Market Assessment Report
Hot Dry Season 2021

26 February to 25 May 2021

July 2021

This Report is prepared by the
Philippine Electricity Market Corporation –
Market Assessment Group for the
Market Surveillance Committee

Contents

Market Assessment Report for Hot Dry Season 2021

This report assesses the results of the integrated Luzon and Visayas operations of the Wholesale Electricity Spot Market (WESM) for the Hot Dry Season 2021 (26 February to 25 May 2021) and how the market performed compared with the previous year. This report provides an overview of the results of market performance, trends, and drivers which are then used to assess competition and conditions in the WESM, as well as the bidding behavior of trading participants.

Part I. Highlights

- The ongoing community quarantine measures declared by the government to combat the spread of coronavirus disease affected the levels of demand since its implementation last March 2020. Appendix A shows the summary of the quarantine declarations during the Hot Dry Season 2021.
- Starting February 2021 up to May 2021, the monthly averages of demand already exceeded its pre-pandemic figures recorded in 2019 indicating the improvement in the economic activity. This is despite the upgrading of quarantine declarations for the Metro Manila and/or "NCR Plus" where the bulk of the load in Luzon region is located.
    - Metro Manila restrictions was upgraded from GCQ (from 1 June 2020 to 28 March 2021[1], except from 2 to 18 August 2020[2]) to ECQ declaration covering 29 March to 11 April[3], to MECQ from 12 April to 14 May[4], and to GCQ with heightened restrictions from 15 to 31 May[5].
- Supply margin was cut in half this year from a high 2,992 MW average in Hot Dry Season 2020 to 1,543 MW in Hot Dry Season 2021 driven by the significant increase in demand as well as higher level of unavailable capacity.
    - Higher level of outage and capacity not offered in the market was observed during the Hot Dry Season of 2021 relative to the Hot Dry Season of 2020 figures.
- The May 2021 billing month's average price of PHP8,035/MWh was the highest monthly average price in the last 7 years from April 2014's PHP9,416/MWh. Meanwhile, the May 2021 billing month set a record-low average supply margin at 993 MW since June 2019's 968 MW.
- About 73 percent of the prices were below PhP5,000/MWh during the entire season. Notwithstanding, market trigger[6] events were noted this season breaching the price spike threshold for 46 intervals. Meanwhile, the price creep threshold nor sustained high price threshold was breached.
- Secondary price cap was imposed on 55 trading intervals during the May 2021 billing month due to persistent high average prices.

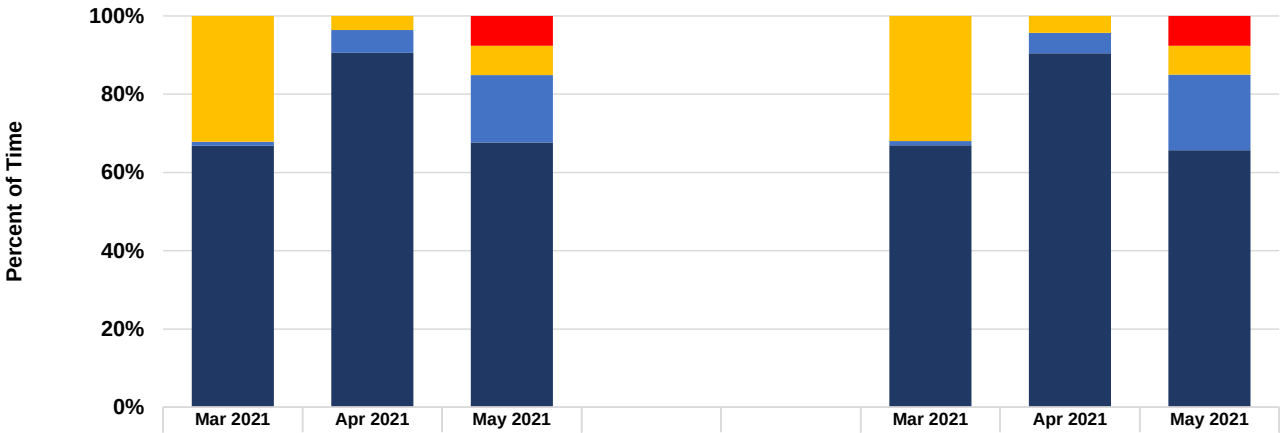
Part II. Assessment of the Market

- Majority of the market price outcomes, at 75 percent, during the Hot Dry Season of 2021 was under normal pricing condition. (Figure 1). It may be recalled that the normal pricing condition prevailed for

[1] *See Appendix A*
[2] https://pcoo.gov.ph/news_releases/metro-manila-put-under-stricter-mecq-for-two-weeks/
[3] https://cnnphilippines.com/news/2021/3/27/ECQ-2021-NCR-Plus-bubble.html
[4] https://news.abs-cbn.com/news/04/28/21/may-2021-quarantine-ncr-plus-mecq
[5] https://www.rappler.com/nation/ncr-plus-quarantine-classification-starting-may-15-2021
[6] Following the approved price thresholds for price trigger events as provided in MSC Resolution No. 2020-04 dated 13 February 2020, *"Recommending Approval of the Seasonality Thresholds for the Spot Price Indices on Market Price Triggers and Interesting Pricing Events".* The ERC was informed of the updated thresholds based on seasonality, which also formed part of the proposed revisions to the ERC-PEMC Protocol.

92 percent of the time during the cool dry season 2021 (previous season) and for 88 percent of the time during the hot dry season 2020 (previous year).

- Price Substitution Methodology (PSM) was applied to 14 percent (297 trading intervals in Luzon and 300 trading intervals in Visayas) of the price outcomes due to frequent congestion events on Samboan-Amlan line 1 and Sucat – Biñan line 3. PSM application was exceptionally high during the March billing month affecting 216 trading intervals in Luzon and 215 trading intervals in Visayas.
- Prices issued with pricing error notices (PEN) affected 8 percent of the price outcomes mainly due to inappropriate input data affecting Luzon and Visayas prices and schedules.
- Secondary price cap[7] was imposed for 3 percent of the time affecting 55 trading intervals for each region during the May billing period attributable to the relatively low supply margin during the month which resulted in sustained high prices.
- No Market Intervention and Market Suspension was declared during the period.



	Luzon					Visayas		
	Mar 2021	Apr 2021	May 2021			Mar 2021	Apr 2021	May 2021
Secondary Cap	0%	0%	8%			0%	0%	8%
Market Intervention (AP)	0%	0%	0%			0%	0%	0%
Congestion (PSM)	32%	4%	8%			32%	4%	7%
Pricing Error Notice	1%	6%	17%			1%	5%	19%
Normal	67%	91%	68%			67%	90%	66%

Figure 1. Summary of Pricing Conditions

Part III. Market Outcome

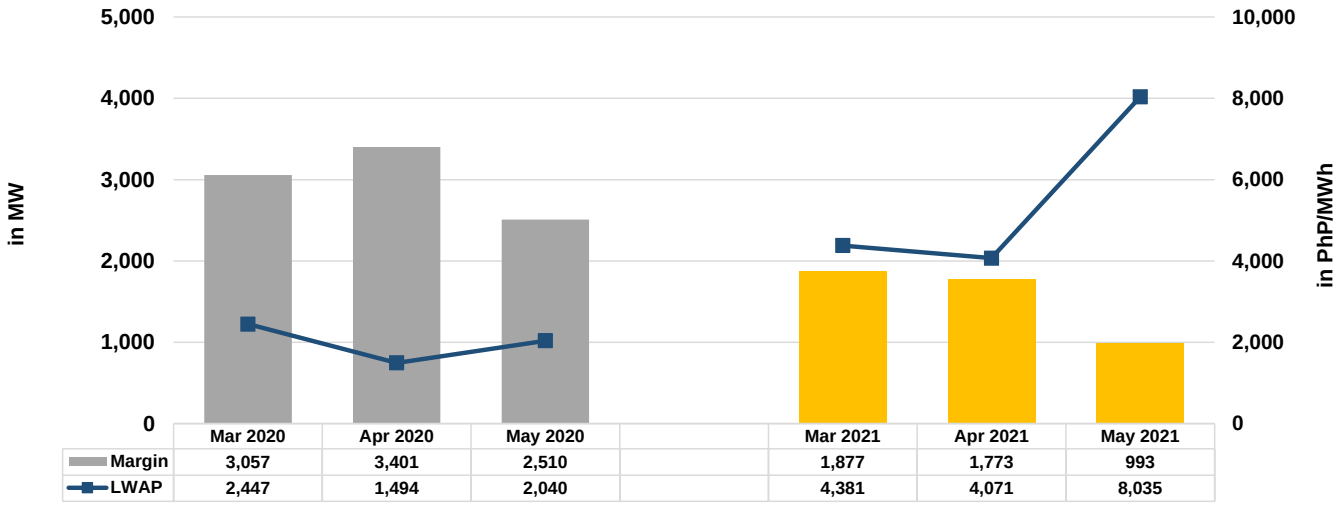
1. Supply Margin[8] and Price[9]

- Supply margin was halved at an average of 1,543 MW in Hot Dry Season 2021 from 2,993 MW in 2020. (Figure 2).

[7] Secondary price cap is imposed when the 120-hour rolling average price exceeds PhP9,000/MWh.
[8] The supply margin is equal to the effective supply less system demand requirement plus reserve schedule.
[9] 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.

- It may be recalled that the Hot Dry Season of 2020 was marked by the height of the implementation of lockdown and quarantine measures to control the spread of the Coronavirus Disease (Covid-19 Pandemic).
- As restrictions were eventually relaxed, demand began to pick up leading to narrower supply margin this year. In addition, this year's figures mirror the historical decrease in supply margin as the summer months set in and demand was relatively high due to increase in temperatures while, at the same time, supply was relatively low due to unavailability of hydro-powered generation.

- The May 2021 billing month particularly recorded a low supply margin at 993 MW recording the lowest monthly average cushion since June 2019 which saw an average supply margin at 968 MW.
- Correspondingly, the average price this season more than doubled at PhP5,585/MWh compared to PHP2,010/MWh in the previous year.
  - Most significant increase was noted in the year-on-year comparison of the averages for the May billing month which multiplied fourfold from PHP 2,040/MWh in 2020 to PHP8,035/MWh in 2021.
  - The record for the highest monthly average price was broken by the May 2021 figures (the highest on record (PHP8,035/MWh) since the PHP9,416/MWh in April 2014).
- Based on the supply margin analysis[10], 17 peak trading intervals exceeded the upper price thresholds and 11 off-peak trading intervals went below the lower price threshold corresponding to their supply margin.



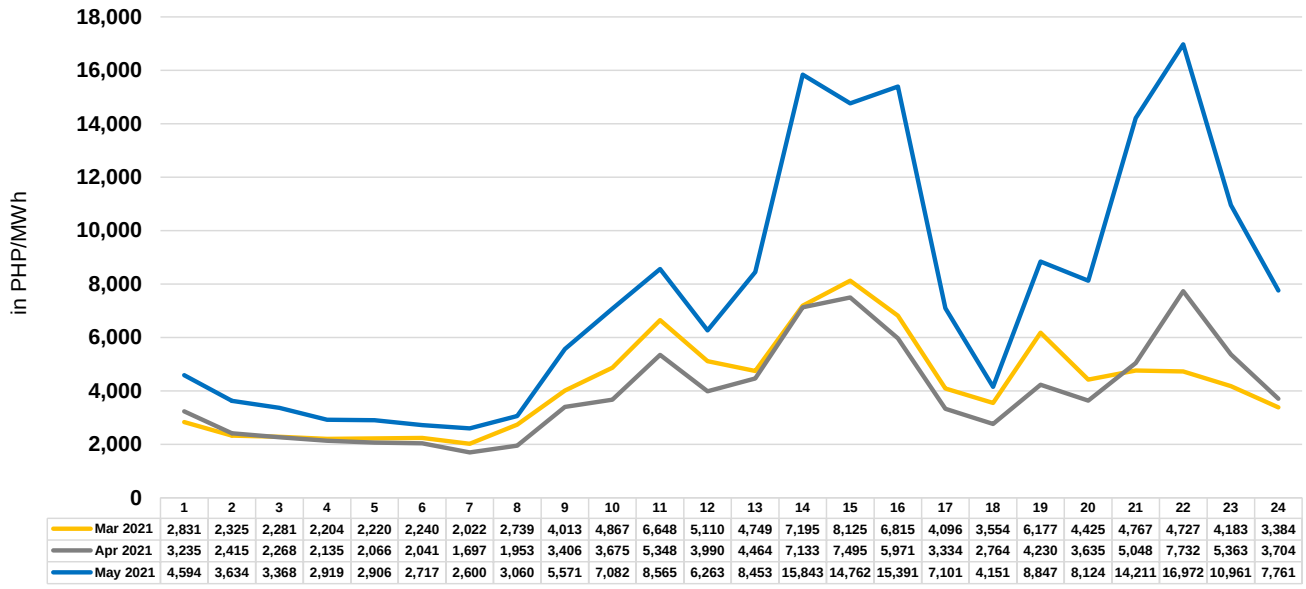
	Mar 2020	Apr 2020	May 2020	Mar 2021	Apr 2021	May 2021
Margin	3,057	3,401	2,510	1,877	1,773	993
LWAP	2,447	1,494	2,040	4,381	4,071	8,035

Figure 2. Average Supply Margin and Average Price

- Consistent with the tighter supply margin in the May 2021 billing month, the hourly profile of prices during the month shifted to higher levels compared to the March and April trends (Figure 3).
  - The peak prices in May were much steeper than that in March and April.
  - March prices were also more elevated compared to the April prices which may partly be attributable to the stricter quarantine measures of ECQ from 29 March to 11 April.
- The afternoon peaks in March and April were recorded at 1500H while the same was recorded at 1400H and 1600H in May. Meanwhile, late evening peak was noted at 2200H during April and May but was not present in March.

[10] Following the approved price thresholds for price trigger events as provided in MSC Resolution No. 2020-04 dated 13 February 2020, *"Recommending Approval of the Seasonality Thresholds for the Spot Price Indices on Market Price Triggers and Interesting Pricing Events"*

- Morning peaks at 1100H and early evening peak at 1900H were consistent in all the months of the season.

