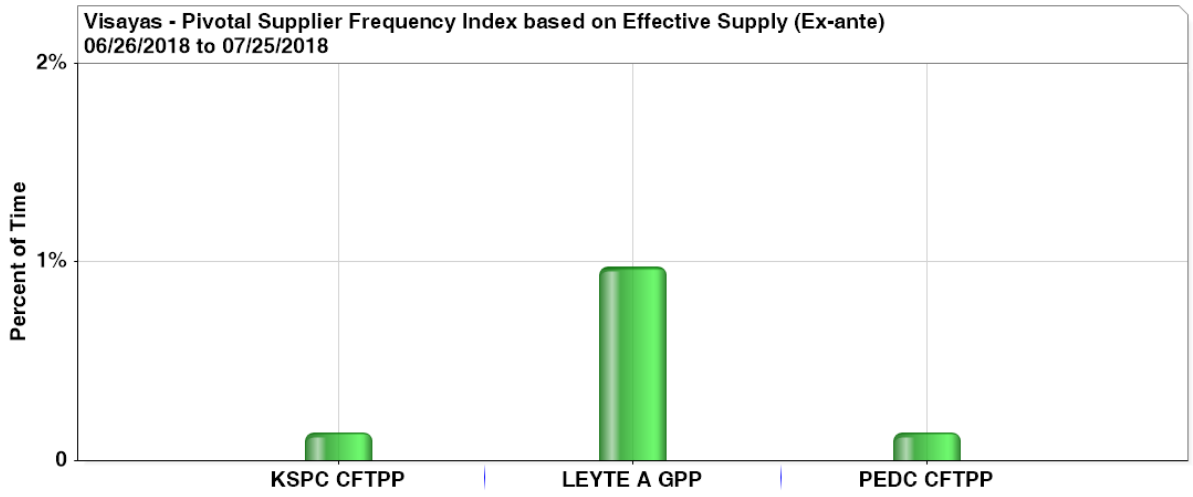
Figure 18. Pivotal Supplier Frequency Index - Luzon, July 2018



[8] 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.

Meanwhile, three (3) Visayas plants became pivotal suppliers during the July billing month led by Leyte A GPP for being pivotal for 1 percent of the time. Coal plants KSPC CFTPP and PEDC CFTPP followed for being pivotal for 0.1 percent of the time each.

Figure 19. Pivotal Supplier Frequency Index - Visayas, July 2018



X. Price-Setters and Pivotal Plants

Six (6) Luzon plants became price setters at the same time that they were pivotal. These plants were led by Ilijan NGPP at 4.6 percent and Sual CFTPP at 2.2 percent. Limay CCGT and Sta. Rita NGPP similarly were pivotal suppliers and price-setters at the same time for 0.7 percent and 0.6 percent of the time, respectively.

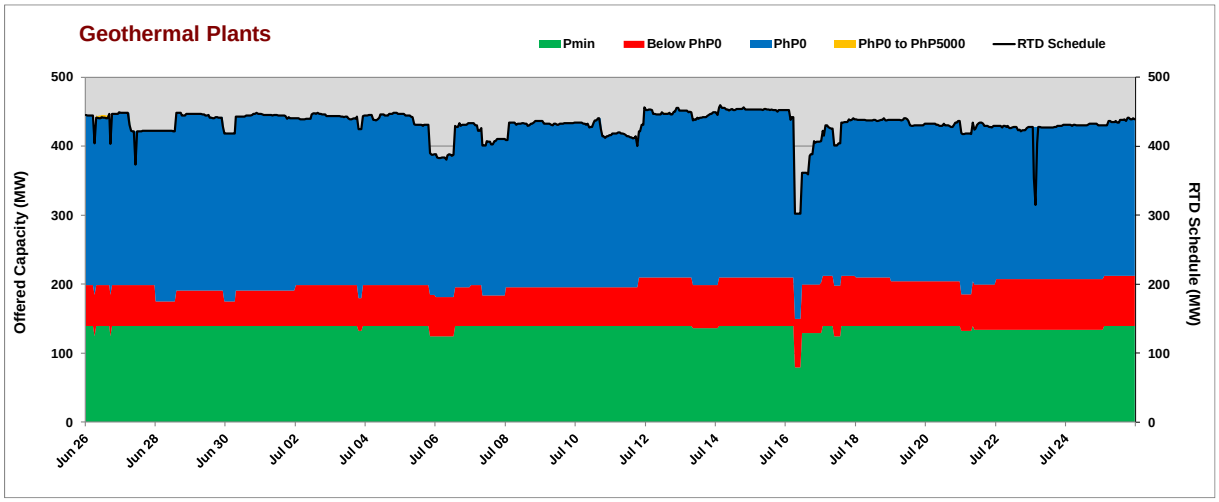
Figure 20. PSI vs. PSFI, July 2018

XI. Generator Offer Pattern

Luzon geothermal plants offered almost its entire capacity (99.9 percent) at PhP0/MWh and below. In particular, about 53.9 percent was priced at exactly PhP0/MWh while the remaining 46 percent was priced below PhP0/MWh (Figure 21). The remaining 0.1 percent was offered at PhP0/MWh to PhP5,000/MWh.

