Market Assessment Report
Cool Dry Season 2021

26 November 2020 to 25 February 2021

April 2021

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

Contents

Market Assessment Report for Cool Dry Season 2021

This report assesses the results of the integrated Luzon and Visayas operations of the Wholesale Electricity Spot Market (WESM) for the Cool Dry Season 2021 (26 November 2020 to 25 February 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 in turn provide the means to assess competition and conditions in the WESM, as well as the bidding behavior of trading participants.

Part I. Highlights

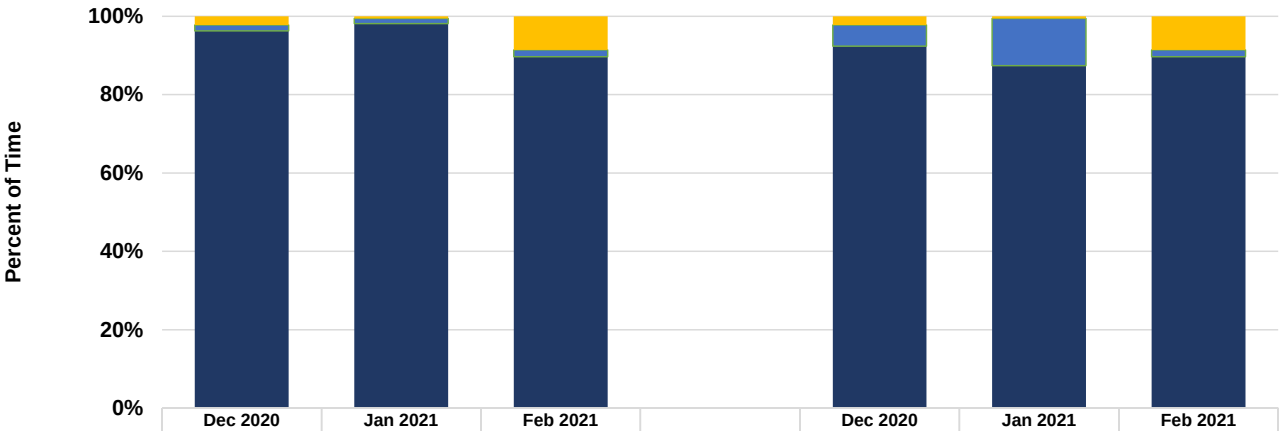
- The Cool Dry Season is usually marked by low level of demand related to the observance of the holidays and cooler temperatures compared to the rest of the billing months in the year.
- However, unusually low level of demand began last March 2020 following the implementation of quarantine measures in a bid to combat the spread of coronavirus disease. Appendix A shows the summary of the quarantine declarations during the Cool Dry Season 2021.
    - From 1 June to 28 February, except from 2 to 18 August[1], the declaration in NCR was downgraded to General Community Quarantine (GCQ) to reactivate the economy and kickstart business activity in the midst of the pandemic.
- As quarantine restrictions were relaxed starting around June 2020, economic activity gradually improved. The Cool Dry Season of 2021 eventually drew closer, although still at lower level, to the height of demand comparable to the previous year's record.
- Meanwhile, supply margin tightened as the high level of outage capacity in January and February reduced the effective supply in the market
    - High level of outage was noted from December 2020 to February 2021, exceeding the monthly outages for the rest of 2020 which were all below the 3,200 MW mark.
- Despite the tighter supply margin in January and February 2021, prices were below the previous year's figures.
- About 95 percent of the prices were below PhP4,000/MWh during the entire season. This notwithstanding, market trigger[2] events were noted this season breaching the price spike threshold for 2 intervals.
- Neither price creep up event nor secondary price imposition was recorded this season.

Part II. Assessment of the Market

- Normal pricing condition prevailed throughout the Cool Dry Season of 2021 at about 92 percent of market price outcomes. (Figure 1).
    - Price Substitution Methodology (PSM) was applied to 4 percent of the price outcomes due to frequent congestion events on Samboan-Amlan line 1.
    - Prices issued with pricing error notices (PEN) affected 4 percent of the price outcomes mainly due to localized constraint violation on Palinpinon 1 transformers (in Visayas region) and to inappropriate input data affecting Luzon and Visayas prices and schedules.
    - No Market Intervention and Market Suspension were declared during the period.

[1] https://pcoo.gov.ph/news_releases/metro-manila-put-under-stricter-mecq-for-two-weeks/
[2] 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"*

- Secondary price cap[3] was not imposed during the period.



	Luzon				Visayas		
	Dec 2020	Jan 2021	Feb 2021		Dec 2020	Jan 2021	Feb 2021
Market Intervention (AP)	0%	0%	0%		0%	0%	0%
Congestion (PSM)	2%	1%	9%		2%	1%	9%
Pricing Error Notice	2%	1%	2%		5%	12%	2%
Normal	96%	98%	90%		92%	87%	90%

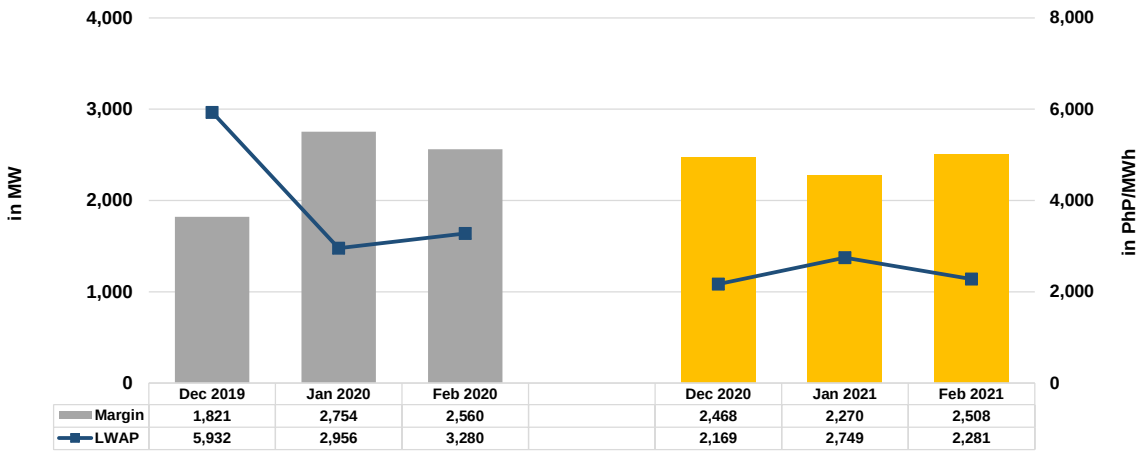
Figure 1. Summary of Pricing Conditions

Part III. Market Outcome

1. Supply Margin[4] and Price[5]

- Year-on-year, the supply margin was a bit higher than the previous year's record owing to the wider supply margin during the December billing month (Figure 2).
  - The January and February 2021 billing months posted lower supply cushion compared to the same months in 2020.
- Despite the lower supply margin in January and February 2021, average market price for the Cool Dry Season 2021 at PHP2,395/MWH was almost half of Cool Dry 2020's PHP4,051/MWh.
  - The December 2020 billing month's average price of PHP2,169/MWh was significantly lower than PHP5,932/MWh
  - Notwithstanding the supply margin decrease in the beginning of 2021, average market prices still went down to PHP2,749/MWH in January 2021 from PHP2,956/MWH in January 2020 and to PHP2,281/MWH in February 2021 from PhP3,280/MWh in February 2020.
- The February 2021 recorded the lowest monthly average market price compared to all the February billing months from 2014 to 2020. Similarly, December 2020 also showed record low average monthly market price for the similar month since 2017.

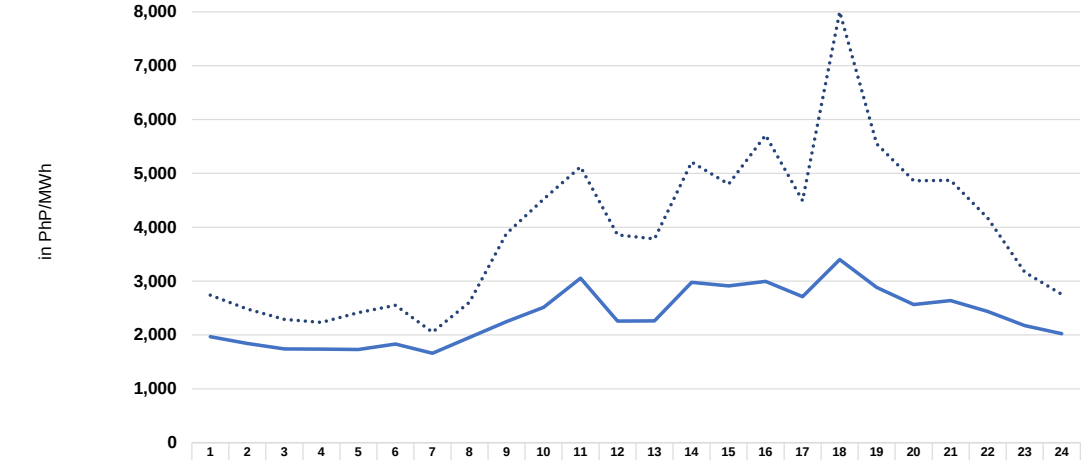
[3] Secondary price cap is imposed when the 120-hour rolling average price exceeds PhP9,000/MWh.
[4] The supply margin is equal to the effective supply less system demand requirement plus reserve schedule.
[5] The market prices were represented by the following: (i) ex-ante load weighted average price (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.



	Dec 2019	Jan 2020	Feb 2020	Dec 2020	Jan 2021	Feb 2021
Margin	1,821	2,754	2,560	2,468	2,270	2,508
LWAP	5,932	2,956	3,280	2,169	2,749	2,281

Figure 2. Average Supply Margin and Average Price

- Historically, notable disparity is observed for prices during peak hours[6] against during off-peak[7] hours (Figure 3). However, it may be seen that less steeper prices are noted in this year's peak prices and flatter 24-hour profile following the low level of demand as a result of the restrictions in industrial and commercial activities.
- The hourly profile showed that price peaks during 1100H and 1800H peaks were retained albeit at much lower levels.
- Moreover, prices plateaued from 1400H to 1600H contrary to the peaks at 1400H and 1600H in the previous year.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Cool Dry Season 2020	2,739	2,480	2,287	2,233	2,414	2,552	2,053	2,606	3,883	4,520	5,121	3,857	3,784	5,211	4,802	5,707	4,494	8,000	5,547	4,862	4,870	4,169	3,164	2,753
Cool Dry Season 2021	1,968	1,844	1,742	1,736	1,729	1,830	1,662	1,953	2,249	2,512	3,053	2,258	2,261	2,977	2,910	2,996	2,712	3,398	2,884	2,564	2,639	2,435	2,172	2,023

Figure 3. Average Price, Hourly Profile

- Figure 4 shows the reduction in average prices more notable in peak prices than in off-peak prices.
  - Average Prices during Peak Hours: Cool Dry Season 2019 at PhP5,228/MWh; Cool Dry Season 2020 at PhP2,921/MWh

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

- Average Prices during Off-peak Hours: Cool Dry Season 2019 at PhP2,990/MWh; Cool Dry Season 2020 at PhP1,914/MWh

- Peak prices in December 2019 were significantly higher than in December 2020.