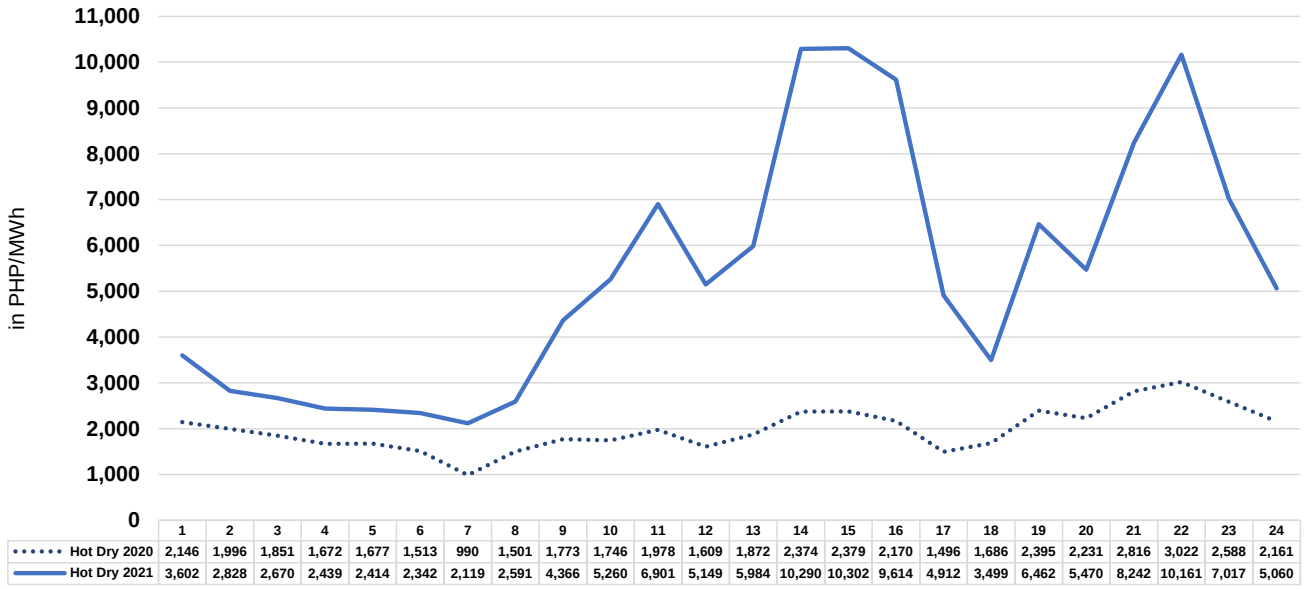


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mar 2021	2,831	2,325	2,281	2,204	2,220	2,240	2,022	2,739	4,013	4,867	6,648	5,110	4,749	7,195	8,125	6,815	4,096	3,554	6,177	4,425	4,767	4,727	4,183	3,384
Apr 2021	3,235	2,415	2,268	2,135	2,066	2,041	1,697	1,953	3,406	3,675	5,348	3,990	4,464	7,133	7,495	5,971	3,334	2,764	4,230	3,635	5,048	7,732	5,363	3,704
May 2021	4,594	3,634	3,368	2,919	2,906	2,717	2,600	3,060	5,571	7,082	8,565	6,263	8,453	15,843	14,762	15,391	7,101	4,151	8,847	8,124	14,211	16,972	10,961	7,761

Figure 3. Average Price, Hourly Profile, Hot Dry Season 2021

- On the other hand, year-on-year comparison of the hourly profile showed more drastic disparity especially during peak hours[11] and evening off-peak[12] hours (Figure 4). Hot Dry Season 2020 hourly profile almost plateaued denoting the limited business operations which usually drove the peak hours consumption.
- Despite the disparity in the monthly 24-hour profile in Figure 3, the year-on-year peaks were interestingly consistent i.e. morning peak at 1100H, afternoon peak at 1400H to 1500H, early evening peak at 1900H and late evening peak at 2200H, albeit at much higher slopes in the Hot Dry Season of 2021.

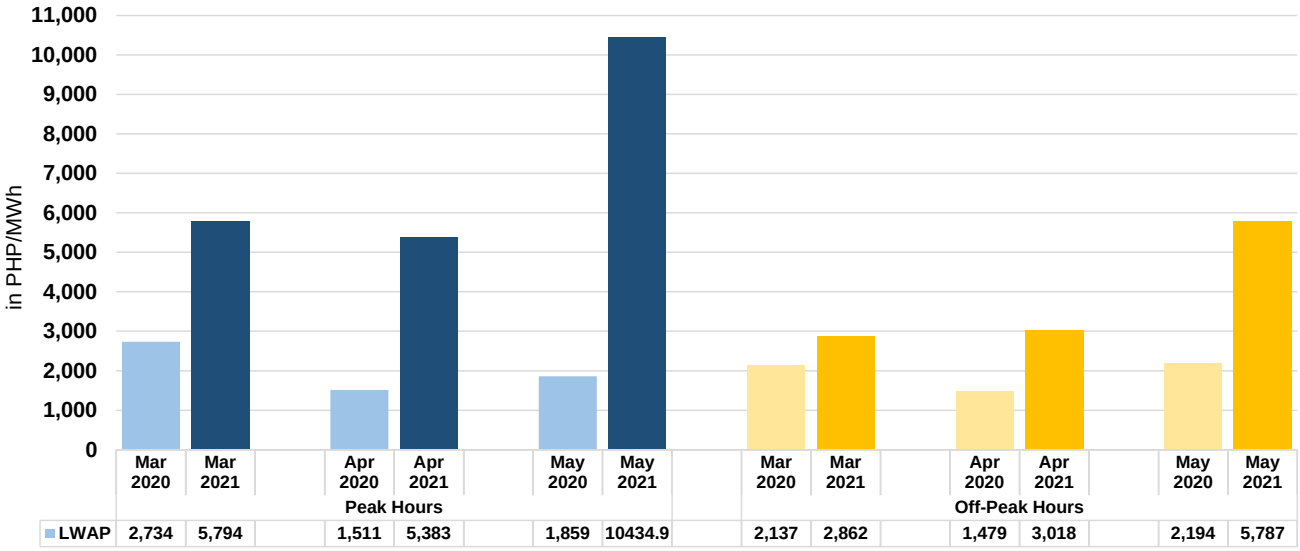
[11] Peak hours include 1000H-2100H from Mondays to Saturdays and 1900H-2000H on Sundays and Holidays.
[12] Off-peak hours include 0100H to 0900H and 2200H to 2400H from Mondays to Saturdays and 0100H to 1800H and 2100H to 2400H on Sundays and Holidays



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Hot Dry 2020	2,146	1,996	1,851	1,672	1,677	1,513	990	1,501	1,773	1,746	1,978	1,609	1,872	2,374	2,379	2,170	1,496	1,686	2,395	2,231	2,816	3,022	2,588	2,161
Hot Dry 2021	3,602	2,828	2,670	2,439	2,414	2,342	2,119	2,591	4,366	5,260	6,901	5,149	5,984	10,290	10,302	9,614	4,912	3,499	6,462	5,470	8,242	10,161	7,017	5,060

Figure 4. Average Price, Hourly Profile, Hot Dry Season 2020 and 2021

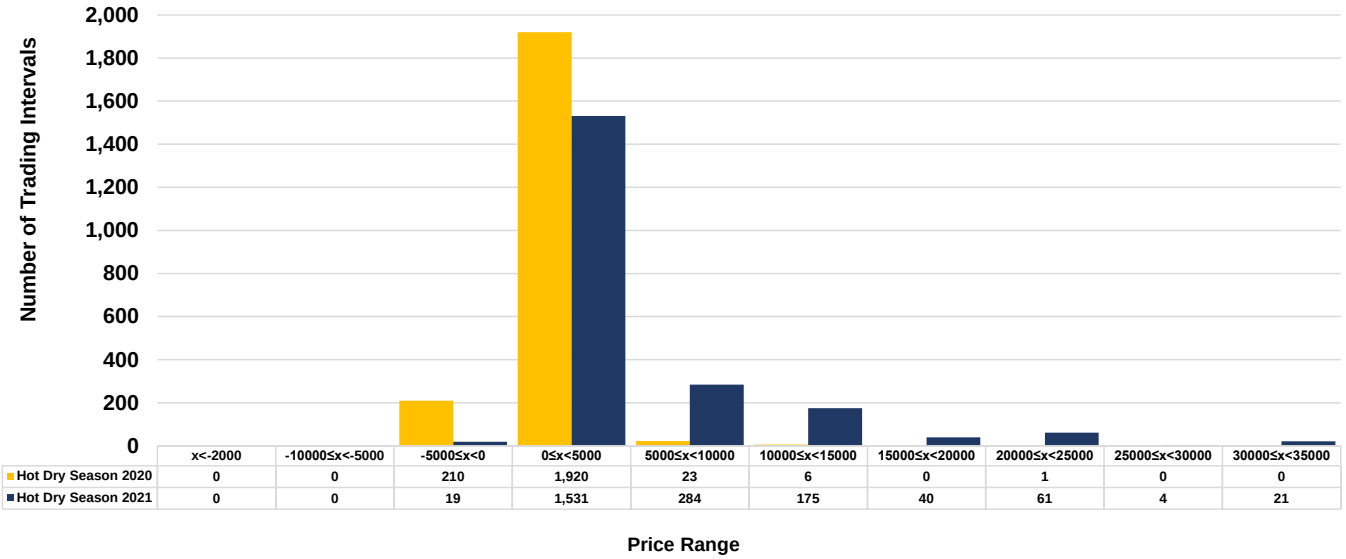
- Figure 5 shows the increase in average prices was more notable in peak prices.
  - Average Prices during Peak Hours: Hot Dry Season 2020 at PHP2,081/MWh; Hot Dry Season 2021 at PHP7,336/MWh
  - Average Prices during Off-peak Hours: Hot Dry Season 2020 at PHP1,944/MWh; Hot Dry Season 2021 at PHP3,961/MWh
- Both peak and off-peak average prices in May 2021 were significantly higher than May 2020 figures.



	Mar 2020	Mar 2021	Apr 2020	Apr 2021	May 2020	May 2021	Mar 2020	Mar 2021	Apr 2020	Apr 2021	May 2020	May 2021
LWAP	2,734	5,794	1,511	5,383	1,859	10434.9	2,137	2,862	1,479	3,018	2,194	5,787

Figure 5. Average Price, by Hour Type

- About 73 percent of the prices ranged from PHP0/MWh up to below PHP5,000/MWh coming from a high 99 percent in the previous year (Figure 6).
    - In particular, majority of the prices or about 56 percent of this year's hot dry season were ranging from PhP2,000/MWh to PHP4,000/MWh.
- Prices beyond the PHP10,000/MWh-mark were more prevalent this year at 14 percent of the time or 302 intervals from merely 7 intervals in Hot Dry Season 2020. Most frequent setters of prices above PHP10,000/MWh this year were oil-based plants Bauang DPP and Limay CCGT.



	x<-2000	-10000≤x<-5000	-5000≤x<0	0≤x<5000	5000≤x<10000	10000≤x<15000	15000≤x<20000	20000≤x<25000	25000≤x<30000	30000≤x<35000
Hot Dry Season 2020	0	0	210	1,920	23	6	0	1	0	0
Hot Dry Season 2021	0	0	19	1,531	284	175	40	61	4	21

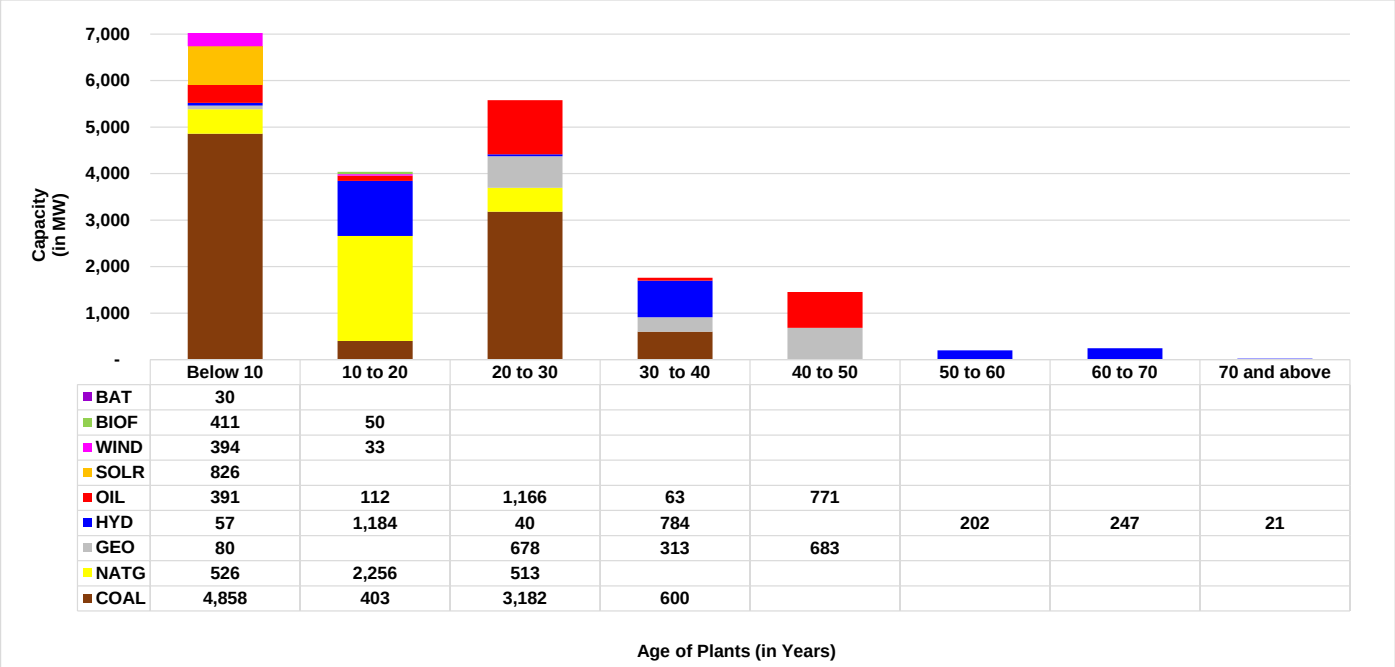
Figure 6. Price Frequency Distribution

2. Supply

a. Capacity Profile

- The registered capacity in the WESM totaled to 20,938 MW. Of which, about 35 percent or 7,366 MW of the registered capacity which are less than 10 years in operations[13] (Figure 7). This involved a total of 138 plants with majority involving coal plants.
- Plants aging 10 to 20 years accounted for 18 percent or about 3,707 MW (involving 32 plants); plants aging 20 to 30 years accounted for 29 percent or about 6,166 MW (involving 37 plants) while plants aging from 30 to 50 years accounted for 15 percent or about 3,230 MW (involving 39 plants).
- Twelve plants, all of which are hydro plants, were more than 50 years in age contributing 470 MW in the registered capacity.