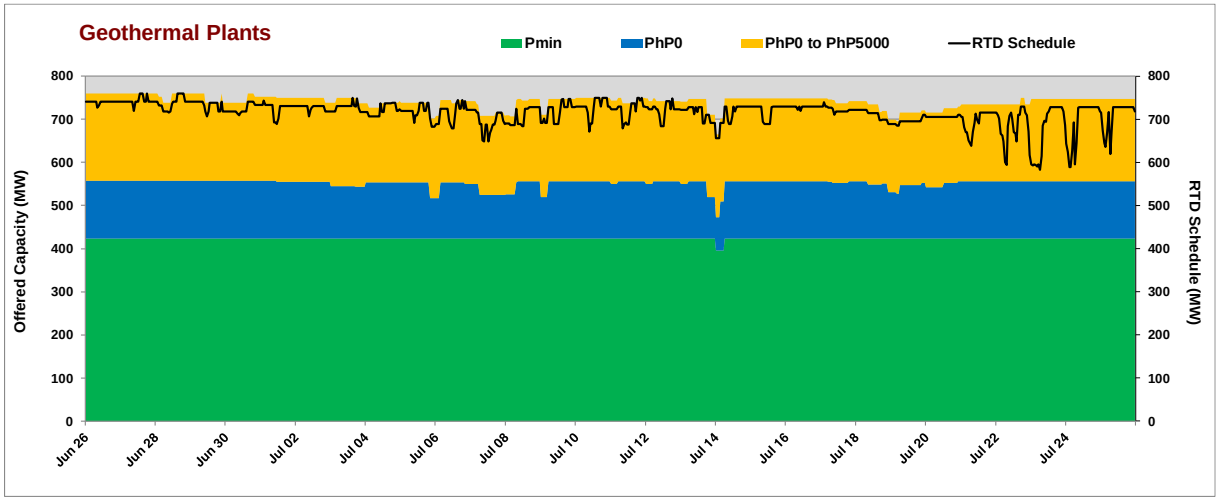
Accordingly, all of its submitted capacity offers, at 99.8 percent, were scheduled for dispatch in the market.

Figure 21. Geothermal Plants Offer Pattern, Luzon – July 2018



On the other hand, Visayas geothermal plants had slightly higher-priced offers compared to Luzon geothermal plants. It was noted that about 25.5 percent of Visayas geothermal plants' offered capacity was priced at above PhP0/MWh up to PhP5,000/MWh while the remaining 74.5 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 22. Geothermal Plants Offer Pattern, Visayas – July 2018

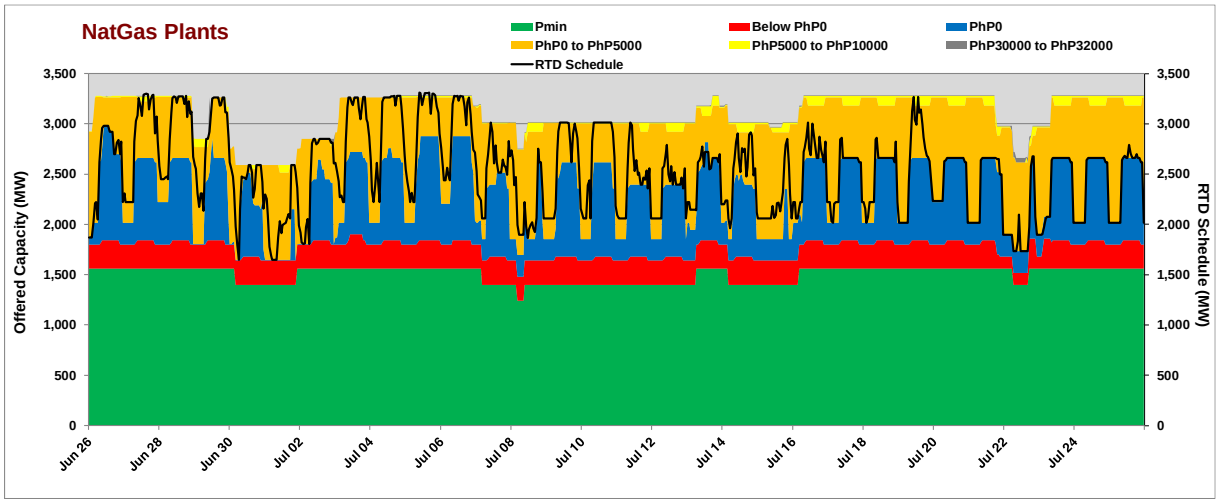


About 74.6 percent of the natural gas plants' capacity offers were priced at PhP0/MWh and below, 24.2 percent was priced above PhP0/MWh to PhP5,000/MWh and 1 percent was priced at above PhP5,000/MWh to PhP10,000/MWh (Figure 23).

A significant decrease in capacity offers priced above PhP30,000/MWh to PhP32,000/MWh was noted from previous month's 9.6 percent to current month's 0.2 percent. Majority of these offers were submitted by San Gabriel NGPP.

Accordingly, about 81.7 percent of the offers of natural gas plants were scheduled for dispatch within the month.

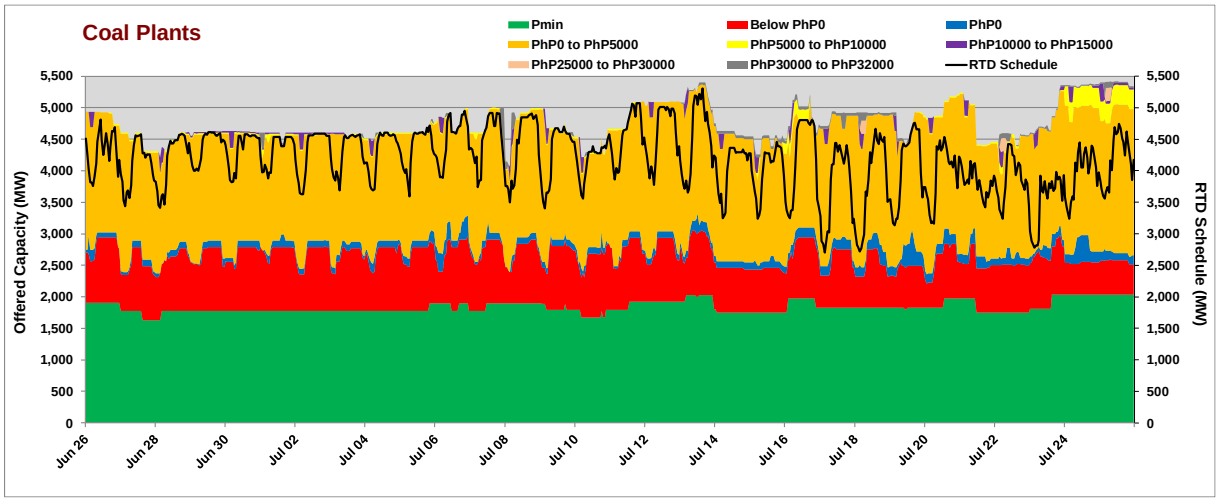
Figure 23. Natural Gas Plants Offer Pattern, Luzon – July 2018