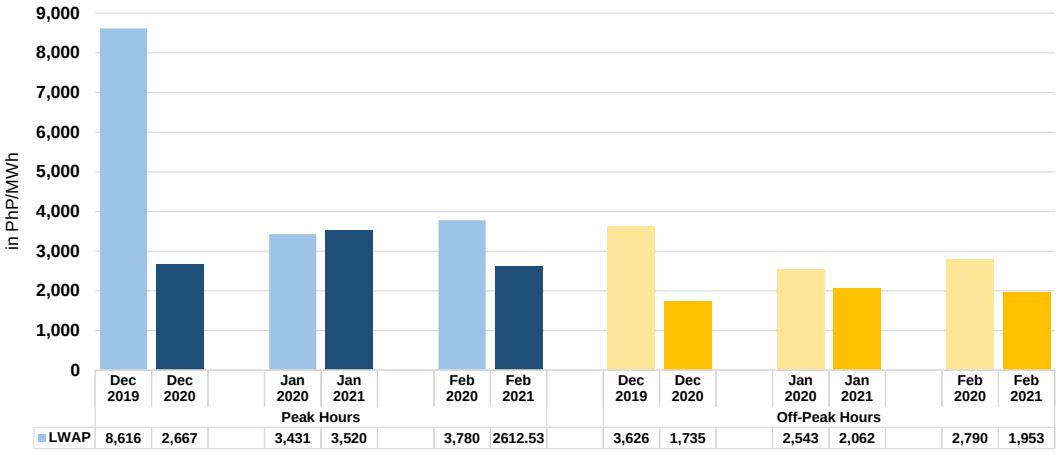


Figure 4. Average Price, by Hour Type

- About 95 percent of the prices ranged from PHP0/MWh up to below PHP5,000/MWh coming from 82 percent in the previous year (Figure 5).
  - In particular, majority of the prices or about 55 percent of this year's cool dry season were ranging from PhP2,000/MWh to PHP4,000/MWh.
- Prices cleared beyond the PhP10,000/MWh-mark, which occurred in 55 trading intervals, were mostly set by oil-based plant PPC DPP (16 intervals).

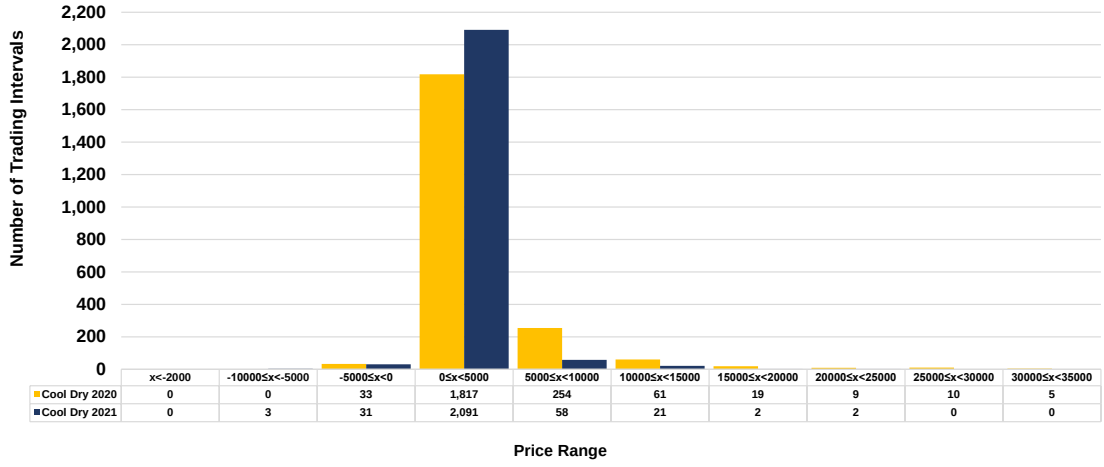


Figure 5. Price Frequency Distribution

- Based on the supply margin analysis[8], three (3) peak trading intervals (Figure 6) exceeded the upper price thresholds and one (1) off-peak trading interval (Figure 7) went below the lower price threshold corresponding to their supply margin.

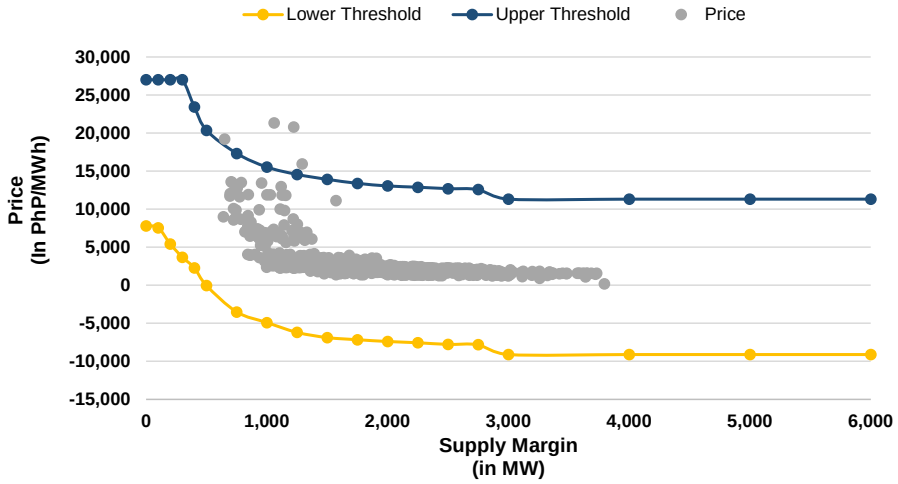


Figure 6. Supply Margin Analysis – Peak

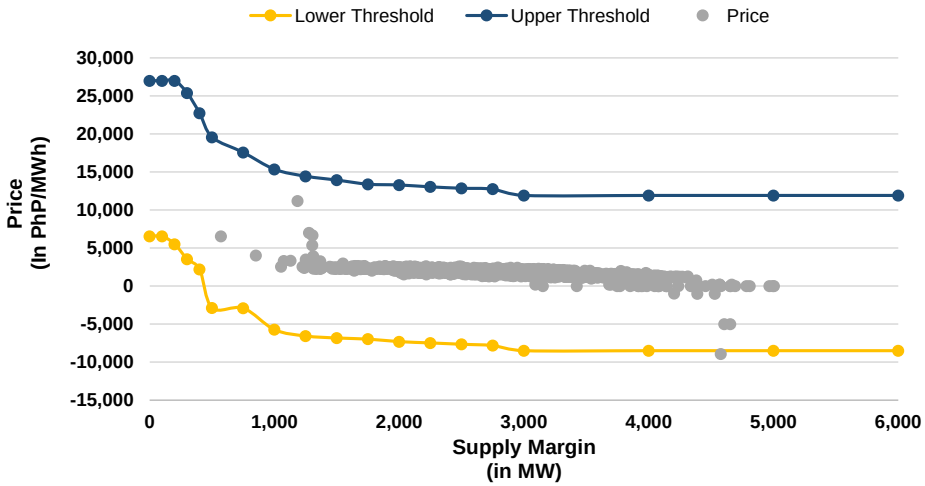


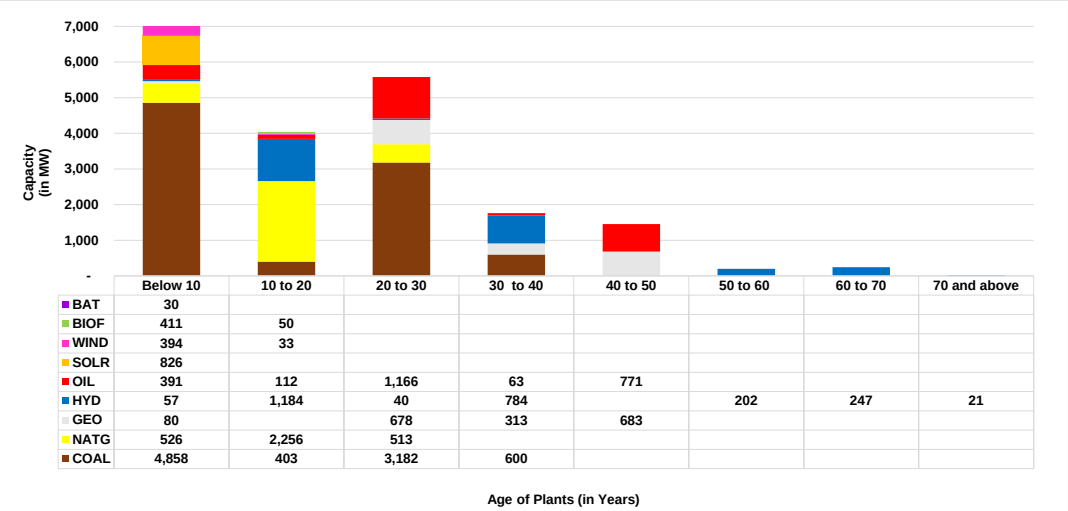
Figure 7. Supply Margin Analysis – Off-Peak

[8] 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"*

2. Supply

a. Capacity Profile

- Out of the 20,871 MW registered in the WESM, about 36 percent or 7,572 MW of the registered capacity (or "have been in operation less than 10 years?)which are less than 10 years in operations[9] (Figure 8). This involved a total of 143 plants with most being coal plants.
- Plants aging 10 to 20 years accounted for 19 percent or about 4,037 MW (involving 28 plants) while plants aging 20 to 30 years accounted for 27 percent or about 5,579 MW (involving 32 plants).
- Twelve plants, all of which are hydro plants, were more than 50 years in age contributing 470 MW in the registered capacity.