[13] Based on registration date or commercial operations date

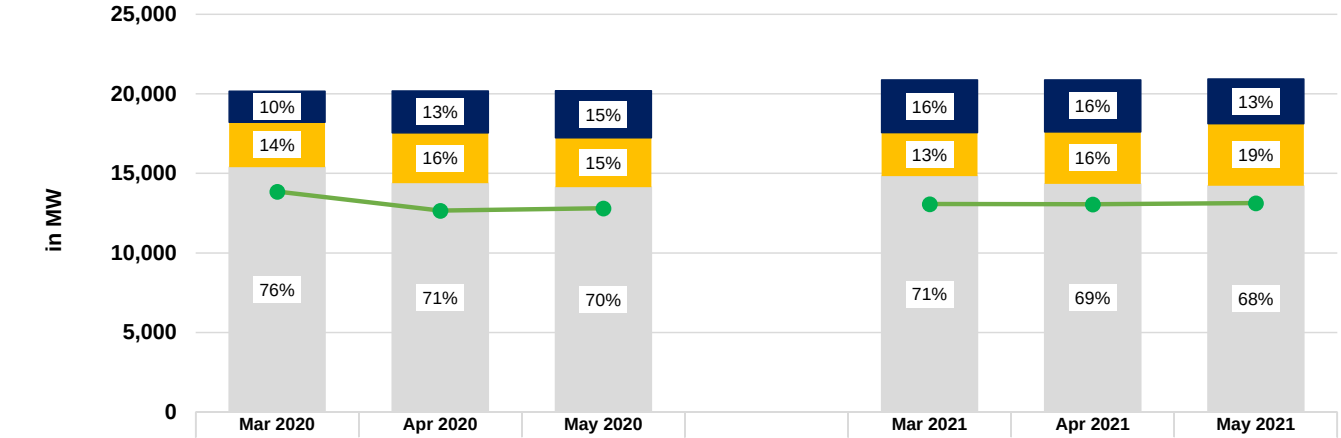


	Below 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 and above
BAT	30							
BIOF	411	50						
WIND	394	33						
SOLR	826							
OIL	391	112	1,166	63	771			
HYD	57	1,184	40	784		202	247	21
GEO	80		678	313	683			
NATG	526	2,256	513					
COAL	4,858	403	3,182	600				

Figure 7. Age of Plants

- About 69 percent (from previous year's 72 percent) of the total registered capacity was available capacity in the market during the hot dry season WESM (Figure 8). The year-on-year drop was mainly driven by the higher level of capacity on outage this year.
- Average outage capacity during Hot Dry Season 2021 was recorded at 3,122 MW, demonstrating an increase from previous year's 2,522 MW.
    - o March 2021 billing month recorded the highest monthly average this season with 3,303 MW. While it trended down towards the end of the season, high average of 2,805 MW was noted in May 2021 billing month.
- Similarly, capacity not offered or nominated in the market, increased slightly to about 3,317 MW (16 percent) from previous year's 3,033 MW (15 percent).
- Accounting for security limits and ramp limitations, effective supply[14] accounted for 63 percent of the total WESM registered capacity at an averaged at 13,087.
- For about 92 percent of the time, HVDC power flow was more often directed towards the Luzon throughout the season, with schedules ranging from 0.6 MW to 420 MW. Meanwhile, schedule of HVDC power flow from Luzon to Visayas ranged from 0.1 MW to 248 MW.

[14] 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).



	Mar 2020	Apr 2020	May 2020		Mar 2021	Apr 2021	May 2021
		Hot Dry 2020				Hot Dry 2021	
Outage	1,952	2,630	2,962		3,303	3,265	2,805
Not Offered/ Not Nominated	2,820	3,167	3,101		2,744	3,269	3,903
Available	15,396	14,382	14,128		14,824	14,343	14,226
Effective Supply	13,857	12,660	12,808		13,069	13,057	13,135

Figure 8. Capacity Profile

b. Capacity and Generation Mix

- In Luzon, coal plants recorded an increase in share in the total registered capacity from 42 percent last year to 44 percent by the end of May 2021 billing month following the entry of 668-MW GNP Dinginin and 25-MW Bataan 2020 CFTPP (Figure 9).
- Solar plants' capacity mix contribution likewise recorded a noticeable increase from 2 percent to 3 percent attributable to the entry of 55-MW Gigasol3 Solar and 16-MW ECOP Tagalag Solar.
- Natural gas and hydro plants accounted for about 19 percent and 15 percent of registered capacity, respectively.
- Coal and natural gas plants' shares grew when measured in terms of actual generation relative to their share in terms of registered capacity. On the contrary, hydro and oil-based plants' shares are lower in terms of actual generation than in terms of registered capacity.
- In terms of actual generation, coal plants' contribution remained the largest at 56 percent (from previous month's 51 percent) while natural gas plants' contribution decreased to 29 percent from previous year's 33 percent which still indicates high utilization as a result of low-priced offers in the market.
- Higher contribution was noted from oil-based plants from 1 percent in the previous year to 2 percent this year.

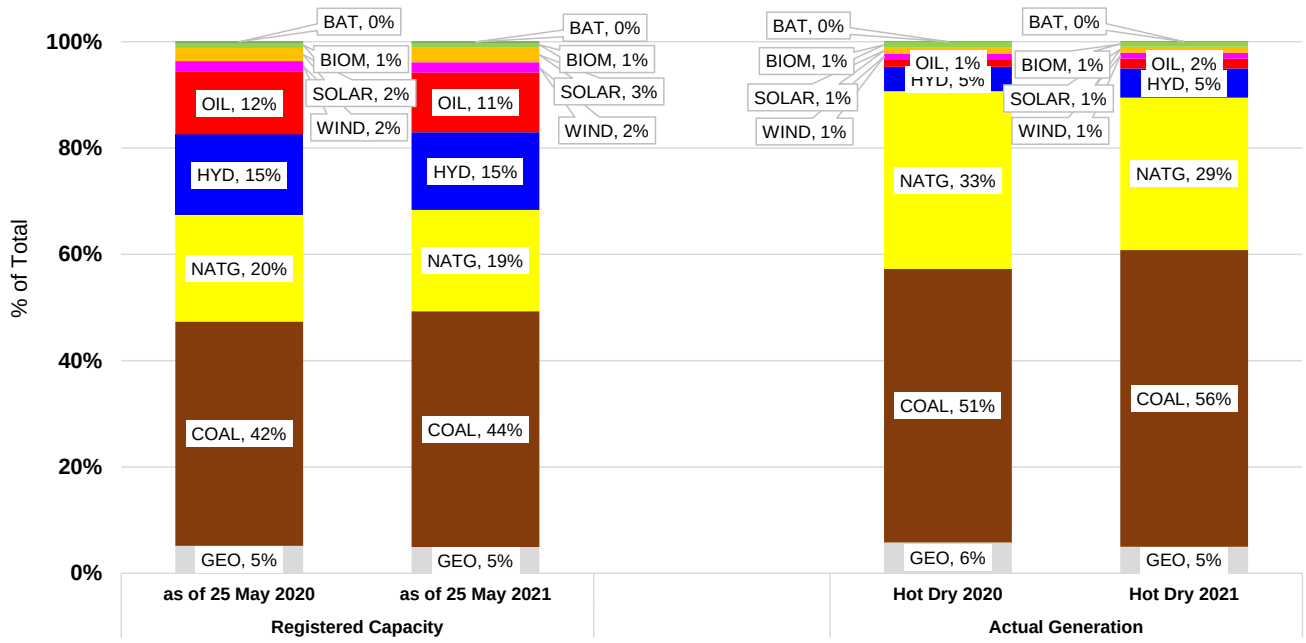


Figure 9. Capacity and Generation Mix – Luzon

- In Visayas, geothermal plants and coal plants accounted for 24 percent and 38 percent of registered capacity, respectively (Figure 10). These plants' shares then increased to 38 percent and 50 percent when measured in terms of actual generation indicating high dispatch and utilization driven by low-priced offers in the market.
- On the other hand, while oil-based, solar, and biomass plants recorded relatively higher contribution in the registered capacity at 15 percent, 11 percent, and 8 percent, these resource types observed minimal utilization at 2 percent, 5 percent, and 2 percent, respectively.

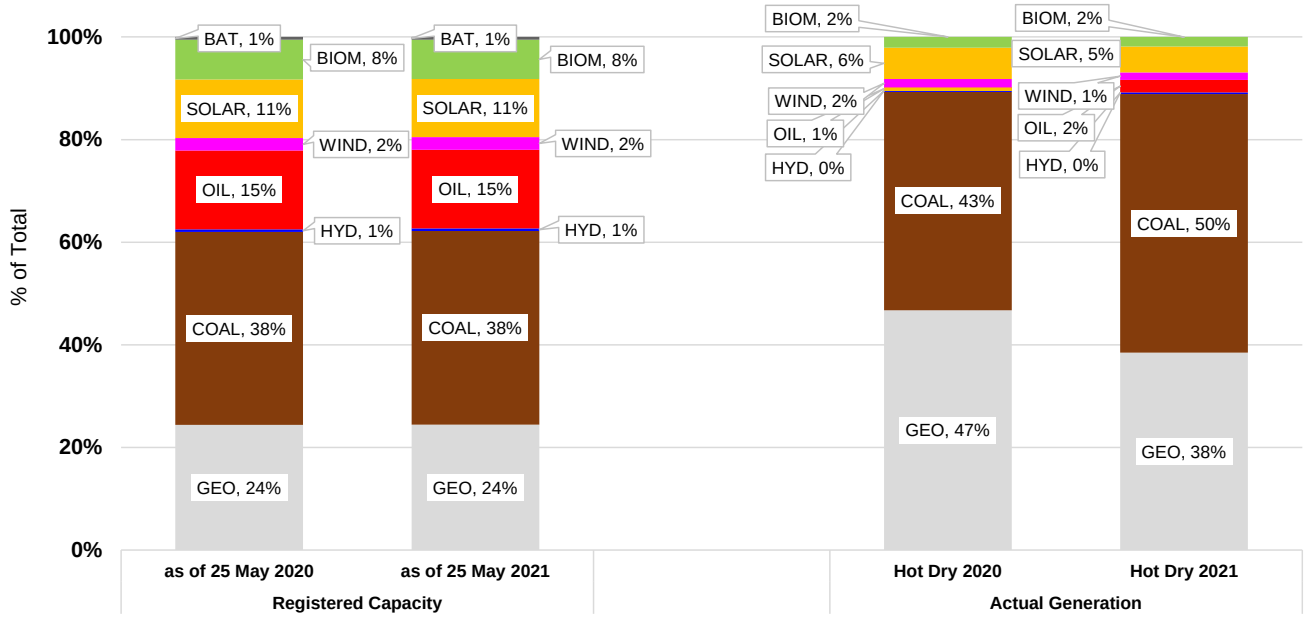
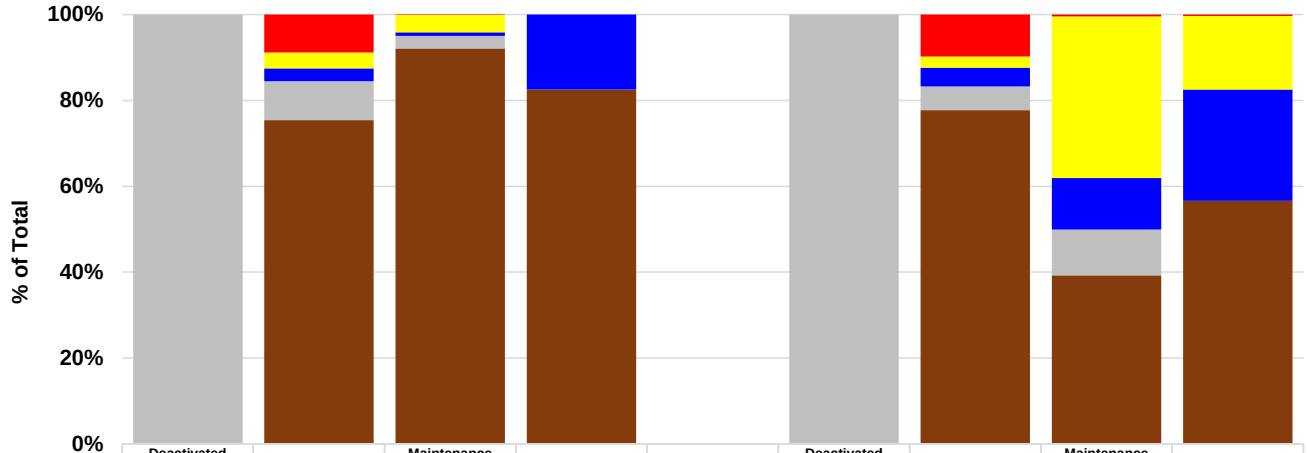