Luzon coal plants submitted 58.3 percent of its capacity offers at prices ranging from PhP0/MWh and below while 39.8 percent was submitted at prices above PhP0/MWh to PhP5,000/MWh (Figure 24). About 1.4 percent of their offered capacity were priced between PhP5,000/MWh to PhP15,000/MWh. The remaining 0.5 percent of the capacity offers were priced at PhP25,000/MWh to PhP32,000/MWh which were mostly submitted by, Anda CFTPP.

About 87.9 percent of the capacity offers of Luzon coal plants were scheduled for dispatch within the month.

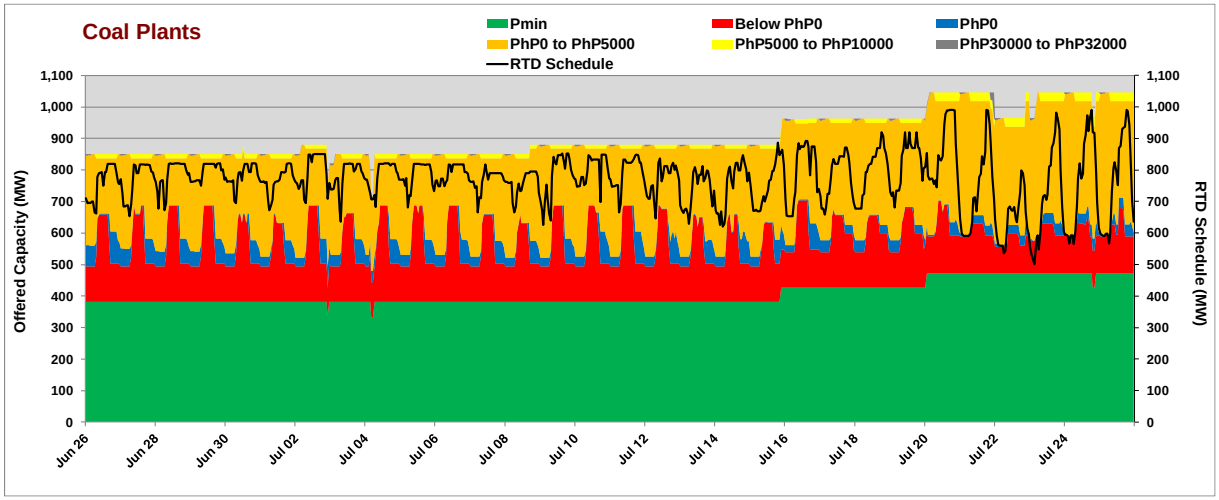
Figure 24. Coal Plants Offer Pattern – Luzon, July 2018



Meanwhile, 66.5 percent of Visayas coal plants' capacity offers was priced at PhP0/MWh and below, 33.3 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 85 percent of the offered capacity from Visayas coal plants was scheduled for dispatch.

Figure 25. Coal Plants Offer Pattern, Visayas – July 2018

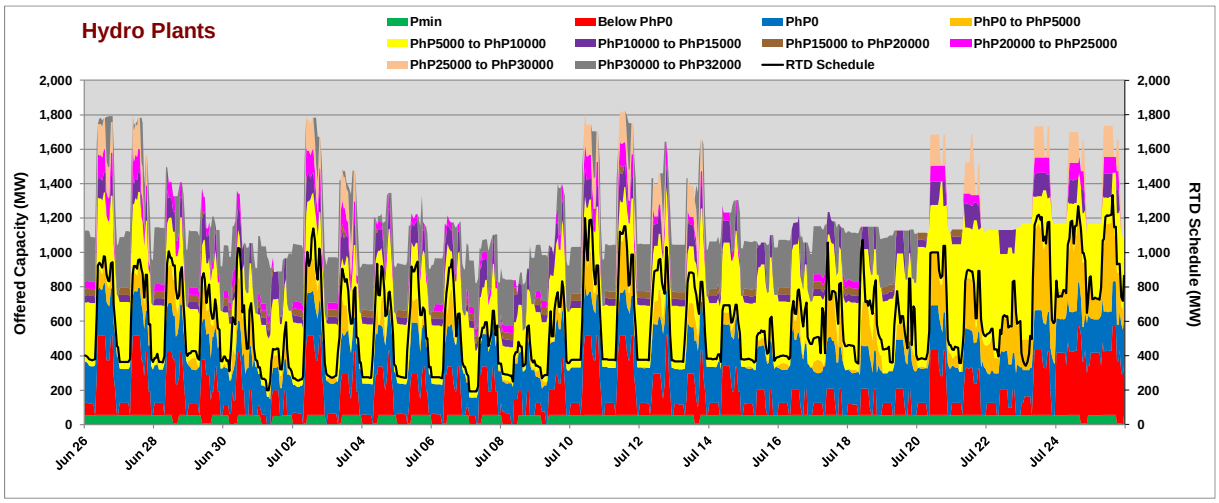


Offer prices of Luzon hydro plants remained to be relatively higher when compared with other plant types, as bulk of their offered capacity, at 30.4 percent were offered at prices ranging from PhP5,000/MWh to PhP10,000/MWh, 6.4 percent were priced at PhP10,000/MWh to PhP20,000/MWh, and 6.3 percent were priced at PhP20,000/MWh to PhP30,000/MWh (Figure 26).