	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				

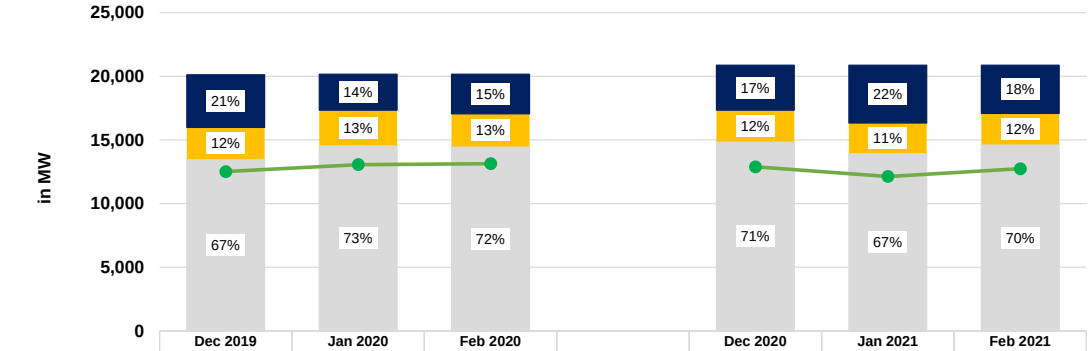
Figure 8. Age of Plants

- Available capacity in the market during the cool dry season accounted for 69 percent of the total registered capacity in WESM (Figure 9). This was lower compared to previous year's 71 percent following the higher level of capacity on outage this year at 19 percent from 17 percent in the last year.
  - Notably high level of outage was noted in all the months of the Cool Dry Season 2021 relative to the monthly outages for the rest of 2020 which were below 3,200 MW mark.
  - The January 2021 billing month observed remarkably high average outage capacity at 4,541 MW related to high level of forced outages involving coal plants.
- Capacity not offered in the market, on the other hand, decreased slightly to about 12 percent from previous year's 13 percent.
- Accounting for security limits and ramp limitations, effective supply[10] averaged at 12,583 or about 60 percent of the total WESM registered capacity.

[9] Based on registration date or commercial operations date

[10] 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).

- HVDC power flow was more frequently directed towards the Luzon region ranging at about 87 percent of the time throughout the season, with schedules ranging from 0.1 MW to 420 MW. Meanwhile, schedule of HVDC power flow from Luzon to Visayas ranged from 0.2 MW to 50 MW.



	Dec 2019	Jan 2020	Feb 2020	Dec 2020	Jan 2021	Feb 2021
	Cool Dry Season 2020			Cool Dry Season 2021		
Outage	4,132	2,817	3,114	3,524	4,541	3,786
Not Offered/ Not Nominated	2,494	2,758	2,569	2,474	2,368	2,435
Available	13,492	14,587	14,479	14,870	13,963	14,651
Effective Supply	12,512	13,066	13,138	12,891	12,127	12,740

Figure 9. 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 45 percent by the end of February 2021 billing month following the entry of 668-MW GNP Dinginin and 25-MW Bataan 2020 CFTPP (Figure 10).
- 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 at 51 percent while natural gas plants' contribution decreased to 29 percent from previous year's 31 percent which still indicates high utilization as a result of low-priced offers in the market.
- Higher contribution was noted from hydro plants from 7 percent in the previous year to 10 percent this year.
- Meanwhile, oil-based plants was seldomly dispatched this cool dry season of 2021.

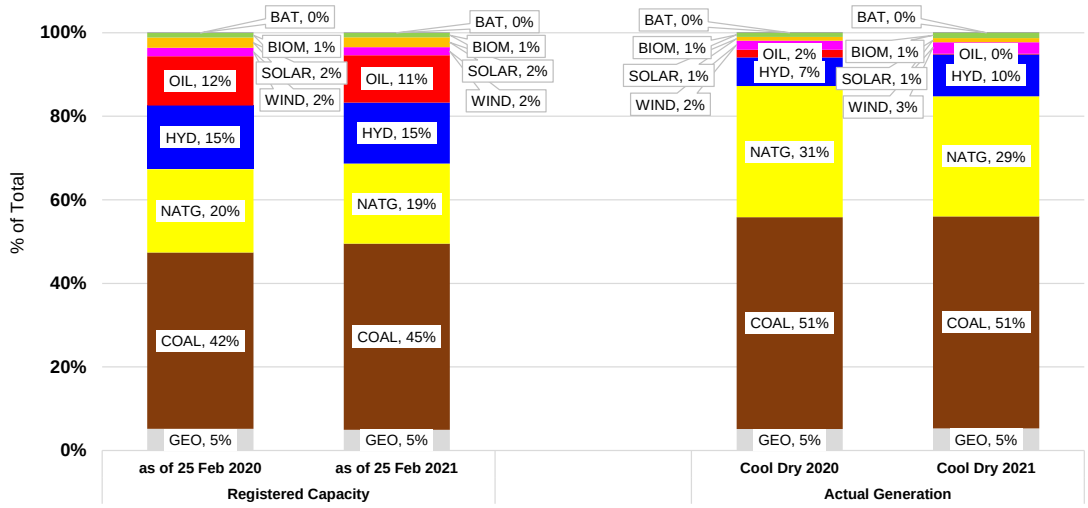


Figure 10. Capacity and Generation Mix – Luzon

- In Visayas, geothermal plants and coal plants accounted for 24 percent and 38 percent of registered capacity, respectively (Figure 11). These plants' shares then increased to 41 percent and 49 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 1 percent, 4 percent, and 2 percent, respectively.
- The entry of Kabankalan Battery in the market pioneered the presence of battery energy storage facility in the Visayas region.

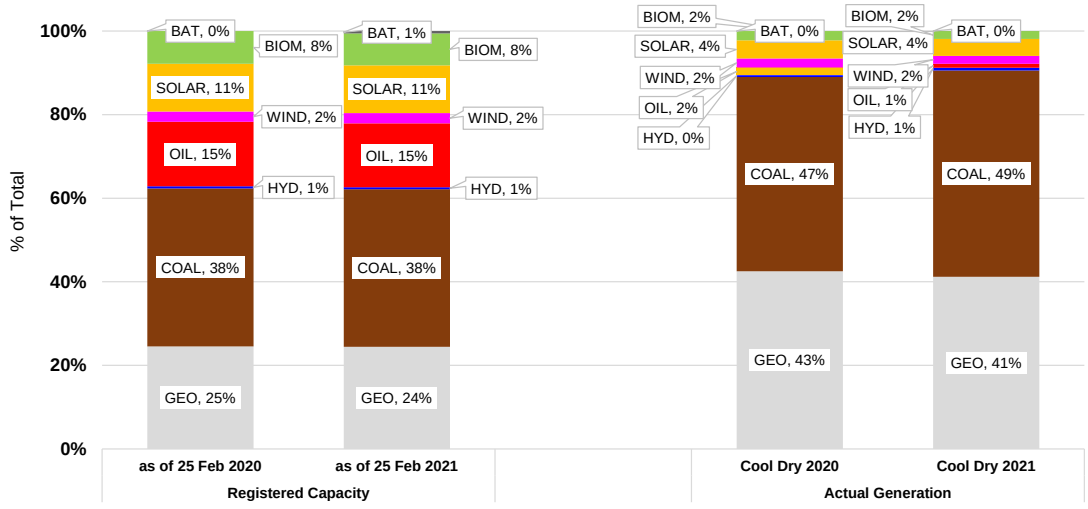
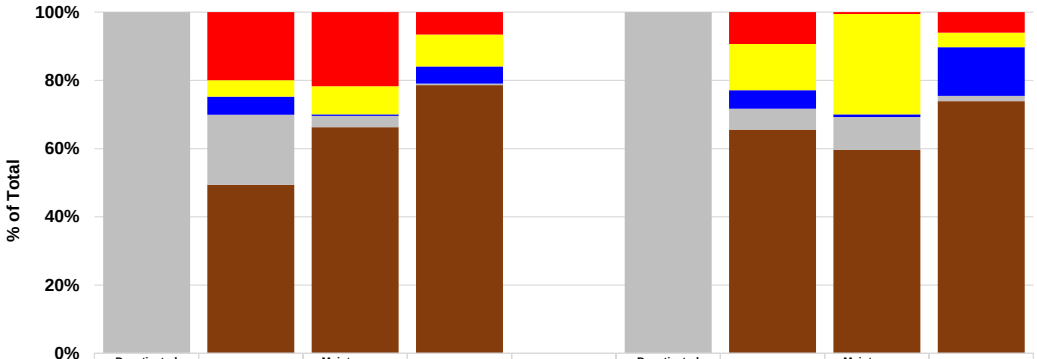


Figure 11. Capacity and Generation Mix – Visayas

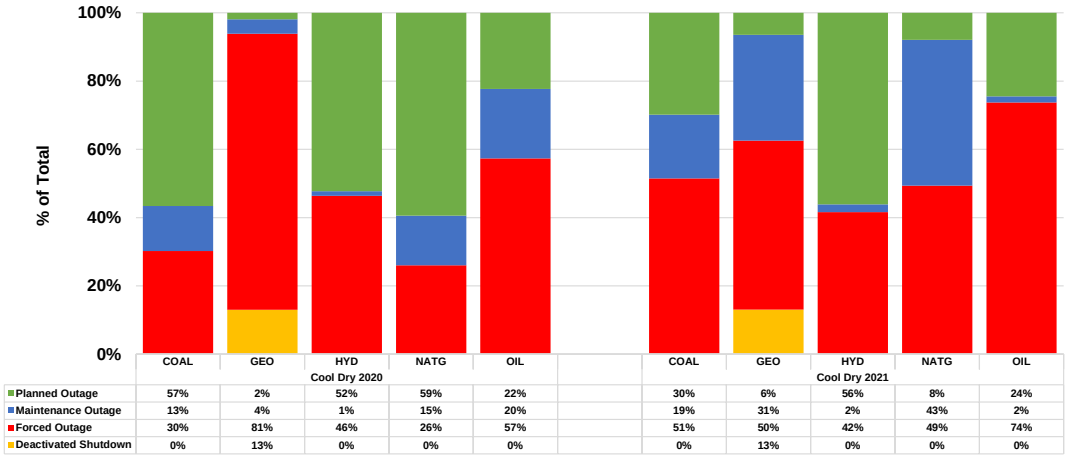
c. Outage Capacity

- Coal plants accounted for the majority of the outage capacity this season at 66 percent (Figure 12), averaging at 2,513 MW of the 3,954 MW total capacity on outage. This mainly involved the following major outages:
  - Sual CFTPP unit 2 (647 MW) - forced outage; beginning 16 September 2020
  - Masinloc CFTPP unit 3 (335 MW) - forced outage; 24 November 2020 to 16 February 2021
  - Sual CFTPP unit 1 (647 MW) - maintenance outage; 18 December 2020 to 28 January 2021
  - Calaca CFTPP unit 2 (300 MW) - forced outage; beginning 3 December 2020
  - Mariveles CFTPP unit 1 (316 MW) - forced outage; beginning 8 January 2021
  - Calaca CFTPP unit 1 (300 MW) - planned outage; 25 November 2020 to 15 January 2021
  - Pagbilao CFTPP unit 3 (420 MW) - planned outage; 11 December 2020 to 14 January 2021
- In terms of outage type, forced outages accounted for about 52 percent of the season's outages, averaging 2,633 MW (Figure 13). Bulk of which involved San Gabriel NGPP (420 MW) from 5 September 2020 to 15 February 2021, Malaya TPP unit 1 (300 MW) beginning 5 May 2019 and Kalayaan PSPP unit 4 (180 MW) beginning 27 November 2020, in addition to the above discussed coal plants which underwent forced outages.
- Planned outages during this season averaged at 731 MW.
- Deactivated shutdown purely involved geothermal plant Makban GPP unit 6 (55 MW) which was on forced outage since 11 April 2013.
- In addition to the prolonged outages of Makban GPP unit 6 and Malaya TPP unit 1, the forced outage of TPC Sangi unit 2 dates back to 17 December 2019.
- Appendix B provides the details of the plant outages during the season which lasted for more than 5 days.