Figure 10. Capacity and Generation Mix – Visayas

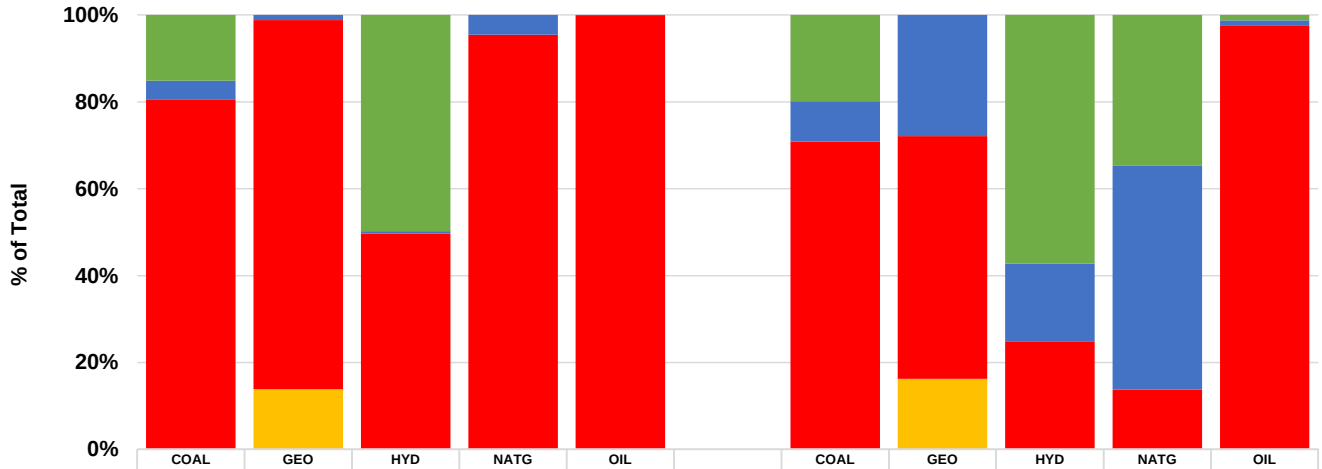
c. Outage Capacity

- Coal plants accounted for the majority of the outage capacity this season at 66 percent (Figure 11), averaging at 2,079 MW of the 3,122 MW total capacity on outage. This mainly involved the following major outages:
  - Sual CFTPP unit 2 (647 MW) - forced outage; beginning 16 September 2020 to 12 May 2021
  - Mariveles CFTPP unit 1 (316 MW) - forced outage; beginning 8 January 2021
  - Calaca CFTPP unit 2 (300 MW) - forced outage; beginning 3 December 2020
  - GNP Dinginin (668 MW, still on testing and commissioning) – forced outage; 5 April 2021 to 5 May 2021
  - Mariveles CFTPP unit 2 (316 MW) – planned outage; 20 March 2021 to 5 May 2021
- The SPEX Malampaya facility was restricted beginning 31 March 2021 which resulted in the limited capacities of natural gas plants.
- In terms of outage type, forced outages accounted for about 60 percent of the season's outages, averaging 2,277 MW (Figure 11). In addition to the above discussed coal plants which underwent forced outages, the following contributed the bulk of the forced outages during the season:
  - Malaya TPP unit 1 (300 MW) beginning 5 May 2019
  - Kalayaan PSPP unit 4 (180 MW) beginning 27 November 2020
  - Makban GPP unit 1 (63.2 MW) beginning 18 March 2021
- Planned outages during this season averaged at 634 MW while maintenance outages averaged at around 352 MW.
- Deactivated shutdown purely involved geothermal plant Makban GPP unit 6 (55 MW) which was on forced outage since 11 April 2013.
- Appendix B provides the details of the plant outages during the season which lasted for more than 5 days.



	Hot Dry 2020					Hot Dry 2021			
	Deactivated Shutdown	Forced Outage	Maintenance Outage	Planned Outage		Deactivated Shutdown	Forced Outage	Maintenance Outage	Planned Outage
OIL	0%	9%	0%	0%		0%	10%	0%	0%
NATG	0%	4%	4%	0%		0%	3%	38%	17%
HYD	0%	3%	1%	17%		0%	4%	12%	26%
GEO	100%	9%	3%	0%		100%	6%	11%	0%
COAL	0%	75%	92%	83%		0%	78%	39%	57%

Figure 11. Outage Capacity by Plant Type



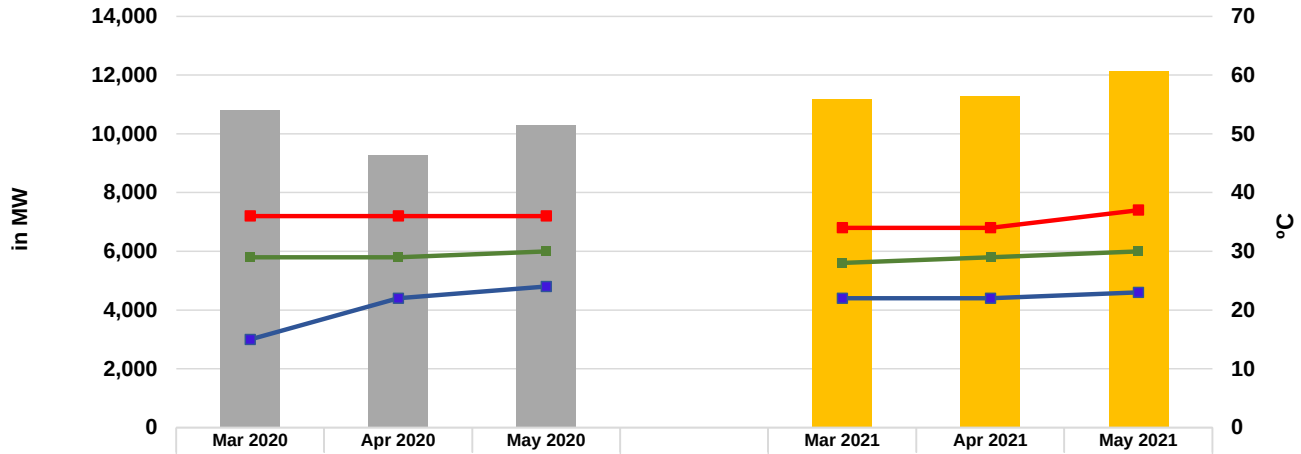
	COAL	GEO	HYD	NATG	OIL		COAL	GEO	HYD	NATG	OIL
			Hot Dry 2020						Hot Dry 2021		
Planned Outage	15%	0%	50%	0%	0%		20%	0%	57%	35%	1%
Maintenance Outage	4%	1%	1%	5%	0%		9%	28%	18%	52%	1%
Forced Outage	81%	85%	50%	95%	100%		71%	56%	25%	14%	98%
Deactivated Shutdown	0%	14%	0%	0%	0%		0%	16%	0%	0%	0%

Figure 12. Outage Capacity by Outage Type

3. Demand[15]

- Amidst the continuous implementation of the quarantine measures since March 2020 which aimed to combat the spread of the coronavirus disease restricted economic activity, demand seemingly normalized with figures exceeding the 2019 Hot Dry Season level. Appendix A shows the summary of the quarantine declarations during the Hot Dry 2021.
- Demand averaged at 11,544MW this year, posting a 14.3 percent decrease from previous year's 10,102MW.
    - Demand steadily grew from March to May attributable to the relaxation of quarantine measures in Metro Manila (as part of the "NCR Plus"), which is the load center, from the ECQ declaration covering 29 March to 11 April[16], to MECQ from 12 April to 14 May[17], and to GCQ with heightened restrictions from 15 to 31 May[18]. On top of the easing of quarantine measures, temperature also observed an upward trend which contributed to the rise in the electricity consumption (Figure 13).
- Contraction was tallied in the GDP growth rate at -4.2 percent for the first quarter of 2021.

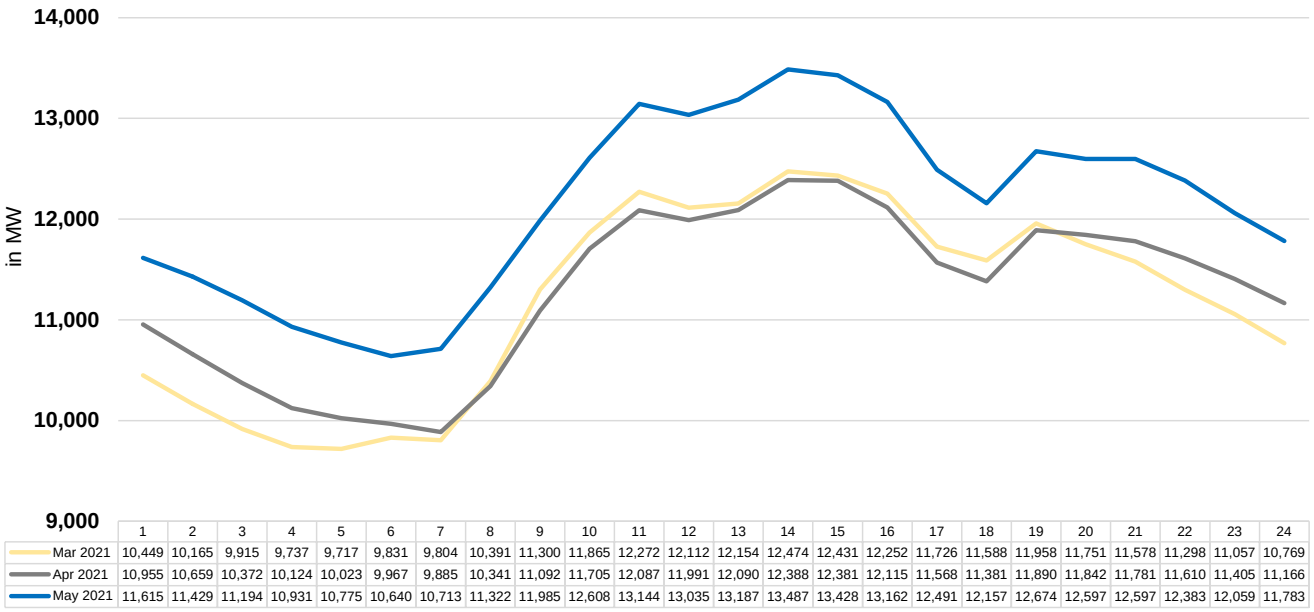
[15] Demand is equal to the total scheduled MW of all load resources in Luzon and Visayas plus losses including reserve schedule
[16] https://cnnphilippines.com/news/2021/3/27/ECQ-2021-NCR-Plus-bubble.html
[17] https://news.abs-cbn.com/news/04/28/21/may-2021-quarantine-ncr-plus-mecq
[18] https://www.rappler.com/nation/ncr-plus-quarantine-classification-starting-may-15-2021



	Mar 2020	Apr 2020	May 2020	Mar 2021	Apr 2021	May 2021
Demand plus Reserve Schedule	10,800	9,259	10,299	11,191	11,284	12,141
High	36	36	36	34	34	37
Average	29	29	30	28	29	30
Low	15	22	24	22	22	23

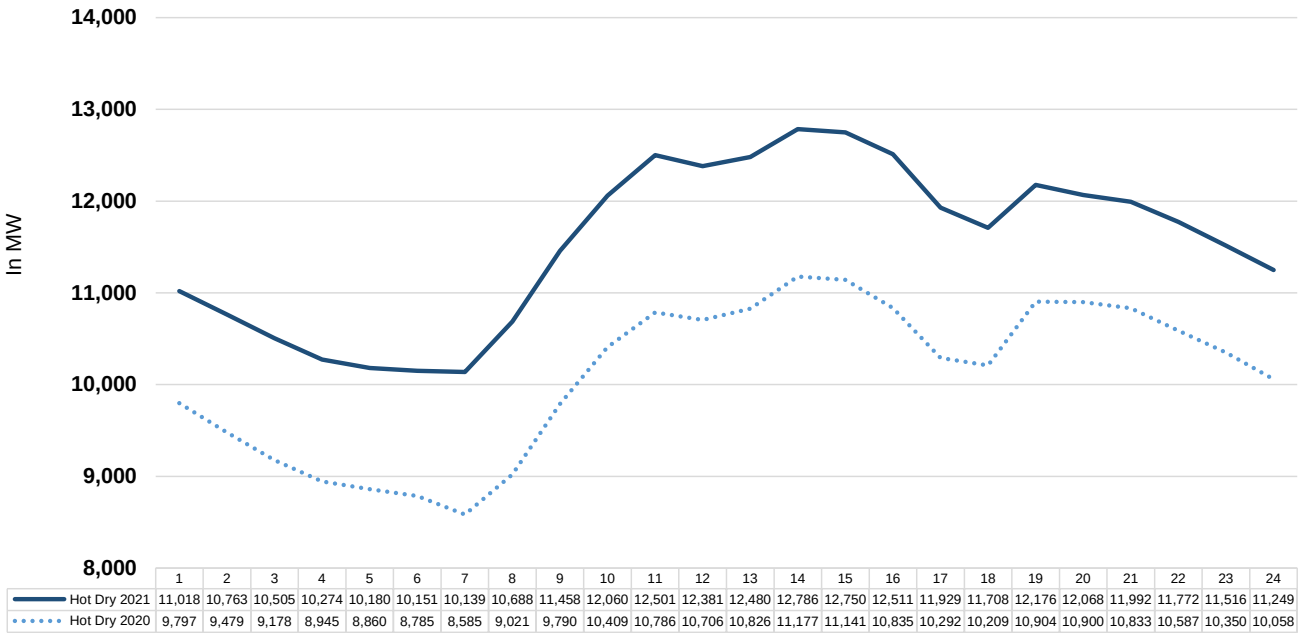
Figure 13. Demand and Temperature

- The 24-hour profile of demand showed that consumption generally climbed up starting at 0700H, peaked at 1100H and 1400H, dropping at 1800H, and peaked again at 1900H before sloping down until the end of the day (Figure 14).
- The April billing month also extended its afternoon peak to 1500H from 1400H. April and May billing months observed late evening peaks at 2100H.
- The demand during the May billing month was notably higher than the April and May billing months following the stricter restrictions at the start of the season and the higher temperature towards the end of the season.
- Year-on-year comparison of the demand profile showed mirroring trend shifted upwards for the 2021 figures (Figure 15).
    - o Average demand during Peak Hours : Hot Dry Season 2020 at 10,874 MW; Hot Dry Season 2021 at 12,485 MW
    - o Average demand during Off-Peak Hours: Hot Dry Season 2020 at 9,471 MW; Hot Dry Season 2021 at 10,793 MW



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mar 2021	10,449	10,165	9,915	9,737	9,717	9,831	9,804	10,391	11,300	11,865	12,272	12,112	12,154	12,474	12,431	12,252	11,726	11,588	11,958	11,751	11,578	11,298	11,057	10,769
Apr 2021	10,955	10,659	10,372	10,124	10,023	9,967	9,885	10,341	11,092	11,705	12,087	11,991	12,090	12,388	12,381	12,115	11,568	11,381	11,890	11,842	11,781	11,610	11,405	11,166
May 2021	11,615	11,429	11,194	10,931	10,775	10,640	10,713	11,322	11,985	12,608	13,144	13,035	13,187	13,487	13,428	13,162	12,491	12,157	12,674	12,597	12,597	12,383	12,059	11,783