Further, it was noted that 12.2 percent was offered at PhP30,000/MWh to PhP32,000/MWh which were mostly submitted by San Roque HEP units 1 and 2 beginning the second week of the billing month following the its outage during the start of the month.

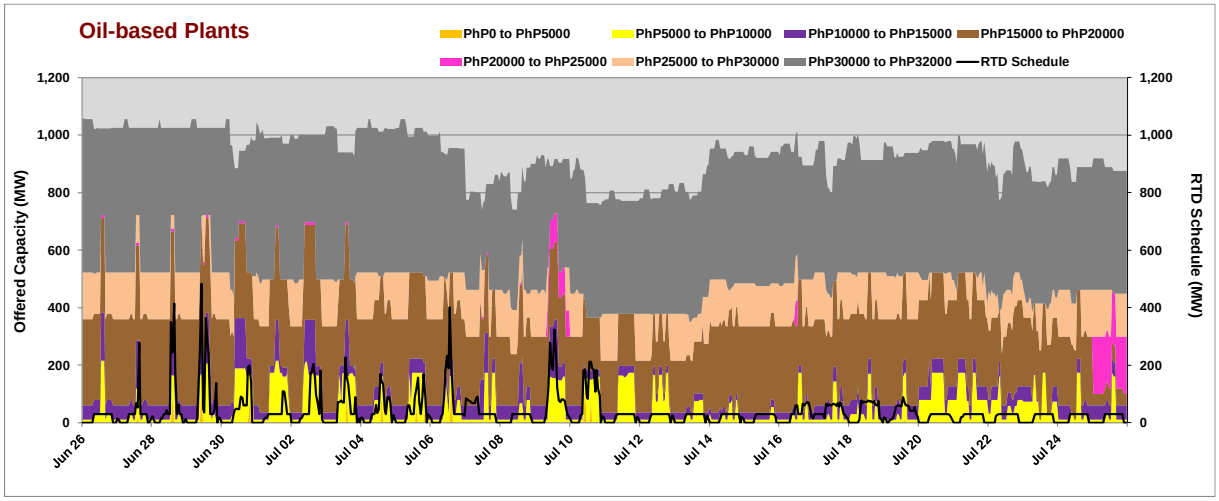
In addition, only 44.8 percent of their capacity offers were priced below PhP5,000/MWh.

Figure 26. Hydro Plants Offer Pattern, Luzon – July 2018



Luzon oil-based plants submitted the highest offer prices with 33.9 percent at PhP10,000/MWh to PhP20,000/MWh and 12.6 percent at PhP20,000/MWh to PhP30,000/MWh (Figure 27). Moreover, 46.9 percent (previous month's 23.3 percent) was offered at PhP30,000/MWh to PhP32,000/MWh. It was noted that only 6.5 percent of its capacity offers priced at PhP10,000/MWh and below.

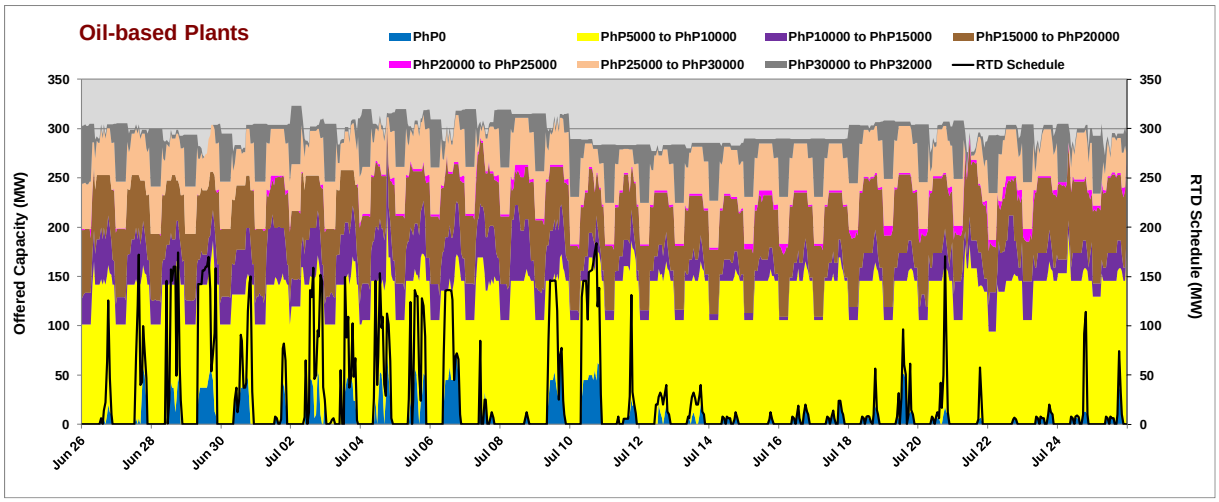
Figure 27. Oil-based Plants Offer Pattern, Luzon – July 2018



Similarly, Visayas oil-based plants offered their capacities at relatively higher prices when compared with other plant types with 23.2 percent priced above PhP20,000/MWh (Figure 28). About 43 percent was offered at PhP5,000/MWh to PhP10,000/MWh, 9.6 percent at PhP10,000/MWh to PhP15,000/MWh and 22.4 percent at PhP15,000/MWh to PhP25,000/MWh. Only 2.8 percent of their capacity offers were priced at PhP0/MWh and below.