	Cool Dry 2020				Cool Dry 2021			
	Deactivated Shutdown	Forced Outage	Maintenance Outage	Planned Outage	Deactivated Shutdown	Forced Outage	Maintenance Outage	Planned Outage
OIL	0%	20%	22%	7%	0%	9%	1%	6%
NATG	0%	5%	8%	9%	0%	14%	29%	4%
HYD	0%	5%	0%	5%	0%	5%	1%	14%
GEO	100%	21%	3%	0%	100%	6%	10%	2%
COAL	0%	49%	66%	79%	0%	66%	60%	74%

Figure 12. Outage Capacity by Plant Type



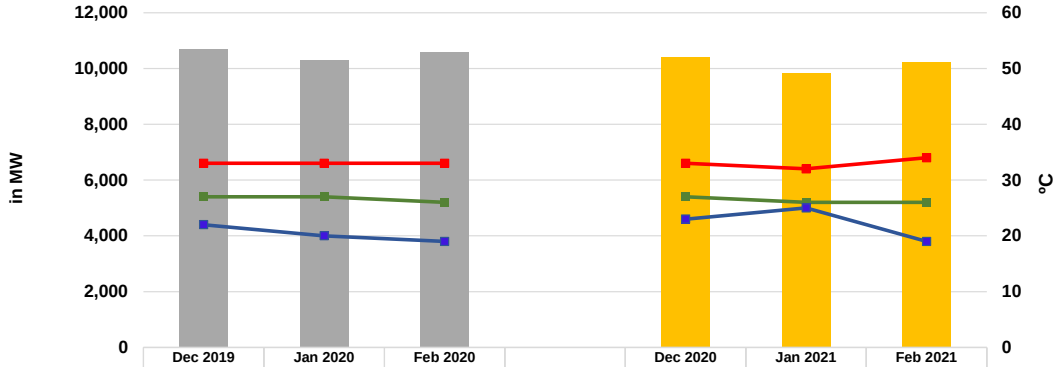
	COAL	GEO	HYD	NATG	OIL	COAL	GEO	HYD	NATG	OIL
			Cool Dry 2020					Cool Dry 2021		
Planned Outage	57%	2%	52%	59%	22%	30%	6%	56%	8%	24%
Maintenance Outage	13%	4%	1%	15%	20%	19%	31%	2%	43%	2%
Forced Outage	30%	81%	46%	26%	57%	51%	50%	42%	49%	74%
Deactivated Shutdown	0%	13%	0%	0%	0%	0%	13%	0%	0%	0%

Figure 13. Outage Capacity by Outage Type

3. Demand[11]

- The continuous implementation of the quarantine measures since March 2020 which aimed to combat the spread of the coronavirus disease restricted economic activity which resulted in a lower demand from industrial and commercial activities.
- As the quarantine measures were gradually relaxed to revive the businesses and kickstart the economy, average demand during the Cool Dry Season of 2021 was inching towards 2020 records when no quarantine measure was in place yet (Figure 14). Appendix A shows the summary of the quarantine declarations during the Cool Dry 2021.
- Demand averaged at 10,168MW this year, demonstrating a 3.5 percent decrease from previous year's 10,535MW.
- Contractions were tallied in the GDP growth rate at -8.3 percent for the fourth quarter of 2020 and at -9.6 percent for the annual growth rate for 2020[12].

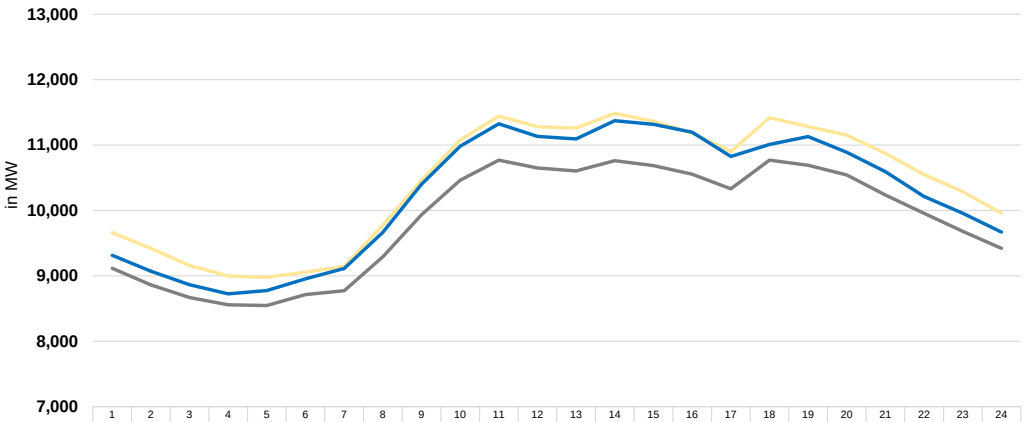
[11] Demand is equal to the total scheduled MW of all load resources in Luzon and Visayas plus losses including reserve schedule
[12] https://psa.gov.ph/, "PSA Releases Annual Revisions of the National Accounts of the Philippines"



	Dec 2019	Jan 2020	Feb 2020	Dec 2020	Jan 2021	Feb 2021
	Cool Dry Season 2020			Cool Dry Season 2021		
Demand plus Reserve Schedule	10,690	10,312	10,578	10,423	9,857	10,233
High	33	33	33	33	32	34
Average	27	27	26	27	26	26
Low	22	20	19	23	25	19

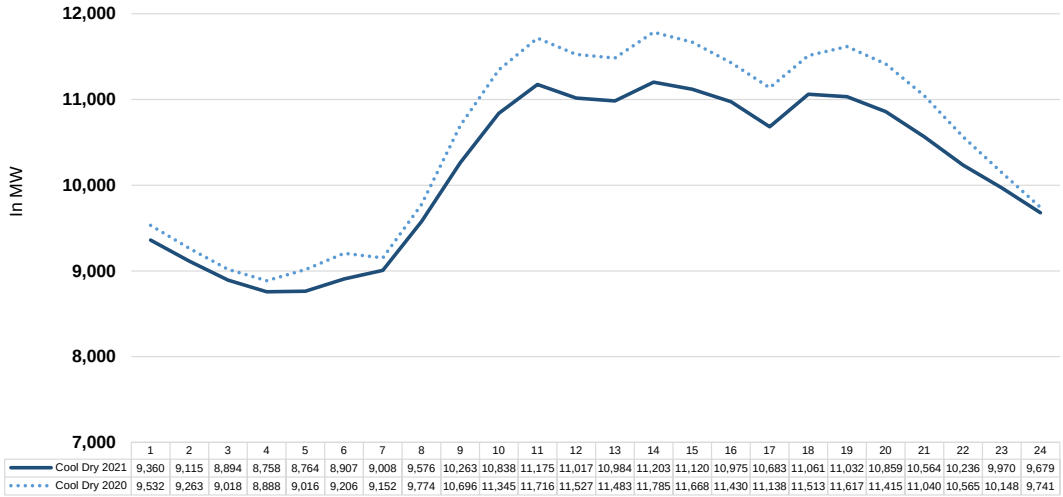
Figure 14. Demand and Temperature

- The 24-hour profile of demand showed that consumption generally climbed up starting at 0700H, peaked at 1100H and 1400H, sloped down at 1700H (Figure 15).
- December and January billing months observed evening peaks at 1800H while the February's evening peak is later at 1900H.
- Year-on-year comparison of the demand profile posted a prominent decline from 0900H to 2200H (Figure 16).
    - o Average demand during Peak Hours : Cool Dry Season 2019 at 11,497 MW; Cool Dry Season 2020 at 11,199 MW
    - o Average demand during Off-Peak Hours: Cool Dry Season 2019 at 9,811 MW; Cool Dry Season 2020 at 9,384 MW
- Moreover, Cool Dry Season 2020 had a morning peak at 0600H while the same was no longer noted during Cool Dry Season 2021. Meanwhile evening peak was earlier this year at 1800H this year compared to 1900H last year denoting changes in the activities attributable to the implementation of quarantine measures.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Dec 2020	9,661	9,420	9,158	8,998	8,977	9,057	9,143	9,775	10,462	11,076	11,442	11,280	11,262	11,483	11,364	11,182	10,899	11,418	11,283	11,153	10,873	10,548	10,287	9,957
Jan 2021	9,117	8,863	8,669	8,559	8,546	8,713	8,774	9,292	9,933	10,463	10,768	10,648	10,605	10,760	10,687	10,555	10,332	10,769	10,691	10,544	10,237	9,957	9,679	9,420
Feb 2021	9,313	9,072	8,864	8,725	8,775	8,955	9,112	9,666	10,400	10,981	11,324	11,131	11,093	11,374	11,317	11,196	10,824	11,009	11,130	10,891	10,593	10,213	9,955	9,669

Figure 15. Monthly Demand Hourly Profile, Cool 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
Cool Dry 2021	9,360	9,115	8,894	8,758	8,764	8,907	9,008	9,576	10,263	10,838	11,175	11,017	10,984	11,203	11,120	10,975	10,683	11,061	11,032	10,859	10,564	10,236	9,970	9,679
Cool Dry 2020	9,532	9,263	9,018	8,888	9,016	9,206	9,152	9,774	10,696	11,345	11,716	11,527	11,483	11,785	11,668	11,430	11,138	11,513	11,617	11,415	11,040	10,565	10,148	9,741