Figure 14. Monthly Demand Hourly Profile, Hot Dry Season 2021



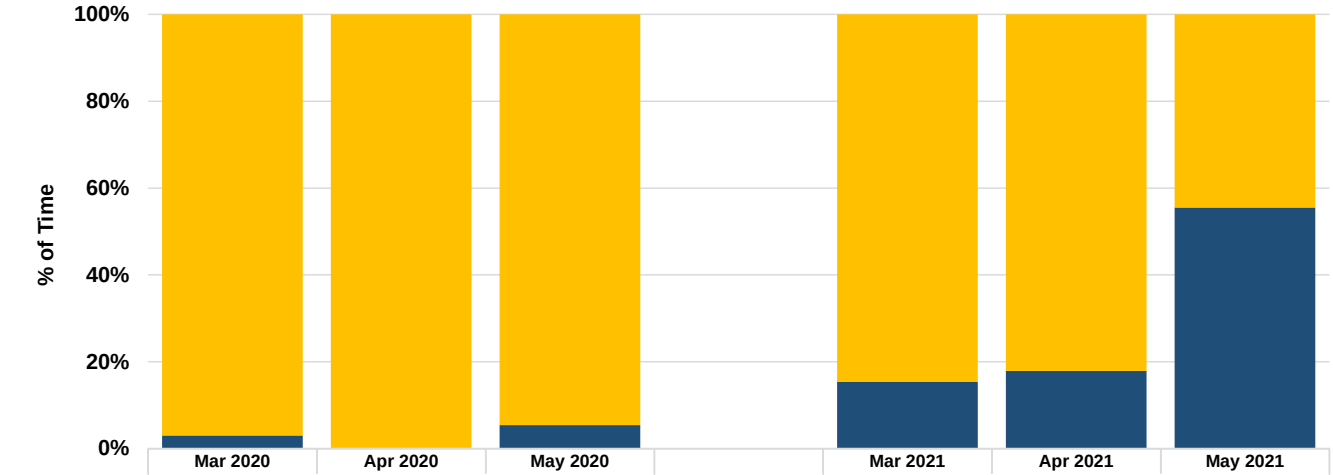
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Hot Dry 2021	11,018	10,763	10,505	10,274	10,180	10,151	10,139	10,688	11,458	12,060	12,501	12,381	12,480	12,786	12,750	12,511	11,929	11,708	12,176	12,068	11,992	11,772	11,516	11,249
Hot Dry 2020	9,797	9,479	9,178	8,945	8,860	8,785	8,585	9,021	9,790	10,409	10,786	10,706	10,826	11,177	11,141	10,835	10,292	10,209	10,904	10,900	10,833	10,587	10,350	10,058

Figure 15. Demand Hourly Profile, Hot Dry Season 2021 and Hot Dry Season 2020

Part IV. Competitiveness Analysis

1. Pivotal Supplier Index[19] and Residual Supply Index[20]

- The determination of pivotal suppliers is a function of the capacity of the plant and the supply margin available in the given hour.
- Pivotal suppliers are monitored to indicate the level of market power a plant possesses to set prices in the market.
- Consistent with the tighter supply margin in this year's hot dry season, pivotal suppliers were more prevalent this period for 30 percent of the time compared to mere 3 percent in the previous year (Figure 16).
    - Particularly, the May 2021 billing month particularly recorded frequent presence of pivotal suppliers, at 56 percent of the time.
- Of the pivotal suppliers, 17 plants were able to concurrently set prices at PhP10,000/MWh and above this season at the same time led by oil-based plants Limay CCGT, Bauang DPP, and Navotas DPP.



	Mar 2020	Apr 2020 Hot Dry 2020	May 2020		Mar 2021	Apr 2021 Hot Dry 2021	May 2021
MI	0%	0%	0%		0%	0%	0%
RSI above 100	97%	100%	95%		85%	82%	44%
RSI 100 and below	3%	0%	5%		15%	18%	56%

Figure 16. Residual Supply Index

2. Market Share and HHI Calculation

- Based on registered capacity, four firms namely San Miguel Corporation (SMC), Aboitiz Power (AP), First Gen Corporation (FGC), and Power Sector Asset and Liabilities Management (PSALM) dominated the market share based on registered capacity (Figure 17).

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

[20] The Residual Supply Index (RSI) measures the ratio of the available generation without a generator to the total generation required (including operational reserve) to supply the demand. RSI also determines whether there are pivotal suppliers in an interval. An RSI below 100 indicates the presence of pivotal plants.

- PSALM, whose share in terms of registered capacity is at 10 percent, obtained 22 percent of market share based on spot quantity and 29 percent based on total trading amount denoting its heavy exposure to the market at 69 percent during the hot dry season of 2021.
- Semirara Mining Power Corporation (SMPC) followed with only about 5 percent of the market share in registered capacity. SMPC's shares in terms of spot quantity at 3 percent and in terms of total trading amount at 2 percent were notably lower than previous year's shares at 24 percent and 19 percent, respectively. It was noted that SMPC had relatively lower spot exposure in the market at 9 percent from a high of 62 percent in the previous year.
- Meanwhile, top shareholder in terms of registered capacity, SMC likewise has a high level of share in terms of spot quantity. Notwithstanding, its share in terms of Total Trading Amount (TTA) shrank to 8 percent denoting that majority of quantities were recorded during trading intervals with low prices.
- In the previous year, it was noted that SMC recorded negative shares in terms of spot quantity and in TTA indicating its purchase from the market to cover its bilateral contracts attributable to lack of output from its portfolio.

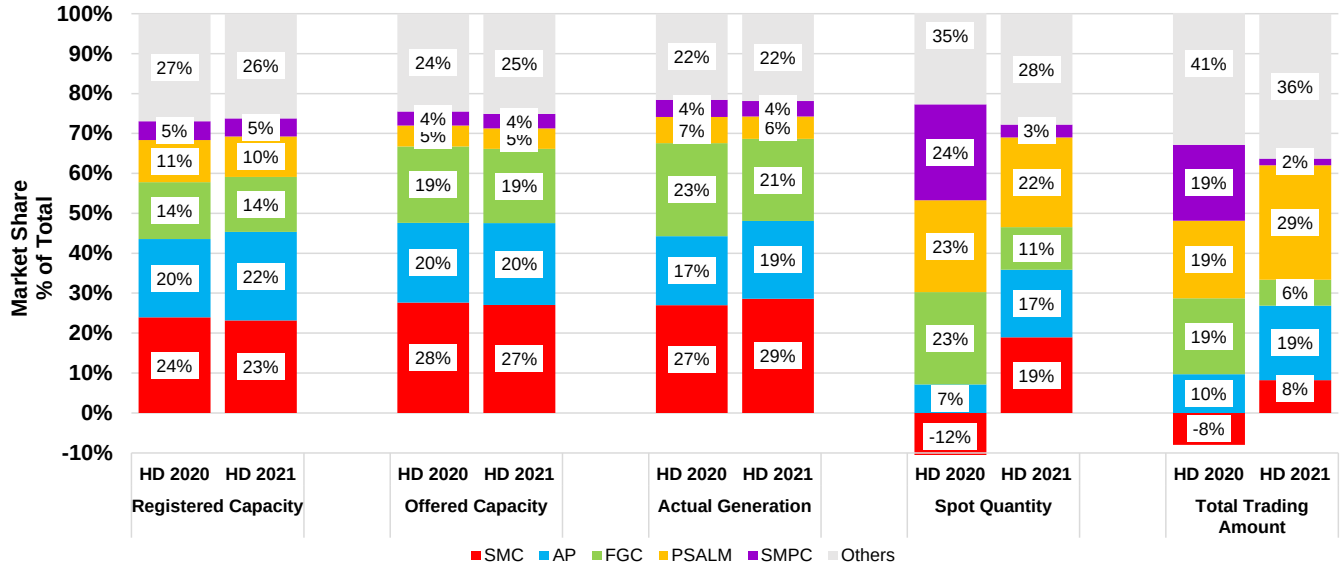


Figure 17. Market Share

3. Herfindahl-Hirschman Index (HHI)[21]

- Corresponding to the market shares recorded, the Herfindahl-Hirschman Index (HHI) calculation indicated a moderately concentrated market when measured in terms of registered capacity, offered capacity, and actual generation, spot quantities and total trading amount (Figure 18).
    - A more concentrated market in terms of spot quantities and total trading amount was observed in the previous year attributable to the higher concentration of shares involving few entities.

[21] 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-used 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.

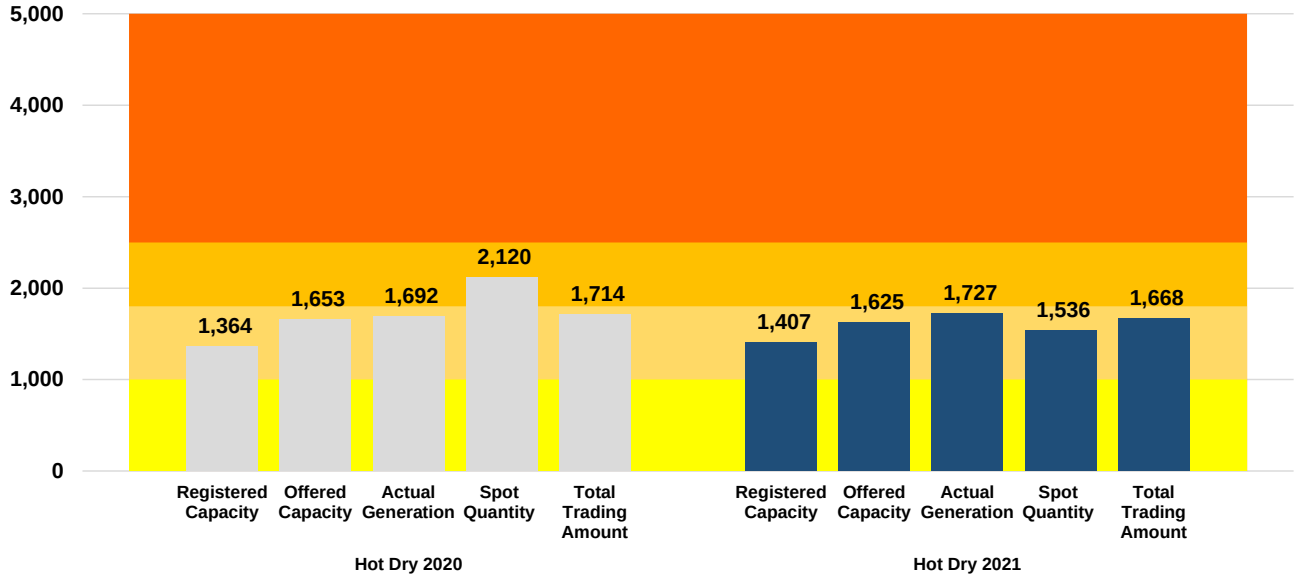


Figure 18. Herfindahl-Hirschman Index (HHI)

Part V. Generator Trading Behavior

- Difference Calculation[22] represents the measure of magnitude of increase or decrease in price offer of a generator, a major participant group (by portfolio), or by plant type.
- In this report, the *Average Reference Price*, which is the weighted average price for all trading intervals during the hot dry season 2020 prices, and the *Average Subject Price*, which is the weighted average price for all trading intervals during the hot dry season 2021prices, were calculated per plant type.
- The supply curve per plant type is established by stacking all the offers of plants, excluding the minimum stable loading (Pmin) and nominated loading level and projected output of preferential and non-scheduled generators, broken down to 1-MW block sizes, under the plant type arranged in monotonically increasing price, per trading interval. The average supply curve per plant type (Figures 20 to 24) is then calculated based on the average of the 24 hourly supply curves of each plant type during the period.
- *Average Price Difference* is calculated as the average of all the price differences between the Average Subject Price and Average Reference Price per 1-MW block of the supply curves per plant type.
- It is important to note that the total offered capacity for each period may not be equal considering the entry of new plants, capacity on outage, capacity not offered in the market, and changes in registered capacity. In line with this, the *Average Difference* is not calculated if either the *Average Reference Price* or *Average Subject Price* is not available.

[22] The methodology for the Offer Pattern Analysis, which is comprised of two parts: Difference Calculation and Outlier Detection , was adopted by the Market Surveillance Committee in order to quantify the amount and evaluate the change in offers and if the same is within or outside the reference levels based on historical data of each generator.

i. Difference Calculation by Plant Type

- Geothermal plants' offers were generally similar to previous year's pattern for the first 600 MW of its capacity (Figure 19), except on the 60MW to 100MW segment of the supply curves.
- Average price for geothermal plants during Hot Dry Season 2021 is slightly higher by PhP261/MWh than in the previous year.
- Capacity offered this year was slightly lower than previous year's record.

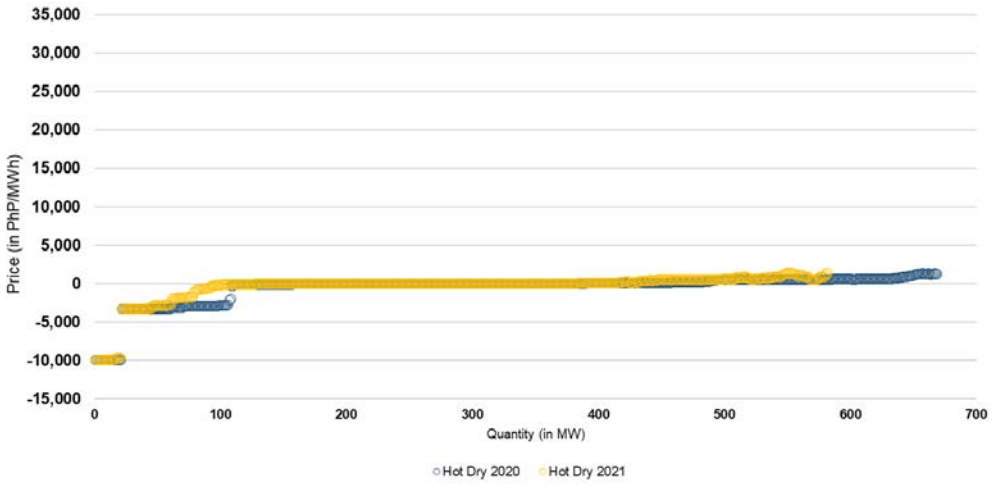


Figure 19. Average Supply Curve – Geothermal

- Coal plants' offers this year for the first 1,500MW of its supply curve was notably lower compared to the previous year (Figure 20). Similarly, offers above the 3,000th MW mark up to 4,000th MW mark showed a slight decrease.
- Minimal change was noted in the average prices for offers at the 1,500th up to 3,000th MW mark.
- Average price for coal plants was lower by PHP2,698/MWh this year compared to previous year's figures.
- Slight decrease in capacity offered by coal plants was noted.