About 7.3 percent of Visayas oil-based plants' capacity offered were scheduled for dispatch during the billing month.

Figure 28. Oil-based Plants Offer Pattern, Visayas – July 2018



XII. Capacity Factor

Luzon

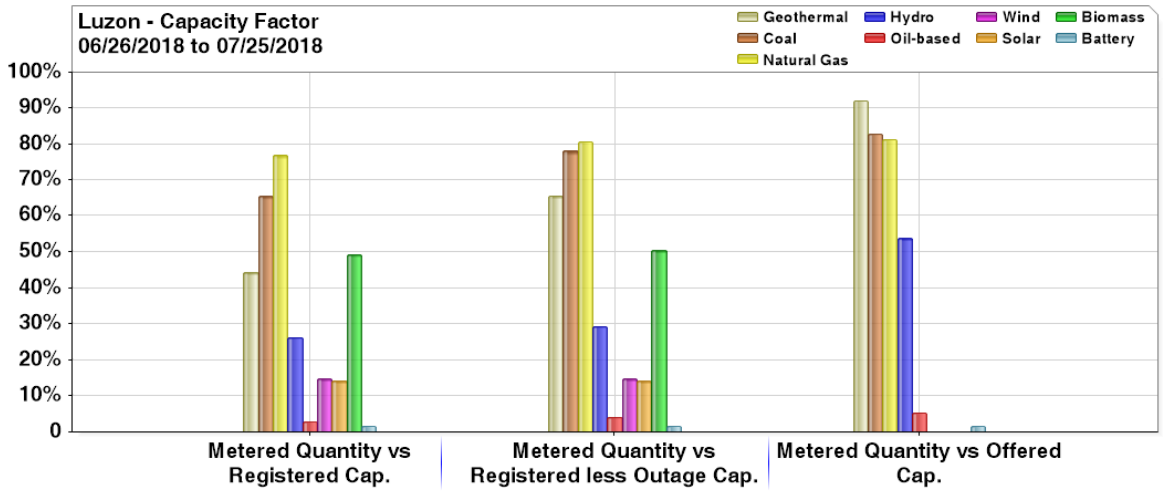
Natural gas plants observed the highest utilization when measured in terms of registered capacity among resource types with capacity factor at 77 percent. Coal and geothermal plants followed with capacity factors of 66 percent and 44 percent, respectively. Hydro and oil-based plants came next at 26 percent 3 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 81 percent and 78 percent, respectively. Geothermal plants followed with a capacity factor of 66 percent, hydro plants with 29 percent, and oil-based plants with 4 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. Coal plants followed at 83 percent and natural gas plants at 81 percent. Higher-priced hydro and oil-based plants had lower capacity factors, at 54 and 5 percent, respectively.

Meanwhile, preferential dispatch plants – biomass plants' capacity factors were posted at 49 percent when measured based on registered capacity and at 50 percent when measured based on registered less outage capacity while wind plants recorded the same capacity factors at 15 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 14 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 29. Capacity Factor – Luzon Plants, July 2018

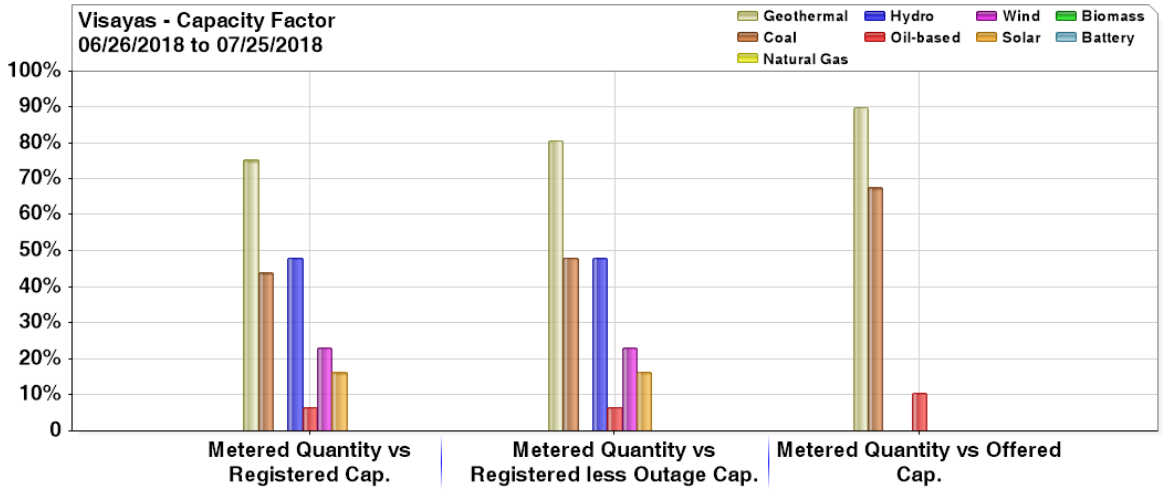


In Visayas, geothermal plants and hydro plants obtained the highest utilization among resource types in terms of registered capacity with capacity factors at 75 percent and 48 percent, respectively. Coal plants then followed with capacity factor at 44 percent in terms of registered capacity. In terms of registered capacity net of outage, geothermal recorded its capacity factors at 81 percent while both coal and hydro plants had 48 percent. Oil-based plants recorded the lowest utilization at 6 percent when measured in terms of registered capacity and at 7 percent when measured in terms of registered capacity net of outage.

In terms of offered capacity, geothermal plants recorded a capacity factor at 90 percent while coal plants' capacity factor was at 68 percent. Meanwhile, oil-based plants posted a capacity factor of 11 percent.

Wind plants' capacity factors based on registered capacity and based on registered capacity net of outage in the region was recorded at 23 percent while solar plants recorded the same at 16 percent. No utilization was recorded from biomass plants this billing month.