Figure 16. Demand Hourly Profile, Cool Dry Season 2021 and Cool Dry Season 2020

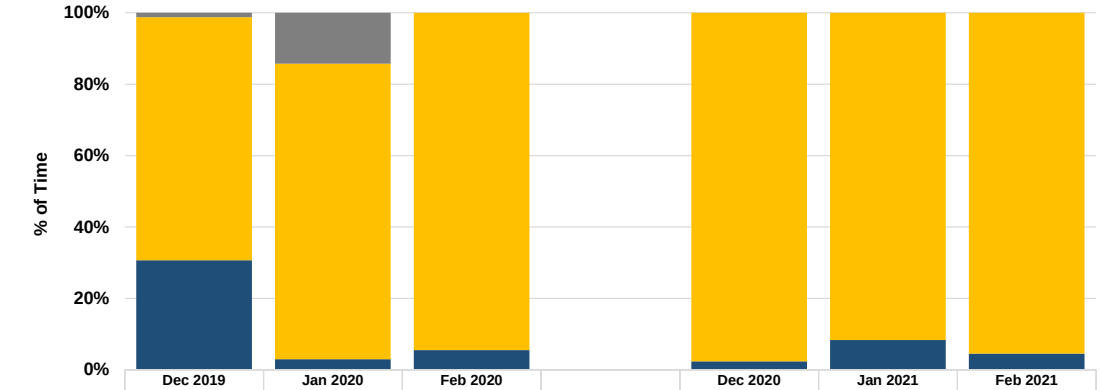
Part IV. Competitiveness Analysis

1. Pivotal Supplier Index[13] and Residual Supply Index[14]

- 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 wider supply margin in this year's cool dry season, pivotal suppliers were rarely recorded at mere 5 percent of the time compared to 13 percent in the previous year (Figure 17).
- The December 2019 billing month particularly recorded frequent presence of pivotal suppliers, at 31 percent of the time, while the same was kept at a minimum, at 2 percent, this December 2020 billing month.
- Meanwhile, the January 2020 billing month recorded the most frequent occurrence of pivotal suppliers this season.
- Despite their presence, no pivotal supplier was able to set prices at PhP10,000/MWh and above this season at the same time.

[13] 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.

[14] 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.



	Dec 2019	Jan 2020	Feb 2020		Dec 2020	Jan 2021	Feb 2021
	Cool Dry Season 2020				Cool Dry Season 2021		
MI	1%	14%	0%		0%	0%	0%
RSI above 100	68%	83%	94%		98%	92%	95%
RSI 100 and below	31%	3%	6%		2%	8%	5%

Figure 17. 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 18).
- Semirara Mining Power Corporation (SMPC) followed with only about 5 percent of the market share in registered capacity but with 10 percent share when measured in terms of spot quantity and 9 percent in terms of total trading amount given that 32 percent of its metered quantities were sold in the spot market.
- Similarly, PSALM obtained 35 percent of market share based on spot quantity and 38 percent based on total trading amount denoting its heavy exposure to the market at 75 percent during the cool dry season of 2021.
- Meanwhile, SMC, and FGC recorded minimal spot exposures to the market at 3 percent apiece, respectively, indicating bilateral contract coverage in most of their transactions. Correspondingly, their SMC's shares in terms of spot quantity and total trading amount was at 6 percent while FGC's share in terms of spot quantity is at 5 percent amidst their significant share in terms of registered capacity. FGC trading amount was negative for the season indicating its net payable to the market.

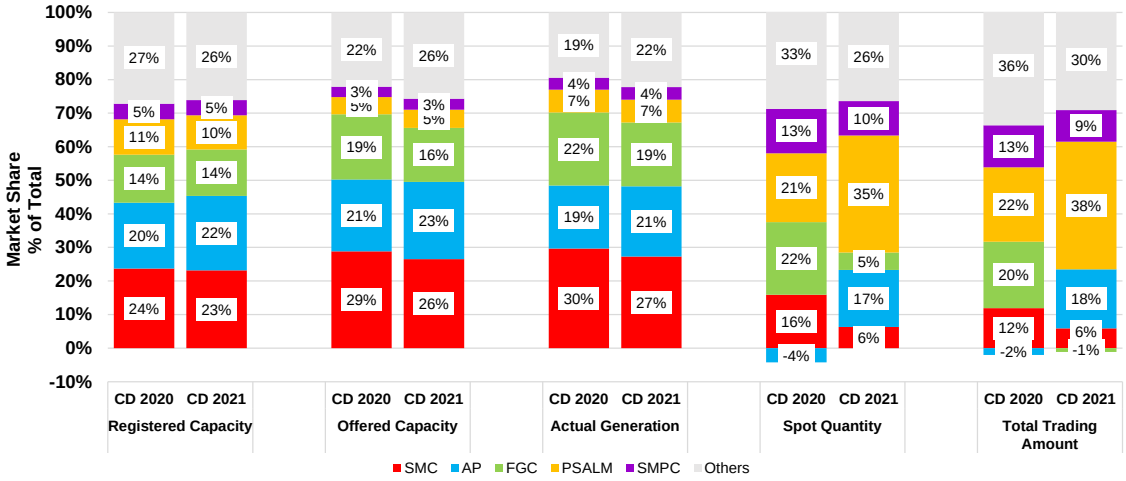


Figure 18. Market Share

3. Herfindahl-Hirschman Index (HHI)[15]

- 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. Meanwhile, HHI calculation showed a concentrated market when measured in terms of spot quantities and total trading amount attributable to the dominance of PSALM (Figure 19).

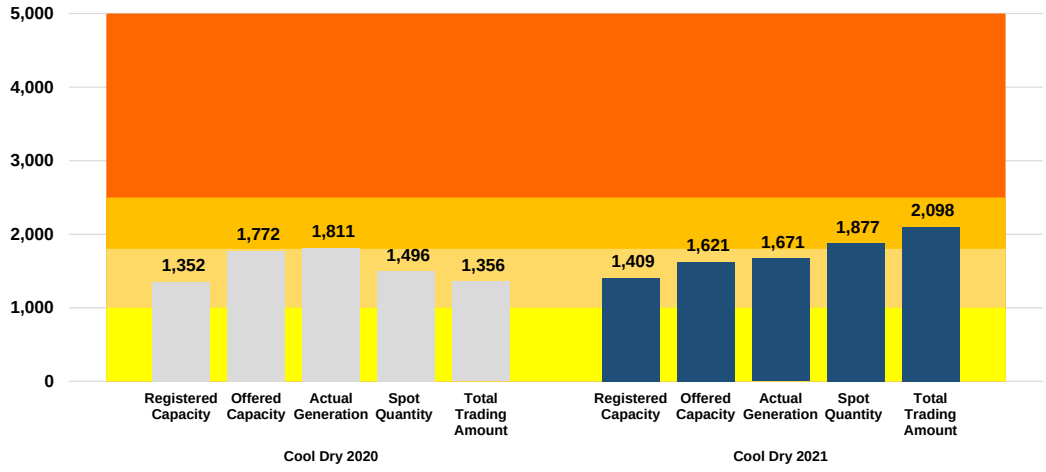


Figure 19. Herfindahl-Hirschman Index (HHI)

[15] 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.

Part V. Generator Trading Behavior

- Difference Calculation[16] 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 cool dry season 2020 prices, and the *Average Subject Price*, which is the weighted average price for all trading intervals during the cool dry season 2020 prices, 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 the 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.

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 20).
- Average price for geothermal plants during Cool Dry Season 2021 is higher by PhP320/MWh than in Cool Dry 2020.
- Capacity offered this year was lower than previous year's record.

[16] 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.

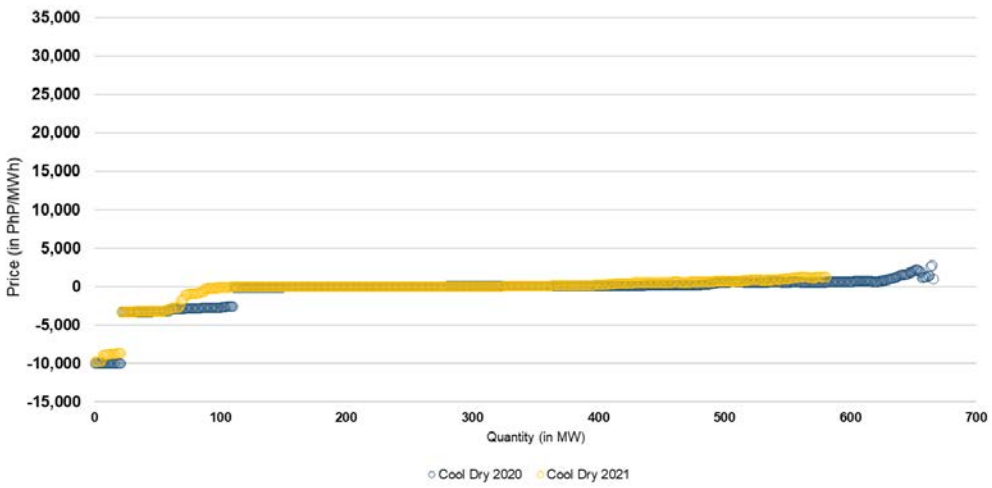


Figure 20. Average Supply Curve – Geothermal

- Coal plants' offers this year for the first 1,000MW of its supply curve was notably lower compared to the previous year (Figure 21).
- Minimal change was noted in the average prices for offers above the 3,000th MW mark.
- Average price for coal plants was lower by PHP499/MWh this year compared to previous year's figures.