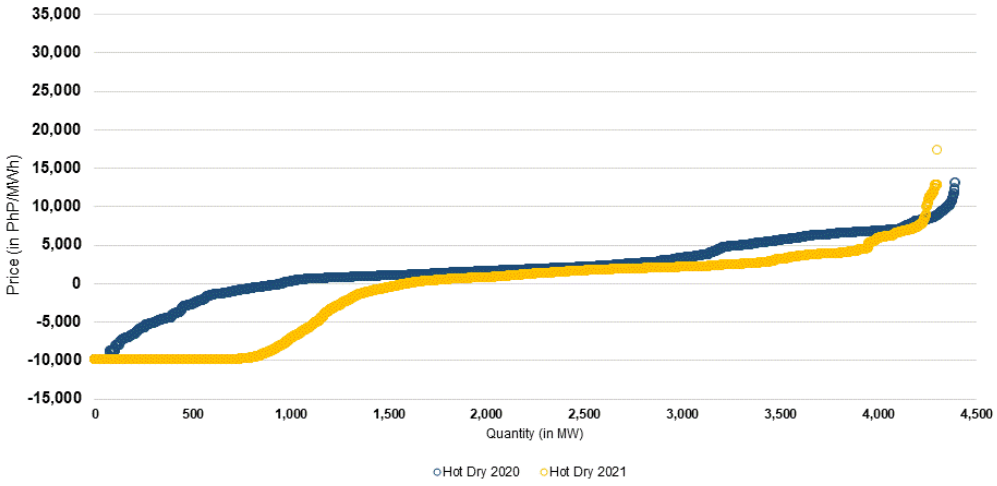


Figure 20. Average Supply Curve – Coal

- Similar offer pattern was noted from natural gas plants compared to its previous year's record except for the slight deviation in the 120th MW to 250th MW part of the supply curve. (Figure 21).
- Average price from natural gas plants this year was slightly higher by PHP402/MWH from 2020 figures.
- Minimally lower capacity was offered by natural gas plants in the Hot Dry Season 2021.

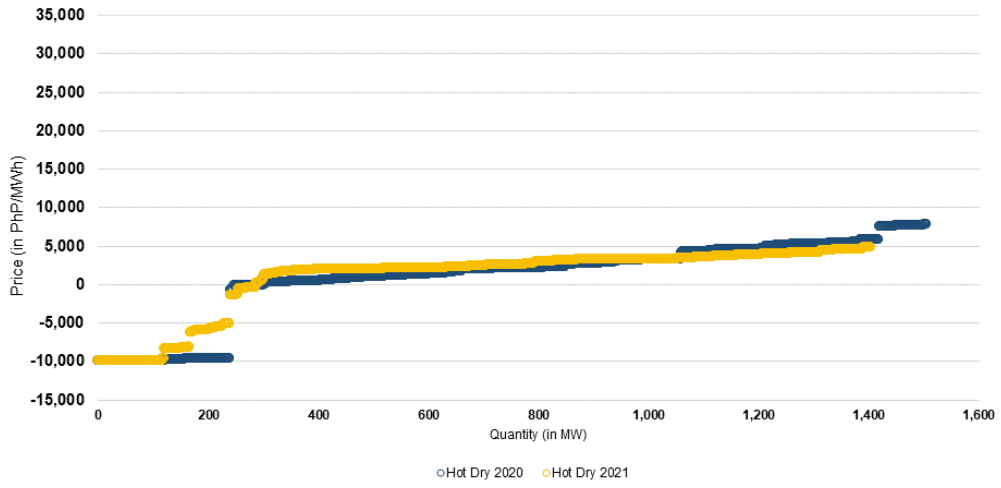


Figure 21. Average Supply Curve – Natural Gas

- Hydro plants demonstrated considerably lower offer prices this year except for first 200 MW of its average supply curve (Figure 22).
- Hydro plants' average price this season recorded a PHP3,753/MWh decrease compared to previous year's average.

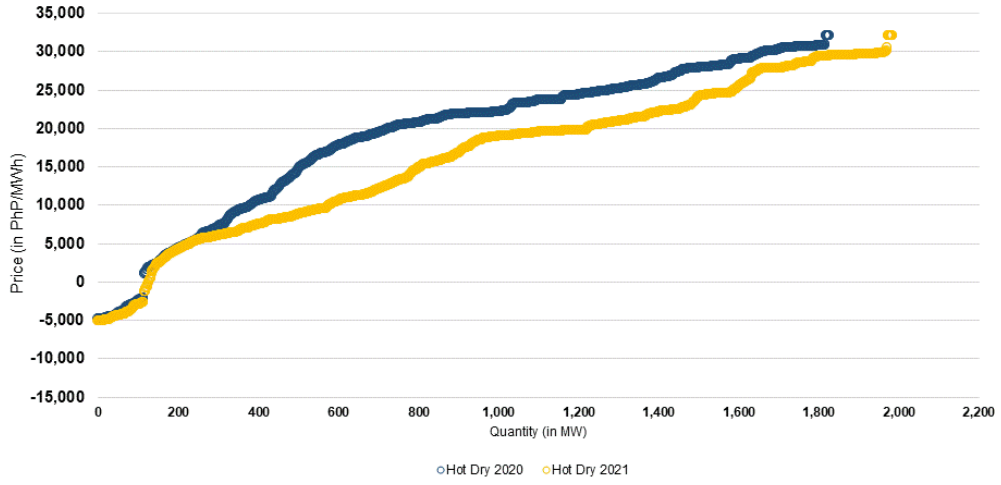


Figure 22. Average Supply Curve – Hydro

- Year-on-year offer pattern from oil-based plants was generally similar (Figure 23).
- Average price from oil-based plants this season posted minimal increase by PHP225/MWh than previous year's average.

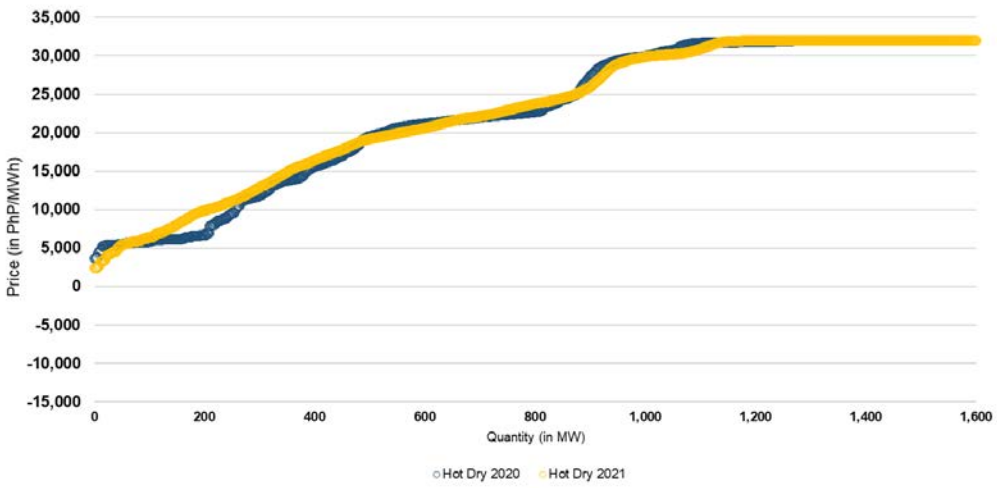


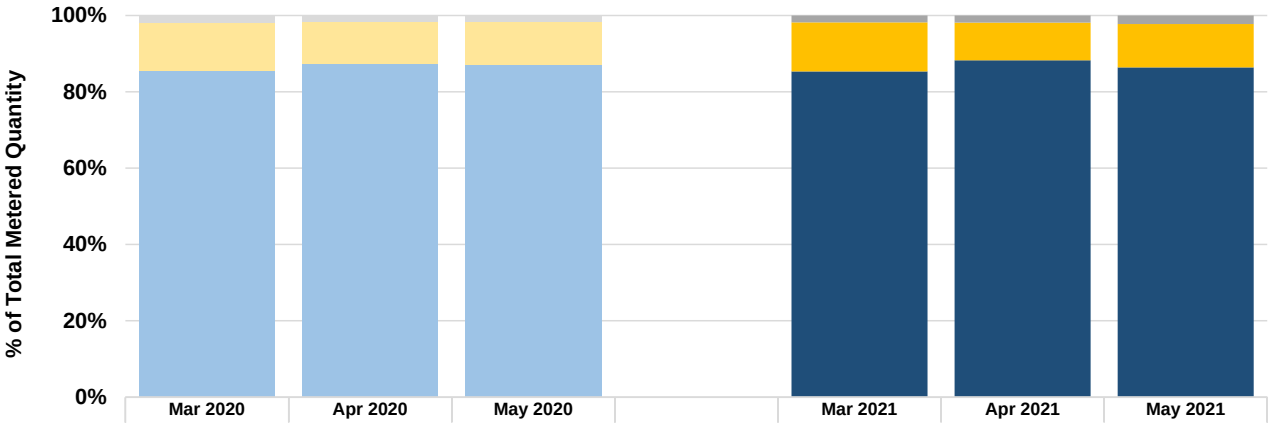
Figure 23. Average Supply Curve – Oil-based

ii. Bid Splitting

- Bid splitting is defined as an offer strategy when a generating unit offers majority or almost its entire capacity at lower prices while simultaneously bidding a small portion of its capacity close or equal to the market offer price cap.
- Eight (8) plants demonstrated bid splitting in their offer strategy during the season in a total of 577 occurrences. In the previous year, when supply margin was wider, only 4 plants had the similar strategy in 982 occurrences.

Part VI. Spot Market Transactions

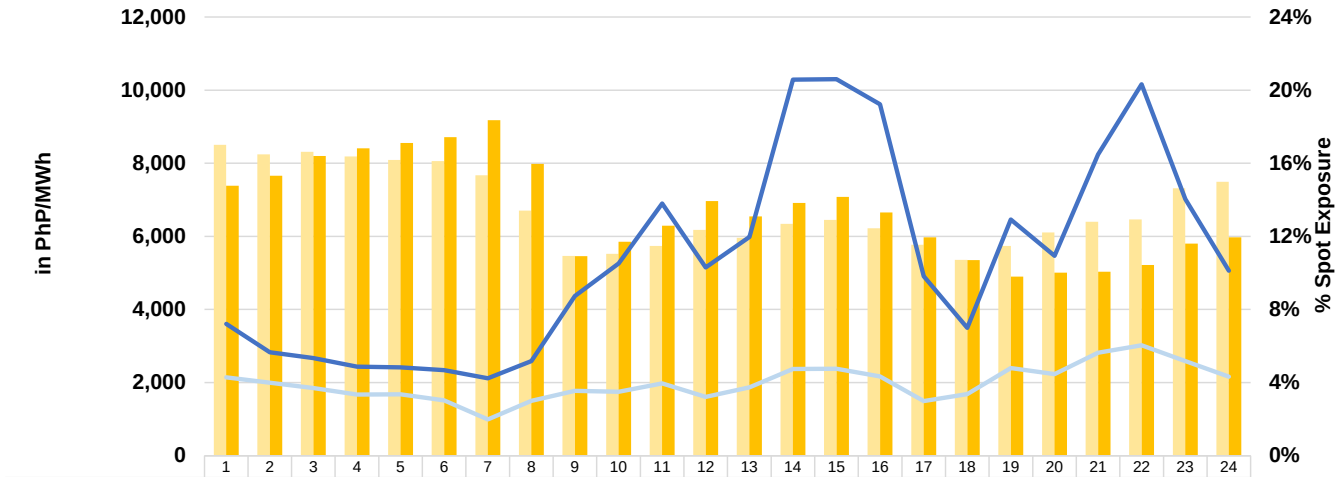
- The total quantity covered by bilateral contracts showed a year-on-year increase similar to the increase in the total metered quantity (Figure 24).
- Correspondingly, spot exposure for the season was recorded at 11.3 percent, close to previous year's 11.6 percent.