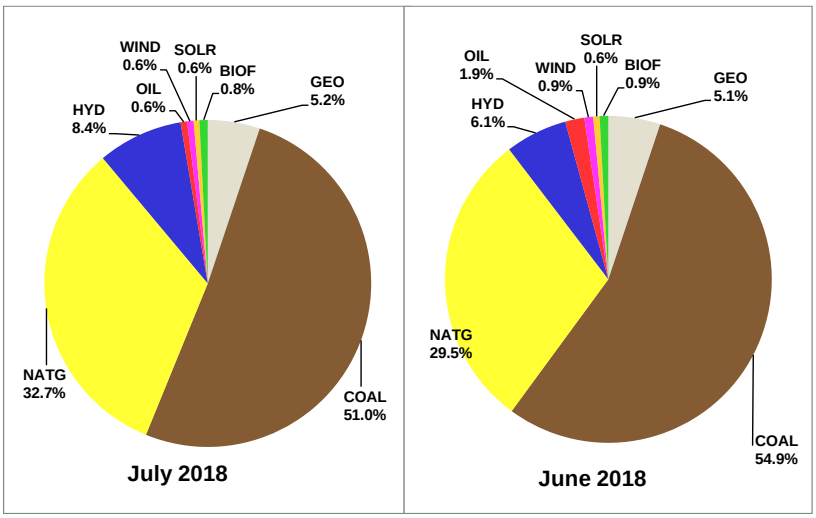
Figure 30. Capacity Factor, Visayas Plants – July 2018



XIII. Generation Mix

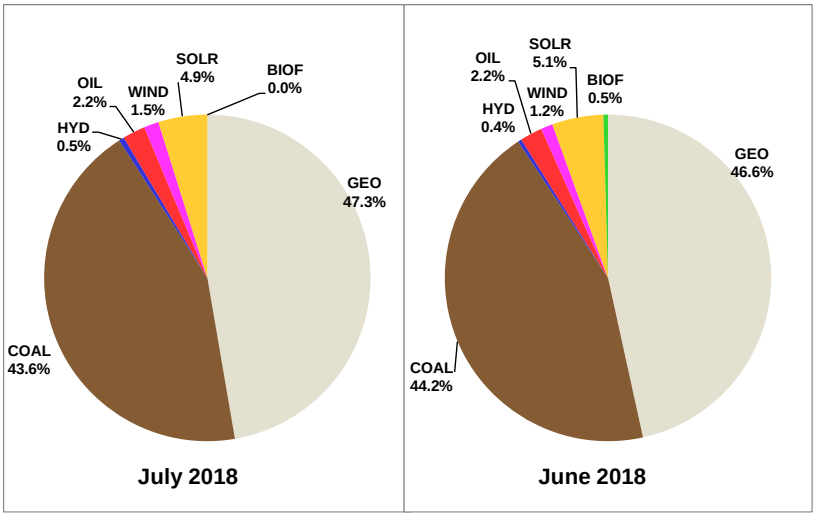
Coal plants contributed the largest chunk of the metered quantity at 51 percent (previous month's 54.9 percent). Natural gas plants followed with 32.7 percent (previous month's 29.5 percent). Hydro and geothermal plants came next with 8.4 percent and 5.2 percent, respectively. Oil-based plants' contribution was recorded at 0.6 percent. Meanwhile, the contribution of preferential and must-dispatch generating units was recorded at 2 percent.

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



In the Visayas region, geothermal plants had the highest contribution at 47.3 percent (previous month's 46.6 percent) of total metered quantity this month followed closely by coal plants with 43.6 percent (previous month's 44.2 percent). Oil-based and hydro plants came next with 2.2 percent and 0.5 percent respectively. Meanwhile, solar plants' contribution was recorded at 4.9 percent while wind plants had 1.5 percent. No generation from Visayas biofuel plants was noted this month following the end of the milling season.

Figure 32. Generation Mix (Based on Metered Quantity), Visayas – July 2018 and June 2018

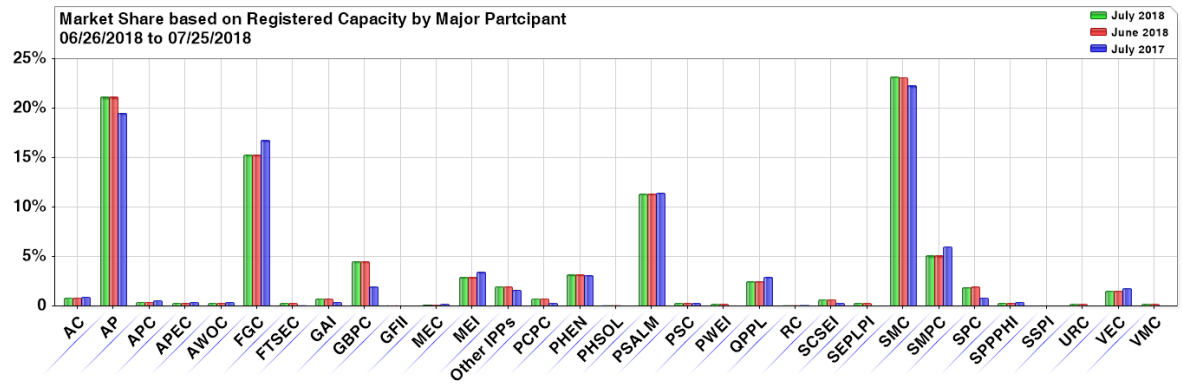


XIV. Market Concentration

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.