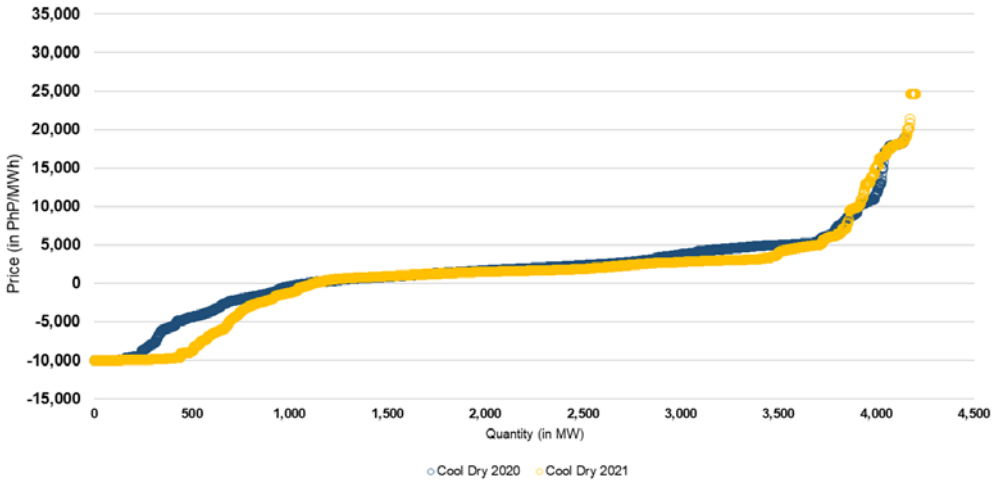


Figure 21. Average Supply Curve – Coal

- Natural gas plants offered its first 200 MW this season at similar prices from the previous year. (Figure 22)
- Capacities at the 200th up to 1,400th MW were generally lower than previous year's record.
- Average price from natural gas plants was lower by PHP1,029/MWH.
- Slightly higher capacity was offered in the Cool Dry Season 2020

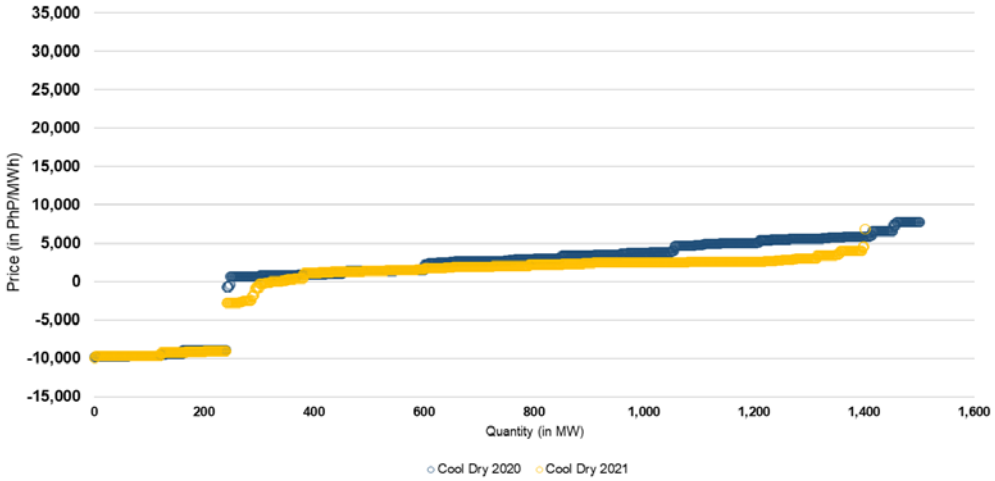


Figure 22. Average Supply Curve – Natural Gas

- Hydro plants demonstrated considerably lower offer prices this year except for the 1800th to 2000th portion of its average supply curve (Figure 24).
- This season's average price from hydro plants posted a PHP2,201/MWh decrease compared to previous year's average.

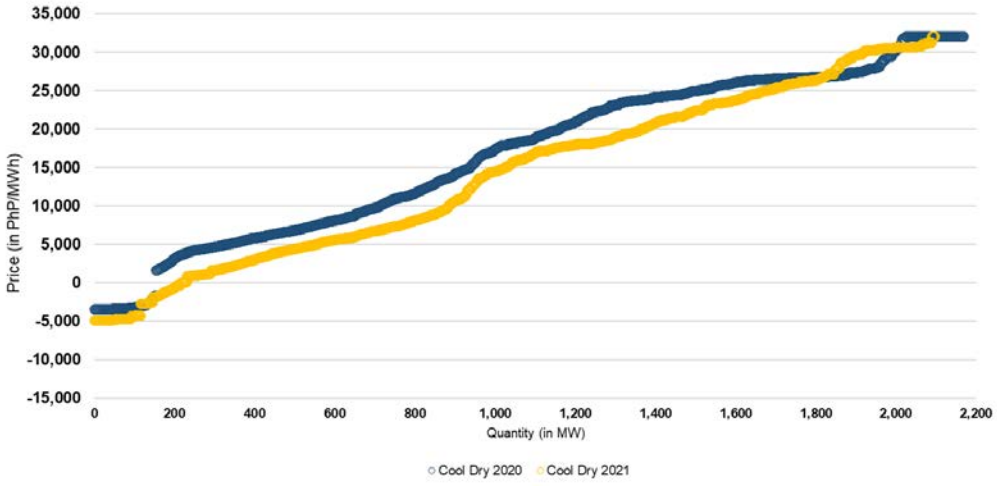


Figure 23. Average Supply Curve – Hydro

- Offer prices for the first 800 MW of oil-based plants showed a year-on-year increase while the rest of the supply curve was generally similar to previous year's pattern. (Figure 24).
- Average price from oil-based plants this season rose by PHP1,136/MWh than previous year's average.
- Slightly higher capacity was offered by oil-based plants this year than last year.

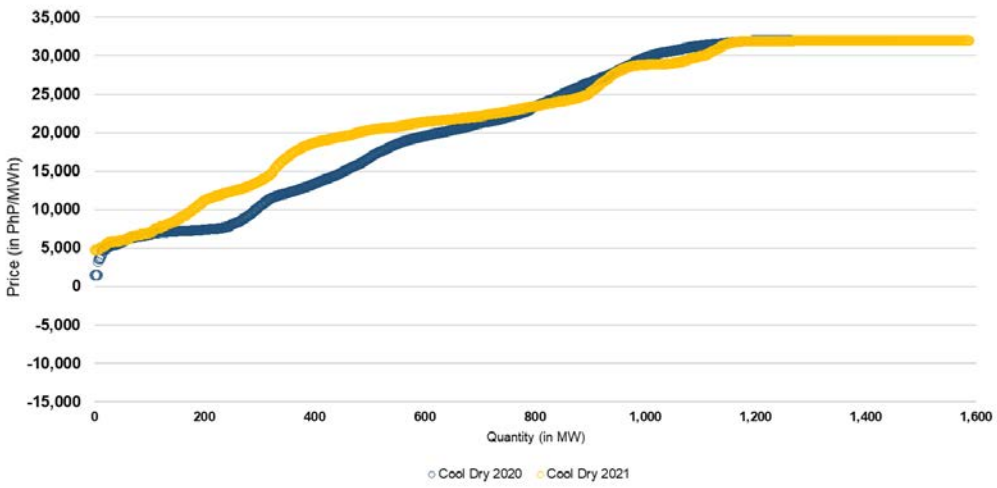


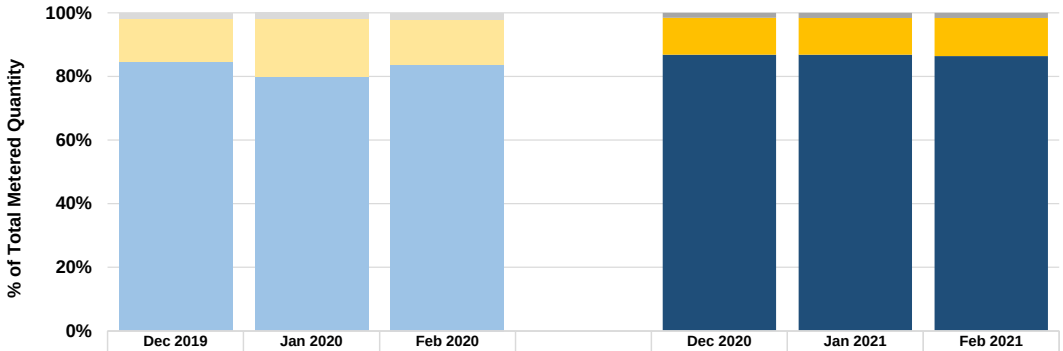
Figure 24. Average Supply Curve – Oil-based

ii. Bid Splitting

- Bid splitting is 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.
- Five (5) plants demonstrated bid splitting in their offer strategy during the season in a total of 1,066 occurrences. In the previous year, when supply margin was tighter, 10 plants had the similar strategy in 1,398 occurrences.

Part VI. Spot Market Transactions

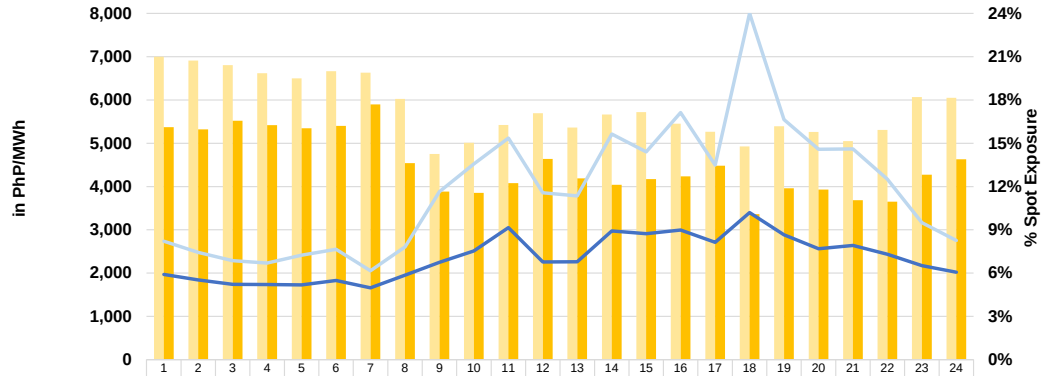
- While the total metered quantity showed a slight decrease, the total quantity covered by bilateral contracts was almost unchanged year-on-year.
- In terms of percentage, lower spot market exposure was noted in all the billing months of Cool Dry Season 2021 (Figure 25). Particularly, the January 2021 showed a notable decline in spot exposure at 12 percent from 18 percent in the previous year.