	Mar 2020	Apr 2020	May 2020		Mar 2021	Apr 2021	May 2021
		Hot Dry 2020				Hot Dry 2021	
Loss	2%	2%	2%		2%	2%	2%
Spot Market Qty	13%	11%	11%		13%	10%	11%
Bilateral Qty	85%	87%	87%		85%	88%	86%

Figure 24. Spot Market Exposure

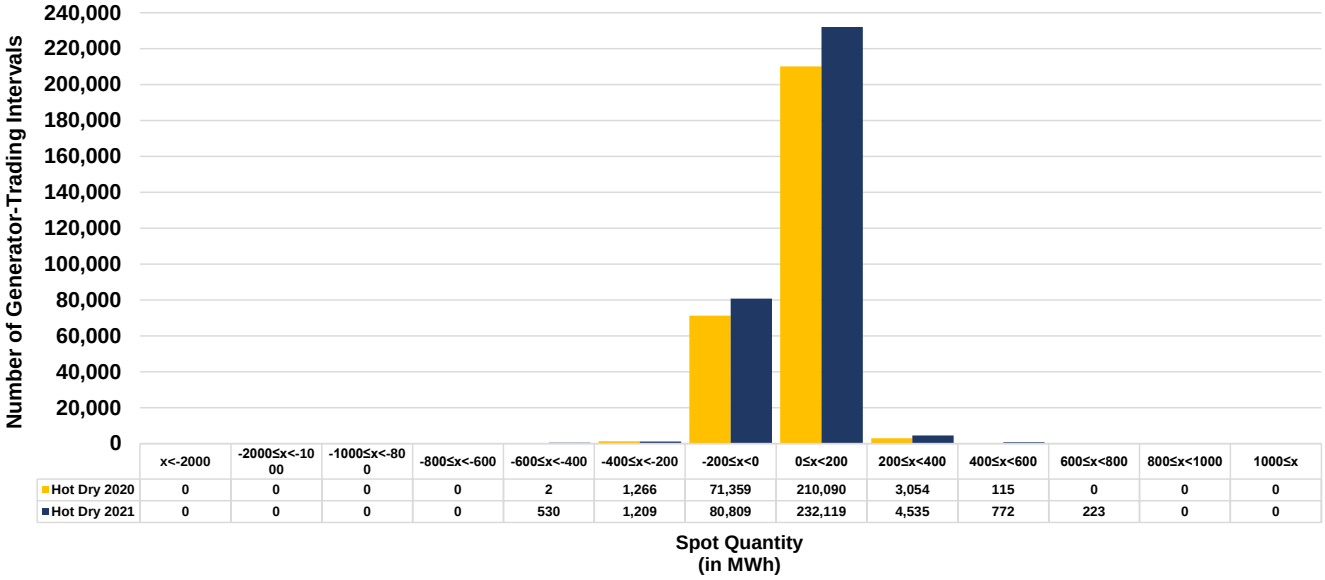
- An increase in spot exposure was noted for the 0400H to 1700H except 0900H while the remaining trading intervals, which are mostly off-peak hours, recorded lower spot exposure (Figure 25).
- The spot exposure and market prices showed a weak correlation given the varying trend in spot exposure despite the consistent hourly increase in market prices.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
HD 2020 - Spot Expo	0.17	0.16	0.17	0.16	0.16	0.16	0.15	0.13	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.12	0.12	0.11	0.11	0.12	0.13	0.13	0.15	0.15
HD 2021 - Spot Expo	0.15	0.15	0.16	0.17	0.17	0.17	0.18	0.16	0.11	0.12	0.13	0.14	0.13	0.14	0.14	0.13	0.12	0.11	0.10	0.10	0.10	0.10	0.12	0.12
HD 2020 - LWAP	2,146	1,996	1,851	1,672	1,677	1,513	990	1,501	1,773	1,746	1,978	1,609	1,872	2,374	2,379	2,170	1,496	1,686	2,395	2,231	2,816	3,022	2,588	2,161
HD 2021 - LWAP	3,602	2,828	2,670	2,439	2,414	2,342	2,119	2,591	4,366	5,260	6,901	5,149	5,984	10,29	10,30	9,614	4,912	3,499	6,462	5,470	8,242	10,16	7,017	5,060

Figure 25. Hourly Profile of Spot Market Exposure and Market Price

- Around 98 percent of the spot quantities (per generator per trading interval) were below 200 MWh (Figure 26).



	x<-2000	-2000≤x<-1000	-1000≤x<-800	-800≤x<-600	-600≤x<-400	-400≤x<-200	-200≤x<0	0≤x<200	200≤x<400	400≤x<600	600≤x<800	800≤x<1000	1000≤x
Hot Dry 2020	0	0	0	0	2	1,266	71,359	210,090	3,054	115	0	0	0
Hot Dry 2021	0	0	0	0	530	1,209	80,809	232,119	4,535	772	223	0	0

Figure 26. Spot Quantity Frequency Distribution

Part VII. Compliance Monitoring

- Provided in Figure 27 is the breakdown of the registered capacity based on the Compliance Monitoring and Assessment of PEMC's Enforcement and Compliance Office. Appendix C provides more details of the breakdown of the registered capacity.
- About 65 percent of the total registered capacity in the WESM was offered in the market and/or was found compliant to the Must Offer Rule.
    - High level of compliance was observed involving Luzon's battery facility, wind, and natural gas plants as well as Visayas' wind, hydro, and coal plants.
- Outage-related concerns accounted for 11.8 percent of the registered capacity.
- Resource constraints, which mostly involved geothermal, natural gas, solar, and hydro plants, accounted for 8.9 percent.
- Registered capacity of plants which underwent Testing and Commissioning accounted for 6.2 percent.
- Only 0.4 percent of the registered capacity were non-compliant and were not justified. These instances will be issued with Request for Investigation (RFI).

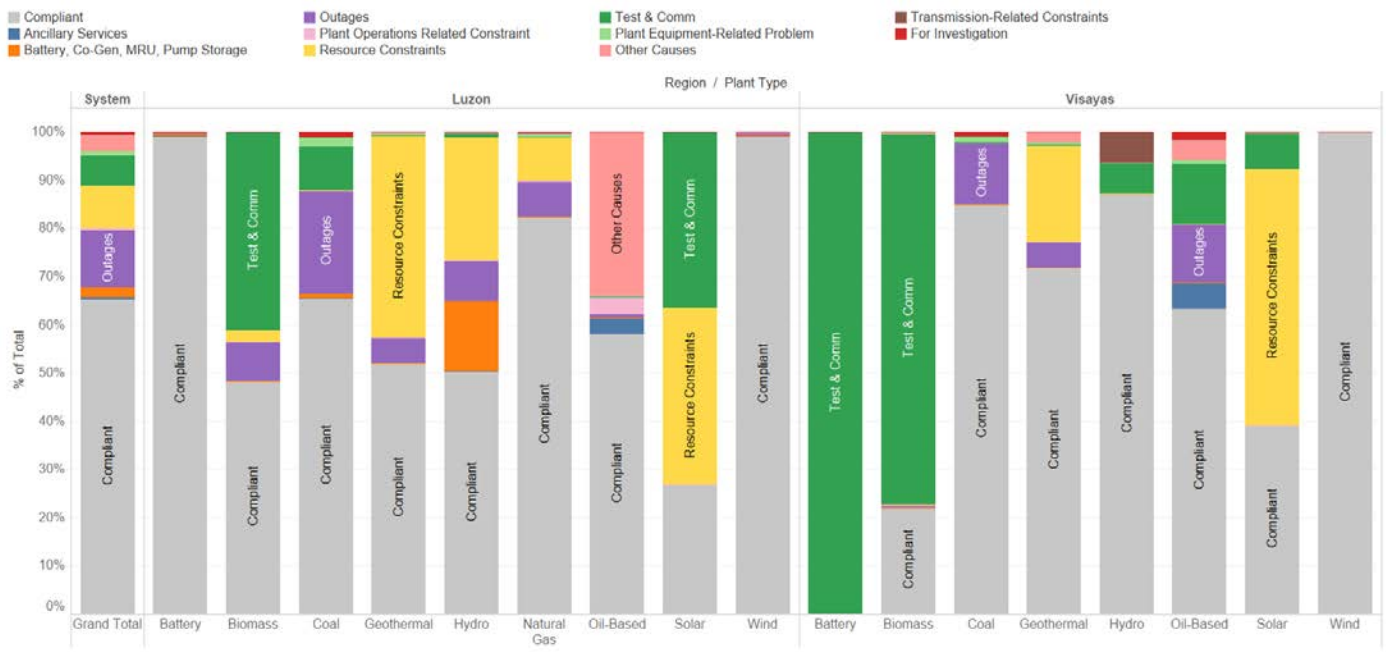


Figure 27. Compliance Monitoring per Resource Type

Appendix A. Quarantine Declaration

Period Covered	Quarantine Declaration			
	ECQ	**MECQ**	**GCQ**	**MGCQ**
1 to 28 February 2021		Ubay, Bohol (Brgy. Bood, Fatima, Poblacion, and Tapon) [23]	National Capital Region (NCR), Davao City, Batangas, CAR, Tacloban City, Davao del Norte, Lanao del Sur, Iligan City[24]	Rest of the country
1 to 31 March 2021	*GCQ with additional restrictions* Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" (29 to 31 March 2021) [25]		Metro Manila, Apayao, Baguio, Batangas, Davao City, Iligan, Kalinga, Lanao del Sur, Mountain Province, and Tacloban[26] *GCQ with additional restrictions* Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" (22 to 28 March 2021)[27]	Rest of the country
1 to 30 April 2021	Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" (1 to 11 April 2021) [28]	Quirino and the city of Santiago[29] Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" (12 to 30 April 2021) [30] Abra (12 to 30 April 2021) [31]	Cordillera Administrative Region, Cagayan, the rest of Isabela, Nueva Vizcaya, Batangas, Lanao del Sur and the cities of Tacloban, Iligan, Davao City[32]	Rest of the country
1 to 14 May 2021		Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" [33] Quirino, city of Santiago, and Abra[34] Ifugao Province[35]	Apayao, Batangas, Benguet, Cagayan, Ifugao, Isabela, Kalinga, Lanao del Sur, Mountain Province, Nueva Vizcaya, and Quezon, and the cities of Baguio, Davao City, Iligan, and Tacloban[36] Palawan[37]	Rest of the country
15 to 31 May 2021		Santiago City, Quirino, Ifugao, Zamboanga[38]	Metro Manila, Bulacan, Cavite, Laguna, Rizal or "NCR Plus" (GCQ with additional restrictions) [39] Apayao, Benguet, Kalinga, Mountain Province, Abra, Baguio, Cagayan, Isabela, Nueva Vizcaya, Batangas province, Quezon, Puerto Princesa, Iligan City, Davao City, Lanao del Sur[40]	Rest of the country

[23] https://pcoo.gov.ph/news_releases/metro-manila-davao-city-to-remain-gcq-starting-february-1/
[24] https://www.gmanetwork.com/news/video/newstvlive/553711/mga-barangay-ng-poblacion-fatima-bood-at-tapon-sa-ubay-bohol-nasa-mecq-simula-ngayong-araw/video/
[25] https://cnnphilippines.com/news/2021/3/27/ECQ-2021-NCR-Plus-bubble.html
[26] https://news.abs-cbn.com/news/02/27/21/metro-manila-9-other-areas-to-remain-under-gcq-in-march-palace
[27] https://interaksyon.philstar.com/trends-spotlights/2021/03/22/188079/greater-manila-vs-ncr-plus-questions-as-govt-labels-areas-under-gcq-bubble/
[28] https://www.channelnewsasia.com/news/asia/philippines-covid-19-curbs-lockdown-manila-extended-14549662
[29] https://news.abs-cbn.com/news/03/29/21/duterte-places-majority-of-ph-under-mgcq-as-new-covid-19-cases-break-record
[30] https://www.philstar.com/headlines/2021/04/11/2090206/ncr-plus-under-modified-ecq-until-april-30
[31] https://ptvnews.ph/ncr-quarantine-nw-dwn-to-mecq1/
[32] https://news.abs-cbn.com/news/03/29/21/duterte-places-majority-of-ph-under-mgcq-as-new-covid-19-cases-break-record
[33] https://news.abs-cbn.com/news/04/28/21/may-2021-quarantine-ncr-plus-mecq
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[35] https://www.philstar.com/nation/2021/05/01/2094965/ifugao-placed-under-mecq-gcq-puerto-princesa
[36] https://news.abs-cbn.com/news/04/28/21/may-2021-quarantine-ncr-plus-mecq
[37] https://www.philstar.com/nation/2021/05/01/2094965/ifugao-placed-under-mecq-gcq-puerto-princesa
[38] https://www.rappler.com/nation/ncr-plus-quarantine-classification-starting-may-15-2021
[39] https://www.rappler.com/nation/ncr-plus-quarantine-classification-starting-may-15-2021
[40] https://www.rappler.com/nation/ncr-plus-quarantine-classification-starting-may-15-2021