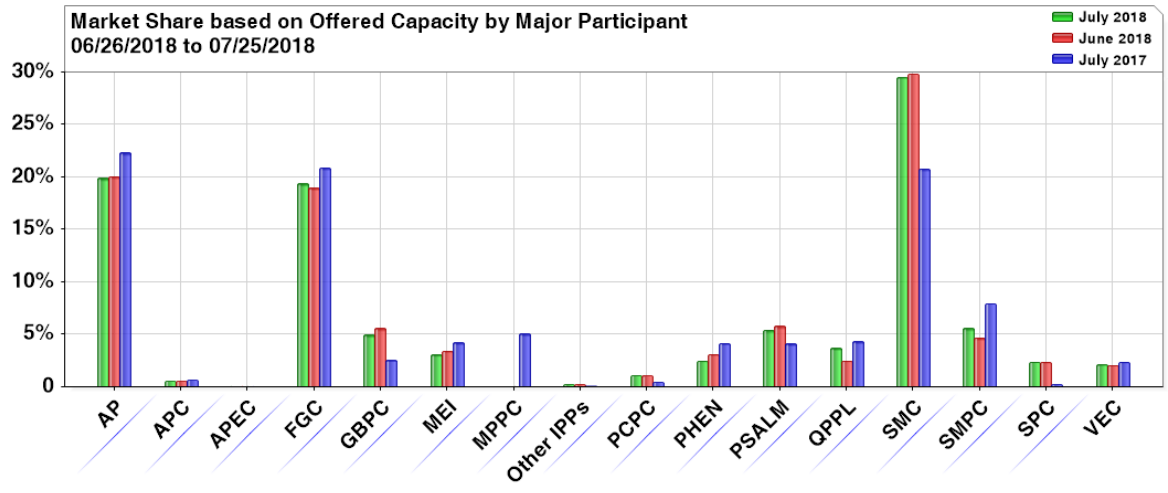
Figure 33. Market Share by Major Participant Group based on Registered Capacity, July 2018, June 2018, and July 2017



Similarly, when market share is calculated based on offered capacity of scheduled generators, SMC group held the largest share of the market at 29.4 percent. AP held the second highest share at 19.8 percent while FGC had 19.3 percent.

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

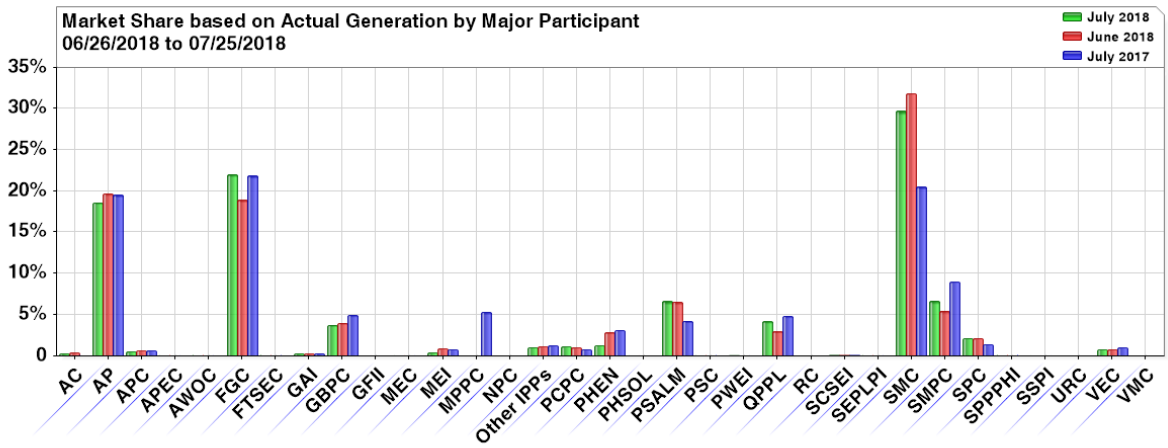
Figure 34. Market Share by Major Participant Group based on Offered Capacity, July 2018 and June 2018



Meanwhile, when market share is calculated based on actual generation of scheduled generators, SMC group likewise held the largest share of the market at 29.7 percent. FGC and AP then followed with 22 percent and 18.6 percent, respectively.

SMPC and PSALM were also among the highest market shareholders each with 6.6 percent of the actual generation.

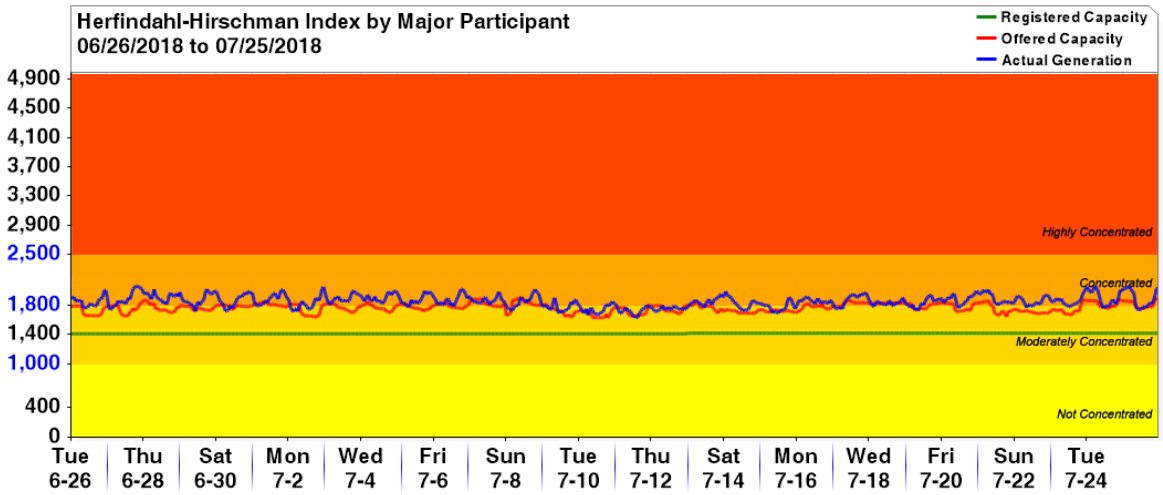
Figure 35. Market Share by Major Participant Group based on Actual Generation, July 2018 and June 2018



b. Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI)[9] calculated based on registered capacity by major participants' grouping indicated a moderately concentrated market throughout the July billing month. Meanwhile, when measured in terms of offered capacity, 438 trading intervals (60.8 percent of the time) showed a moderately concentrated market while the remaining 282 trading intervals (39.2 percent) showed a concentrated market. On the other hand, HHI calculation based on actual generation indicated a concentrated market more frequently at 554 trading intervals (76.9 percent) while the remaining 166 trading intervals (23.1 percent) indicated a moderately concentrated market.

Figure 36. Hourly HHI based by Major Participant Grouping, July 2018

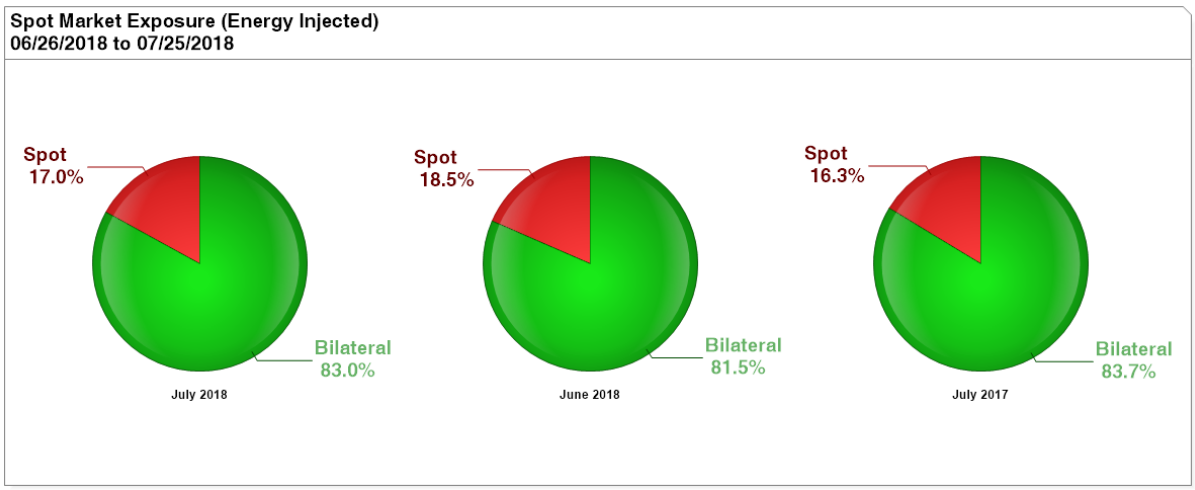


XV. Spot Exposure

Spot market transaction of generator-trading participants comprised about 17 percent of the total energy transaction in the WESM. This was lower than previous month's 18.5 percent but higher than previous year's 16.3 percent. Still, majority of the total energy injected into the grid was covered by bilateral contracts.

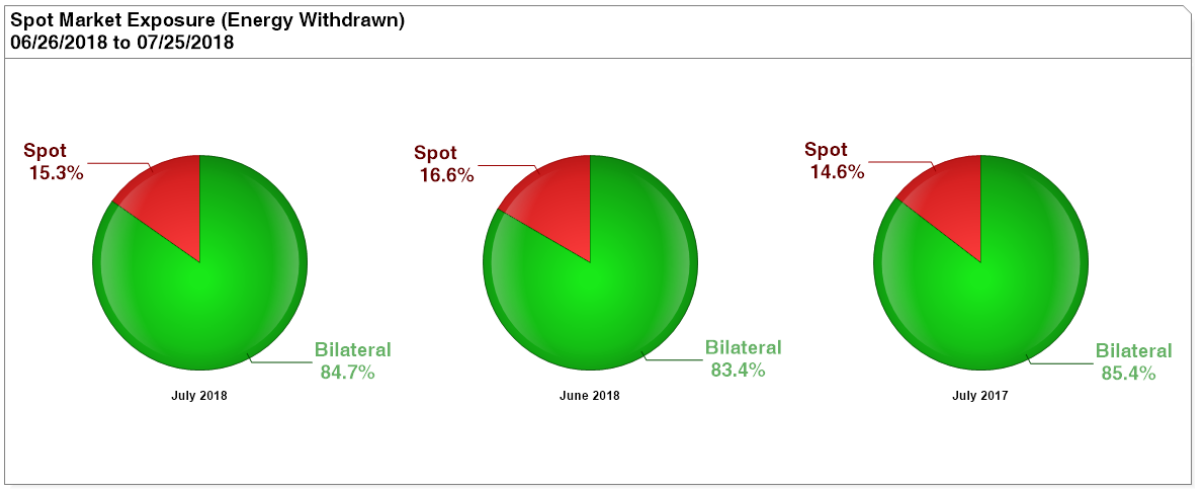
[9] The HHI measures the degree of market concentration, taking into account the relative size and distribution of participants in the monitored market. It is calculated as the sum of squares of the participant's market share. The following are the widely-ised HHI screening numbers: the HHI approaches 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 37. Spot Market Exposure of Generator-Trading Participants, July 2018, June 2018, and July 2017



On the side of the customers, only 15.3 percent of the total energy transaction during the billing month was attributed to spot market transactions. This was similarly lower than previous month's 16.6 percent and higher than previous year's 14.6 percent.

Figure 38. Spot Market Exposure of Customers, July 2018, June 2018, and July 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.