	Dec 2019	Jan 2020	Feb 2020		Dec 2020	Jan 2021	Feb 2021
	Cool Dry Season 2020				Cool Dry Season 2021		
Loss	2%	2%	2%		2%	2%	2%
Spot Market Qty	13%	18%	14%		12%	12%	12%
Bilateral Qty	85%	80%	84%		87%	87%	86%

Figure 25. Spot Market Exposure

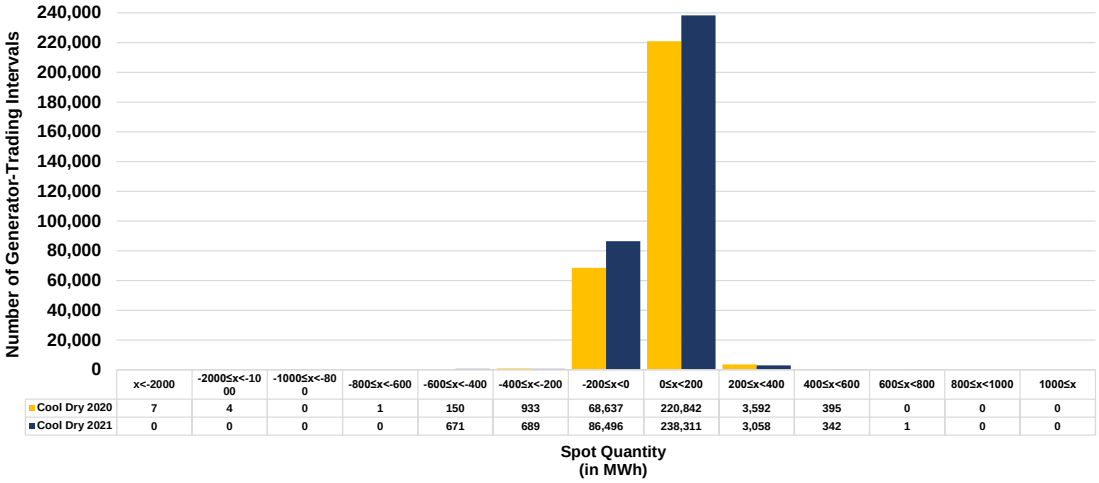
- In a general, a year-on-year decrease in spot exposure was noted in all the hours throughout the day. (Figure 26)
- The spot exposure showed a positive correlation, albeit at a weak value, given that the year-on-year decline in the hourly average spot exposure corresponded to the decreasing trend of 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
CD 2020 - Spot Expo	0.21	0.21	0.20	0.20	0.19	0.20	0.20	0.18	0.14	0.15	0.16	0.17	0.16	0.17	0.17	0.16	0.16	0.15	0.16	0.16	0.15	0.16	0.18	0.18
CD 2021 - Spot Expo	0.16	0.16	0.17	0.16	0.16	0.16	0.18	0.14	0.12	0.12	0.12	0.14	0.13	0.12	0.13	0.13	0.13	0.10	0.12	0.12	0.11	0.11	0.13	0.14
CD 2020 - LWAP	2,739	2,480	2,287	2,233	2,414	2,552	2,053	2,606	3,883	4,520	5,121	3,857	3,784	5,211	4,802	5,707	4,494	8,000	5,547	4,862	4,870	4,169	3,164	2,753
CD 2021 - LWAP	1,968	1,844	1,742	1,736	1,729	1,830	1,662	1,953	2,249	2,512	3,053	2,258	2,261	2,977	2,910	2,996	2,712	3,398	2,884	2,564	2,639	2,435	2,172	2,023

Figure 26. Hourly Profile of Spot Market Exposure and Market Price

- Around 99 percent of the spot quantities (per generator per trading interval) were below 200 MWh (Figure 27).



	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
Cool Dry 2020	7	4	0	1	150	933	68,637	220,842	3,592	395	0	0	0
Cool Dry 2021	0	0	0	0	671	689	86,496	238,311	3,058	342	1	0	0

Figure 27. Spot Quantity Frequency Distribution

Part VII. Compliance Monitoring

- Provided in Figure 29 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 64 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, coal, and hydro plants.
- Outage-related concerns accounted for 18.5 percent of the registered capacity.
- Registered capacity of plants which underwent Testing and Commissioning accounted for 6.2 percent.
- Resource constraints, which mostly involved biomass, geothermal, solar, and hydro plants, accounted for 5.1 percent.
- Only 0.03 percent of the registered capacity were non-compliant and were not justified. These instances will be issued with Request for Investigation (RFI).
    - All of the incidents for RFI solely involved coal plants.

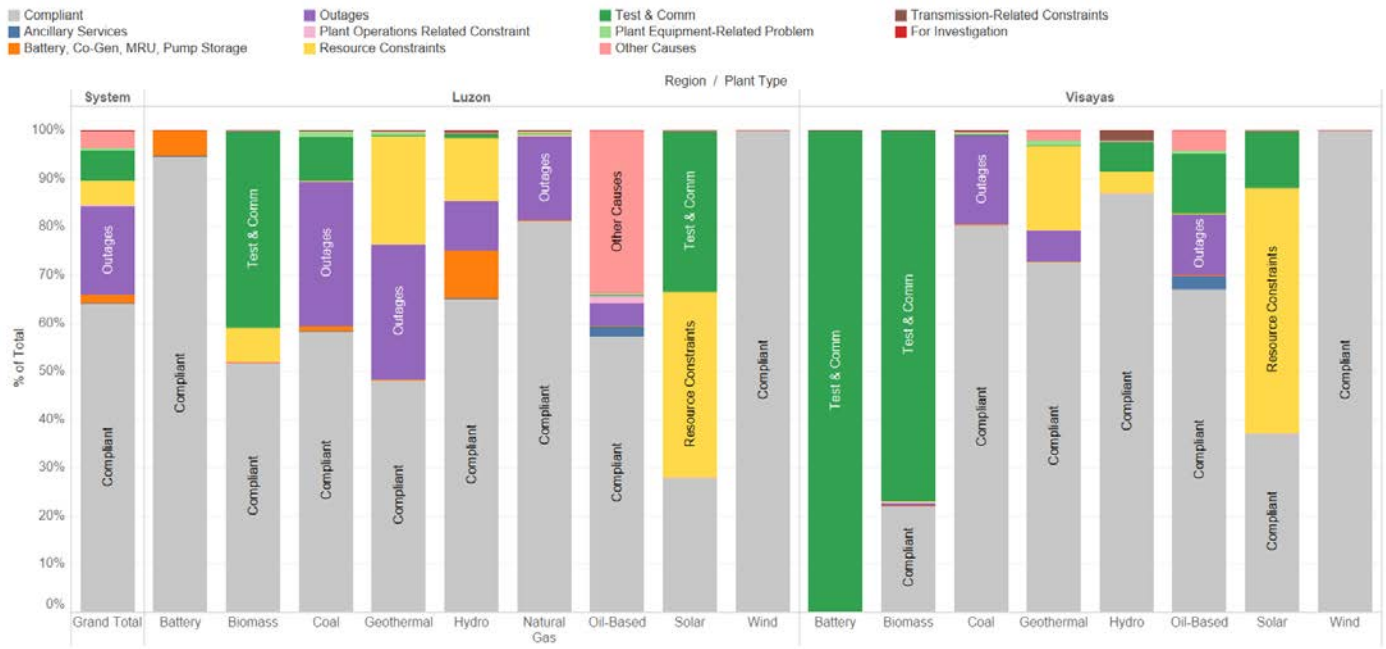


Figure 28. Compliance Monitoring per Resource Type

Appendix A. Quarantine Declaration

Period Covered	Quarantine Declaration			
	ECQ	MECQ	GCQ	MGCQ
1 to 30 Nov 2020			Metro Manila, Batangas, Tacloban City, Bacolod City, Iligan City, Iloilo City, Lanao del Sur Davao City[17] (20 to 30 November 2020) Laoag City[18] (27 November to 11 December 2020)	Rest of the country
1 to 31 December 2020			Metro Manila, Batangas, Tacloban City, Iligan City, Iloilo City, Lanao del Sur, Davao City, Davao del Norte[19] Laoag City[20] (12 to 25 December 2020) Isabela[21] (14 to 30 December 2020)	Rest of the country
1 to 31 January 2021	Tuguegarao City[22] (20 January to 3 February 2021)		National Capital Region (NCR), Santiago City, Batangas, Tacloban City, Iligan City, Lanao del Sur, Davao City, and Davao del Norte[23] Laoag City[24] (beginning 11 January) Passi[25] (28 January to 11 February 2021)	Rest of the country
1 to 28 February 2021		Ubay, Bohol (Brgy. Bood, Fatima, Poblacion, and Tapon) [26]	National Capital Region (NCR), Davao City, Batangas, CAR, Tacloban City, Davao del Norte, Lanao del Sur, Iligan City[27]	Rest of the country

[17] https://www.sunstar.com.ph/article/1877454/Manila/Local-News/Davao-City-reverts-to-GCQ-as-infections-continue-rising
[18] https://news.abs-cbn.com/news/11/27/20/quarantine-lockdown-mecq-laoag-city-covid19-coronavirus-response
[19] https://pcoo.gov.ph/news_releases/president-duterte-retains-metro-manilas-gcq-status-from-december-1-to-31/
[20] https://www.pna.gov.ph/articles/1124332
[21] https://cnnphilippines.com/regional/2020/12/15/Isabela-reverts-to-GCQ-December-2020.html
[22] https://www.manilatimes.net/2021/01/21/news/regions/tuguegarao-city-on-ecq-again/830092/
[23] https://pcoo.gov.ph/OPS-content/on-the-january-2021-community-quarantine-classifications/
[24] https://newsinfo.inquirer.net/1382280/laoag-city-reverts-to-stricter-quarantine-as-covid-19-cases-rise
[25] https://www.pna.gov.ph/articles/1128791
[26] https://pcoo.gov.ph/news_releases/metro-manila-davao-city-to-remain-gcq-starting-february-1/
[27] 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/