Appendix B. Major Plant Outages

Region	Plant Type	Plant/ Unit Name	Major Participant Group	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks	Date Commissioned/ Commercial Operation
LUZON	GEO	Makban 6	AP	55	04/11/2013 22:44			Deactivated Shutdown	Conducted gas compressor test	Apr 1979
LUZON	OIL	Malaya 1	FGC	300	05/03/2019 18:21			Forced Outage	Declared unavailable due to motorization of unit generator caused by the non-opening of phase B of PCB 8-05CB08MAL	Aug 1975
VISAYAS	GEO	Upper Mahiao 3	FGC	32	07/22/2020 17:01			Maintenance Outage	Trip with Loss of Excitation. Economic Shutdown	Jul 1997
LUZON	COAL	Sual 2	GBPC	647	09/16/2020 14:45	05/12/2021 4:58	237.59	Forced Outage	Tripped due to high turbine vibration	Oct 1999
LUZON	HYD	Kalayaan 4	AP	180	11/27/2020 22:01	03/23/2021 14:09	115.67	Forced Outage	Excessive Oil Leak at Pothead conductors.	May 2004
LUZON	COAL	Calaca 2	AP	300	12/03/2020 9:01			Forced Outage	Generator stator earth fault	Sep 1984
LUZON	OIL	Limay 8	Other IPPs	90	01/04/2021 0:01	02/27/2021 14:43	54.61	Planned Outage	Maintenance Outage until 03 February 2021	Dec 1994
LUZON	COAL	GN Power 1	SMC	316	01/08/2021 18:26			Forced Outage	Boiler tube leak.	May 2013
LUZON	NATG	Sta. Rita 3	AP	265.5	01/19/2021 4:39	03/06/2021 19:46	46.63	Maintenance Outage	Maintenance Outage	Oct 2001
VISAYAS	OIL	TPVI 2	AP	6.7	01/26/2021 14:50	02/26/2021 10:35	30.82	Forced Outage	EMERGENCY CUT-OUT DUE TO INJECTION PUMP PROBLEM	Aug 1977
VISAYAS	COAL	TPC Sangi 2	AC	85	01/29/2021 21:08	03/19/2021 19:31	48.93	Forced Outage	EMERGENCY CUT-OUT DUE TO OIL LEAK at BEARING 4	Dec 2013
VISAYAS	OIL	TPC Carmen 4	AC	10	02/12/2021 9:47	05/06/2021 23:31	83.57	Forced Outage	TRIPPED DUE TO LOW ENGINE LO PRESSURE	Mar 1979
LUZON	BIOF	IBEC	SMPC	18.3	02/14/2021 0:01	03/02/2021 0:11	16.01	Planned Outage	Annual MO	Jul 2015
LUZON	HYD	San Roque 2	Other IPPs	145	02/15/2021 0:01	02/27/2021 0:01	12.00	Planned Outage	Maintenance Outage until 26 February 2021	May 2003
LUZON	GEO	Makban 1	AC	63.2	02/17/2021 23:11	02/26/2021 12:21	8.55	Forced Outage	Steam supply diverted to Unit 2.	Apr 1979
VISAYAS	GEO	Malitbog 3	Other IPPs	72	02/20/2021 0:22	02/26/2021 10:46	6.43	Maintenance Outage	EDC-Leyte A MBPP Unit 3 plant shutdown for PMS	Jul 1997
VISAYAS	GEO	Malitbog 1	FGC	72	02/20/2021 0:25	02/26/2021 2:34	6.09	Maintenance Outage	EDC-Leyte A MBPP Unit 1 plant shutdown for PMS	Jul 1997
VISAYAS	COAL	CEDC 3	FGC	82	02/21/2021 0:29	04/09/2021 11:33	47.46	Forced Outage	TO CONDUCT REPAIR OF COAL FEEDER	Jan 2011
LUZON	NATG	Ilijan B1	GAI	190	02/21/2021 0:32	03/09/2021 1:55	16.06	Planned Outage	Maintenance Outage until 09 March 2021	Jun 2002
LUZON	NATG	Ilijan B3	Other IPPs	220	02/24/2021 0:34	03/09/2021 6:43	13.26	Planned Outage	Planned Outage (GOP)	Jun 2002
LUZON	NATG	Ilijan B2	AC	190	02/24/2021 0:47	03/11/2021 14:56	15.59	Planned Outage	Planned Outage(GOP).	Jun 2002
VISAYAS	COAL	CEDC 1	#N/A	82	02/24/2021 0:52			Planned Outage	UNIT SHUTDOWN TO FACILITATE ANUAL PMS UNTIL 17 MARCH 2021	Apr 2010
VISAYAS	COAL	THVI 1	FGC	169	02/24/2021 23:32	03/19/2021 14:39	22.63	Planned Outage	UNIT TRIPPED DURING RAMPING DOWN TO ZERO LOAD (RTD is 0) WITH INDICATION. TURBINE HP EXHAUST TEMPERATURE HIGH HIGH. SCHEDULE FOR PMS PER GOP FROM 25 FEBRUARY 2021 (0001H) TO 21 MARCH 2021 (2400H)	Dec 2017
LUZON	GEO	Makban 2	Other IPPs	63.2	02/26/2021 14:50	03/18/2021 20:12	20.22	Forced Outage	Steam supply diverted to Unit 1	Apr 1979
LUZON	COAL	SLTEC 2	AP	122.9	02/28/2021 16:52	03/08/2021 19:31	8.11	Forced Outage	Emergency shutdown due to boiler tube leak.	Aug 2015
LUZON	COAL	SBPL	URC	455	02/28/2021 23:46	03/15/2021 2:31	14.11	Planned Outage	Maintenance Outage.	Apr 2019
VISAYAS	SOLR	San Carlos Sun	Other IPPs	46.8	03/03/2021 18:07	03/13/2021 9:19	9.63	Maintenance Outage	Offline due to maintenance activity	Mar 2016
LUZON	HYD	Bakun 1	MEI	37	03/06/2021 6:08			Maintenance Outage	Total Plant shutdown due to facilitate APM and other protection related activities.(RECLASSIFIED FROM FORCE. OMC OUTAGE)	Feb 2001
LUZON	HYD	San Roque 3	Other IPPs	145	03/08/2021 0:01	03/20/2021 0:01	12.00	Planned Outage	Maintenance Outage until March 19 2021	May 2003
LUZON	NATG	San Lorenzo 1	AP	264.8	03/10/2021 0:53	03/20/2021 5:27	10.19	Maintenance Outage	Maintenance Outage until 16 March 2021.	Sep 2002
VISAYAS	GEO	Nasulo	Other IPPs	48.3	03/13/2021 15:53	05/03/2021 19:09	51.14	Forced Outage	Auto-tripped. affected by tripping of Main Transformer due to Tap Changer trouble	Apr 2014
VISAYAS	GEO	Upper Mahiao 1	AP	32	03/14/2021 20:51	03/25/2021 14:02	10.72	Forced Outage	Due to Generator bearing high temperature	Jul 1997
LUZON	NATG	Sta. Rita 1	AP	257.3	03/17/2021 21:36	03/24/2021 22:08	7.02	Forced Outage	Emergency shutdown due to gas turbine cooling air leak	Jun 2000
LUZON	GEO	Makban 1	AP	63.2	03/18/2021 21:14			Forced Outage	Steam supply diverted to Unit 2	Apr 1979
LUZON	COAL	GN Power 2	AP	316	03/20/2021 0:58	05/05/2021 13:32	46.52	Planned Outage	Maintenance Outage	May 2013
LUZON	HYD	Magat 3	FGC	97	03/20/2021 7:01	05/22/2021 19:40	63.53	Planned Outage	Maintenance Outage	Oct 1983
LUZON	HYD	Ambuklao 1	URC	35	03/20/2021 7:57	04/04/2021 15:27	15.31	Planned Outage	Maintenance outage.	Dec 1956
VISAYAS	GEO	Mahanagdong B1	FGC	5	03/25/2021 0:27	04/01/2021 16:11	7.66	Forced Outage	Emergency cut out from the system	Jul 1997
VISAYAS	GEO	Upper Mahiao 1	AC	32	03/26/2021 0:05	04/10/2021 14:50	15.61	Forced Outage	Under investigation.	Jul 1997
LUZON	NATG	Sta. Rita 4	AP	264	03/26/2021 0:46	04/08/2021 21:21	13.86	Maintenance Outage	Unplanned maintenance outage to facilitate rectification of HRSG expansion bellow	Oct 2001
LUZON	COAL	Calaca 1	AP	300	03/27/2021 0:40	04/05/2021 22:47	9.92	Maintenance Outage	Maintenance Outage until 06 April 2021. For inspection and repair in coal and oil burner assemblies	Sep 1984
LUZON	BIOF	BT2020	PSALM	13	03/30/2021 2:04	04/11/2021 3:43	12.07	Forced Outage	Correction of boiler tube leak	May 2015
VISAYAS	OIL	TPVI 4	Other IPPs	6.8	03/30/2021 21:54	04/05/2021 21:30	5.98	Forced Outage	GENERATOR BREAKER CONTROL FAILURE	Aug 1977
LUZON	HYD	Ambuklao 2	FGC	35	04/05/2021 8:12	04/21/2021 19:49	16.48	Planned Outage	Scheduled outage (GOP) until 18 April 2021.	Dec 1956
LUZON	COAL	GNP Dinginin 1	Other IPPs	668	04/05/2021 14:55	05/05/2021 9:46	29.79	Forced Outage	Tripped out at 600MW. Commissioning Test Freqency-58.78hz	Oct 2020
LUZON	HYD	Magat 4	AP	97	04/13/2021 0:02	05/07/2021 15:30	24.64	Planned Outage	Maintenance outage under GOP.	Oct 1983
VISAYAS	COAL	Kepco Salcon 2	PWEI	103	04/14/2021 21:29	05/14/2021 23:20	30.08	Forced Outage	SUSPECTED BOILER TUBE LEAK	Mar 2011
VISAYAS	COAL	CEDC 2	#N/A	82	04/15/2021 0:29	05/05/2021 16:04	20.65	Forced Outage	PMS	Jun 2010
LUZON	GEO	Tiwi 1	Other IPPs	60	04/15/2021 9:32	05/01/2021 8:12	15.94	Maintenance Outage	Supply steam to unit 2.(RECLASSIFIED FROM FORCE. OMC OUTAGE)	Jan 1979
LUZON	HYD	Ambuklao 3	URC	35	04/17/2021 8:07	05/04/2021 17:03	17.37	Planned Outage	APM	Dec 1956
LUZON	COAL	SLPGC 2	FGC	150	04/21/2021 1:09	05/15/2021 21:51	24.86	Forced Outage	Boiler tube leak.	Jan 2015
VISAYAS	GEO	PGPP1 Unit 1	Other IPPs	37.5	04/23/2021 0:05	05/18/2021 17:26	25.72	Maintenance Outage	Offline due to PMS.	Aug 1983
LUZON	BIOF	IPower 1	AP	10.8	04/25/2021 13:01			Maintenance Outage	Testing of turbine	Sep 2014
VISAYAS	COAL	THVI 1	PSALM	169	04/26/2021 15:18	05/02/2021 6:58	5.65	Forced Outage	TURBINE TRIPPED INDICATION	Dec 2017
LUZON	HYD	Masiway	PSALM	12	04/26/2021 17:01			Maintenance Outage	APM	Jan 1981
LUZON	COAL	SLTEC 2	AP	122.9	04/30/2021 5:01			Forced Outage	Tripped while on the process of de-loading due to steam leak at Heat Recovery Area front wall	Aug 2015
VISAYAS	BIOF	SCBE	SCSEI	7.4	05/01/2021 1:37	05/06/2021 12:30	5.45	Maintenance Outage	Offline due to maintenance activity	Feb 2009
LUZON	HYD	Maris 2	PSALM	4.3	05/01/2021 7:01	05/10/2021 16:19	9.39	Planned Outage	Maintenance outage as per GOMP	Oct 2017
LUZON	HYD	Magat 2	SCSEI	97	05/01/2021 7:04	05/14/2021 19:10	13.50	Planned Outage	Maintenance outage as per GOMP	Aug 1983
LUZON	HYD	Magat 1	AP	97	05/01/2021 7:06	05/14/2021 18:20	13.47	Maintenance Outage	APM	Aug 1983
LUZON	HYD	Maris 1	PSALM	4.3	05/01/2021 7:08	05/10/2021 19:13	9.50	Planned Outage	Maintenance outage as per GOMP	Oct 2017
LUZON	COAL	SLPGC 1	URC	150	05/02/2021 13:07	05/23/2021 12:28	20.97	Forced Outage	Emergency shutdown due to boiler tube leak	Jan 2015
VISAYAS	COAL	Kepco Salcon 1	SMC	103	05/08/2021 2:34			Planned Outage	APMS	Nov 2010
LUZON	GEO	Makban 10	AP	20	05/15/2021 7:13	05/23/2021 9:18	8.09	Forced Outage	Unplanned outage to facilitate replacement of ruptured disc.	Apr 1979
LUZON	COAL	Sual 2	AP	647	05/16/2021 0:28			Maintenance Outage	To correct the problem at pressure control valve of gland steam	Oct 1999
LUZON	HYD	Angat M 1	SPC	50	05/17/2021 8:01			Planned Outage	APMT of Transformer A	Oct 1967
LUZON	HYD	Angat M 2	MEI	50	05/17/2021 8:01			Planned Outage	APMT of Transformer A	Oct 1967
VISAYAS	OIL	TPVI 3	SCSEI	6.8	05/20/2021 13:49			Forced Outage	EMERGENCY CUT-OUT DUE TO CUT-OFF STUD BOLT	Aug 1977
VISAYAS	COAL	TPC Sangi 2	SSPI	85	05/23/2021 0:17			Forced Outage	TG5 OFFLINE DUE HIGH VIBRATION BEARING 5	Dec 2013
LUZON	HYD	Caliraya 1	Other IPPs	14	05/24/2021 8:01			Planned Outage	Semi-Annual Maintenance shutdown	Oct 2002
LUZON	HYD	Caliraya 2	SPC	14	05/24/2021 8:01			Planned Outage	Semi-Annual Maintenance.	Oct 2002
VISAYAS	BIOF	FFHC	SMPC	9	05/24/2021 8:12			Maintenance Outage	Offline to conduct weekly maintenance.	Feb 2009
VISAYAS	OIL	TPVI 5	AP	6.8	05/24/2021 15:33			Forced Outage	CUT-OUT DUE TO BROKEN STUD BOLT	Aug 1977
LUZON	OIL	Limay 7	SMC	60	05/25/2021 16:23			Forced Outage	Declared unavailable due to fuel valve malfuction	Dec 1994

Appendix C. Details of ECO Compliance Monitoring

Region	Plant Type	Compliant	Ancillary Service	Co-Generation, Pumped Storage, Battery	Derating - Plant Equipment Related Problem/Maintenance and Ambient Conditions	MRU, Station Use, and Other Causes	Outages	Resource Constraints	Security Limits, Market System , Transmission Related Constraints,	Start-up/Shutdown Process and Other Plant Operations Related Constraints	Testing and Commissioning	**Inadequate Explanation/ For Investigation**	Grand Total
Luzon	Battery	99%	0.0%	0.5%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	**0.0%**	100%
Luzon	Biomass	48%	0.0%	0.0%	0.0%	0.0%	8.2%	2.3%	0.0%	0.0%	41.1%	**0.02%**	100%
Luzon	Coal	66%	0.0%	0.9%	1.9%	0.0%	21.4%	0.0%	0.1%	0.1%	9.1%	**0.9%**	100%
Luzon	Geothermal	52%	0.0%	0.0%	0.4%	0.2%	5.3%	42.0%	0.0%	0.0%	0.0%	**0.0%**	100%
Luzon	Hydro	50%	0.1%	14.5%	0.0%	0.0%	8.6%	25.4%	0.1%	0.0%	1.0%	**0.0%**	100%
Luzon	Natural Gas	82%	0.0%	0.0%	0.7%	0.1%	7.2%	8.8%	0.3%	0.4%	0.1%	**0.0%**	100%
Luzon	Oil-Based	58%	3.4%	0.0%	0.1%	33.9%	0.8%	0.0%	0.0%	3.7%	0.0%	**0.0%**	100%
Luzon	Solar	27%	0.0%	0.0%	0.0%	0.0%	0.0%	36.7%	0.0%	0.0%	36.5%	**0.0%**	100%
Luzon	Wind	99%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.1%	0.0%	0.0%	**0.0%**	100%
Visayas	Battery	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	**0.0%**	100%
Visayas	Biomass	22%	0.0%	0.0%	0.0%	0.2%	0.6%	0.2%	0.0%	0.0%	77.1%	**0.0%**	100%
Visayas	Coal	85%	0.0%	0.0%	1.3%	0.0%	12.8%	0.0%	0.1%	0.1%	0.0%	**0.8%**	100%
Visayas	Geothermal	72%	0.0%	0.0%	0.4%	2.2%	5.2%	20.3%	0.0%	0.0%	0.0%	**0.0%**	100%
Visayas	Hydro	87%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	6.3%	0.0%	6.3%	**0.0%**	100%
Visayas	Oil-Based	63%	5.5%	0.0%	1.0%	4.3%	12.1%	0.0%	0.0%	0.0%	12.4%	**1.4%**	100%
Visayas	Solar	39%	0.0%	0.0%	0.0%	0.0%	0.0%	53.2%	0.2%	0.0%	7.5%	**0.0%**	100%
Visayas	Wind	100%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	100%
Grand Total		65%	0.5%	2.1%	1.0%	3.4%	11.8%	8.9%	0.1%	0.5%	6.2%	**0.4%**	100.0%