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	PSALM	300	05/03/2019 18:21			Forced Outage	Declared unavailable due to motorization of unit generator caused by the non-op	Aug 1975
VISAYAS	COAL	TPC Sangi 1	GBPC	60	12/17/2019 6:05			Forced Outage	Generator differential trip	Dec 2013
VISAYAS	GEO	Upper Mahiao 3	PSALM	32	07/22/2020 17:01			Maintenance Outage	Trip with Loss of Excitation. Economic Shutdown	Jul 1997
LUZON	NATG	San Gabriel	FGC	420	09/05/2020 17:14	02/15/2021 16:38	162.98	Forced Outage	Tripped at 211MW load. System Frequency is 59.401hz.	Mar 2016
LUZON	COAL	Sual 2	SMC	647	09/16/2020 14:45			Forced Outage	Tripped due to high turbine vibration	Oct 1999
VISAYAS	GEO	Leyte 2	FGC	39.3	09/19/2020 1:58	12/02/2020 1:29	73.98	Maintenance Outage	Corrective maintenance. data gathering for the high vibration (0200H-0600H)	Jun 1983
VISAYAS	GEO	PGPP1 Unit 1	FGC	37.5	09/19/2020 23:47	12/28/2020 16:01	99.68	Maintenance Outage	Offline due to scheduled maintenance.	Aug 1983
LUZON	GEO	Tiwi 5	AP	57	10/31/2020 20:11	01/13/2021 2:36	73.27	Forced Outage	On houseload operation as contingency measures for incomming Typhoon ROLLY	Jan 1979
LUZON	GEO	Tiwi 2	AP	60	11/01/2020 3:33	12/14/2020 10:55	43.31	Forced Outage	On houseload operation as contingency measures for incomming Typhoon ROLLY	Jan 1979
LUZON	GEO	Tiwi 6	AP	57	11/01/2020 5:58	12/03/2020 0:08	31.76	Forced Outage	On houseload operation as contingency measures for incomming Typhoon ROLLY	Jan 1979
LUZON	GEO	Makban 8	AP	20	11/14/2020 8:24	01/26/2021 8:04	72.99	Forced Outage	Defective cooling tower fan	Apr 1979
LUZON	HYD	Kalayaan 3	PSALM	180	11/24/2020 0:01	12/06/2020 0:01	12.00	Planned Outage	Maintenance Outage	May 2004
LUZON	COAL	Masinloc 3	SMC	335	11/24/2020 20:20	02/16/2021 14:15	83.75	Forced Outage	Excitation Trouble	Mar 2019
LUZON	COAL	Calaca 1	SMPC	300	11/25/2020 0:44	01/15/2021 5:13	51.19	Planned Outage	Maintenance Outage until 09 Jan 2021	Sep 1984
LUZON	COAL	SLTEC 2	AC	122.9	11/25/2020 21:05	12/13/2020 9:55	17.53	Forced Outage	Turbine bearing vibration high	Aug 2015
LUZON	HYD	Kalayaan 4	PSALM	180	11/27/2020 22:01			Forced Outage	Excessive Oil Leak at Pothead conductors.	May 2004
VISAYAS	COAL	THVI 1	AP	169	11/28/2020 14:11	12/12/2020 15:02	14.04	Forced Outage	AUTO TRIPPED WITH INDICATION FURNACE PRESSURE HIGH HIGH	Dec 2017
VISAYAS	BIOF	URC 1	URC	40	11/30/2020 8:07	12/07/2020 1:09	6.71	Maintenance Outage	Offline to conduct weekly maintenance.	Dec 2014
VISAYAS	GEO	Leyte 2	FGC	39.3	12/02/2020 1:30	12/15/2020 17:26	13.66	Planned Outage	PMS	Jun 1983
LUZON	COAL	Calaca 2	SMPC	300	12/03/2020 9:01			Forced Outage	Generator stator earth fault	Sep 1984
VISAYAS	BIOF	SCBE	Other IPPs	7.4	12/04/2020 18:14	12/10/2020 0:14	5.25	Forced Outage	Isolated from the grid due to tripping of 69kV Cadiz-San Carlos Sub TL. Customer	Feb 2009
VISAYAS	BIOF	VMC	VMC	34	12/09/2020 9:36	12/21/2020 1:20	11.66	Forced Outage	Offline due to boiler problem.	Nov 2015
LUZON	COAL	Pagbilao 3	AP	420	12/11/2020 0:55	01/14/2021 20:51	34.83	Planned Outage	Maintenance outage (GOP)	Jul 2017
VISAYAS	COAL	THVI 1	AP	169	12/12/2020 20:44	12/18/2020 2:09	5.23	Forced Outage	GENERATOR WINDING TEMP HIGH	Dec 2017
LUZON	COAL	SMC 2	SMC	150	12/14/2020 23:48	01/08/2021 12:13	24.52	Planned Outage	Maintenance Outage until 04 January 2021	Mar 2017
VISAYAS	GEO	PGPP1 Unit 2	FGC	37.5	12/17/2020 0:12	12/26/2020 18:31	9.76	Maintenance Outage	Offline due to planned corrective maintenance.	Aug 1983
VISAYAS	GEO	PGPP1 Unit 3	FGC	37.5	12/17/2020 0:24	12/24/2020 18:46	7.77	Maintenance Outage	Offline due to Planned Corrective Maintenance.	Aug 1983
LUZON	COAL	Sual 1	SMC	647	12/18/2020 23:34	01/28/2021 13:58	40.60	Maintenance Outage	To rectify erratic movement of HP turbine governing valve of HPGV 1.(RECLASSIFIE	Oct 1999
LUZON	NATG	San Lorenzo 1	FGC	264.8	12/19/2020 2:41	12/24/2020 20:05	5.72	Maintenance Outage	Maintenance outage.	Sep 2002
VISAYAS	COAL	PEDC 3	GBPC	150	12/25/2020 0:35	01/24/2021 12:32	30.50	Planned Outage	PMS	Aug 2016
LUZON	COAL	SMC 4	SMC	150	12/25/2020 23:20	01/18/2021 17:43	23.77	Maintenance Outage	Planned Outage (GOP).	Sep 2018
LUZON	NATG	San Lorenzo 2	FGC	261.8	12/26/2020 2:44	12/31/2020 5:24	5.11	Maintenance Outage	Maintenance Outage.	Sep 2002
VISAYAS	BIOF	VMC	VMC	34	12/26/2020 4:57	01/06/2021 9:49	11.20	Forced Outage	Offline due to boiler problem.	Nov 2015
LUZON	COAL	SLPGC 2	SMPC	150	12/30/2020 15:10	01/15/2021 11:44	15.86	Forced Outage	Emergency shutdown due to boiler tube leak.	Jan 2015
VISAYAS	BIOF	FFHC	Other IPPs	9	12/31/2020 16:11	01/05/2021 20:03	5.16	Maintenance Outage	Offline due to maintenance.	Feb 2009
VISAYAS	GEO	PGPP1 Unit 1	FGC	37.5	01/02/2021 21:39	01/10/2021 0:09	7.10	Forced Outage	Auto-tripped. Ongoing investigation on cause of tripping.	Aug 1983
LUZON	OIL	Limay 8	MEI	90	01/04/2021 0:01			Planned Outage	Maintenance Outage until 03 February 2021	Dec 1994
LUZON	BIOF	BT2020	Other IPPs	13	01/06/2021 21:56	01/14/2021 2:53	7.21	Forced Outage	Tube failure	May 2015
LUZON	COAL	GN Power 1	AP	316	01/08/2021 18:26			Forced Outage	Boiler tube leak.	May 2013
LUZON	COAL	ANDA 1	APC	72	01/09/2021 0:01	01/28/2021 0:31	19.02	Planned Outage	Maintenance Outage until 29 January 2021.(GOP).	Apr 2015
VISAYAS	OIL	TPVI 2	AP	6.7	01/14/2021 17:47	01/22/2021 15:22	7.90	Forced Outage	UNIT CUT-OUT FROM THE SYSTEM TO FACILITATE ENGINE INTERNAL INSPECTION	Aug 1977
VISAYAS	GEO	PGPP1 Unit 1	FGC	37.5	01/18/2021 3:08	01/26/2021 2:58	7.99	Forced Outage	Auto-tripped due to Condenser Vacuum very low	Aug 1983
LUZON	NATG	Sta. Rita 3	FGC	265.5	01/19/2021 4:39			Maintenance Outage	Maintenance Outage	Oct 2001
LUZON	COAL	QPPL	QPPL	460	01/20/2021 13:57	01/31/2021 8:15	10.76	Planned Outage	Maintenance Outage until 30 January 2021.	May 2000
VISAYAS	COAL	THVI 2	AP	169	01/24/2021 20:13	02/24/2021 1:30	30.22	Planned Outage	ANNUAL PMS	Dec 2017
LUZON	HYD	San Roque 1	SMC	145	01/25/2021 0:01	02/06/2021 0:01	12.00	Planned Outage	Maintenance Outage until 05 February 2021.(GOP)	May 2003
VISAYAS	OIL	TPVI 2	AP	6.7	01/26/2021 14:50			Forced Outage	EMERGENCY CUT-OUT DUE TO INJECTION PUMP PROBLEM	Aug 1977
VISAYAS	COAL	PEDC 2	GBPC	83.7	01/28/2021 0:54	02/19/2021 7:06	22.26	Maintenance Outage	Annual PMS	Apr 2011
VISAYAS	COAL	TPC Sangi 2	GBPC	85	01/29/2021 21:08			Forced Outage	EMERGENCY CUT-OUT DUE TO OIL LEAK at BEARING 4	Dec 2013
LUZON	COAL	Calaca 1	SMPC	300	02/02/2021 10:26	02/13/2021 19:05	11.36	Forced Outage	Boiler tube leak.	Sep 1984
LUZON	HYD	Kalayaan 3	PSALM	180	02/03/2021 0:01	02/09/2021 19:42	6.82	Planned Outage	Maintenance Outage until 10 February 2021	May 2004
LUZON	GEO	Makban 2	AP	63.2	02/03/2021 21:30	02/17/2021 20:37	13.96	Forced Outage	Steam diverted to Makban 1	Apr 1979
VISAYAS	GEO	PGPP2 Unit 3	FGC	20	02/04/2021 0:05	02/10/2021 22:04	6.92	Maintenance Outage	Offline to conduct cleaning of first stage turbine blades	Aug 1983
LUZON	GEO	MGPP 1	AC	20	02/08/2021 0:39	02/15/2021 3:29	7.12	Planned Outage	Maintenance Outage until 15 February 2021	Dec 2013
LUZON	HYD	Kalayaan 2	PSALM	180	02/11/2021 0:01	02/20/2021 19:37	9.82	Planned Outage	Maintenance Outage until 14 February 2021	Aug 1982
VISAYAS	OIL	TPC Carmen 4	GBPC	10	02/12/2021 9:47			Forced Outage	TRIPPED DUE TO LOW ENGINE LO PRESSURE	Mar 1979
LUZON	BIOF	IBEC	Other IPPs	18.3	02/14/2021 0:01			Planned Outage	Annual MO	Jul 2015
LUZON	HYD	San Roque 2	SMC	145	02/15/2021 0:01			Planned Outage	Maintenance Outage until 26 February 2021	May 2003
LUZON	GEO	Makban 1	AP	63.2	02/17/2021 23:11			Forced Outage	Steam supply diverted to Unit 2.	Apr 1979
VISAYAS	GEO	Malitbog 3	PSALM	72	02/20/2021 0:22			Maintenance Outage	EDC-Leyte A MBPP Unit 3 plant shutdown for PMS	Jul 1997
VISAYAS	GEO	Malitbog 1	PSALM	72	02/20/2021 0:25			Maintenance Outage	EDC-Leyte A MBPP Unit 1 plant shutdown for PMS	Jul 1997
VISAYAS	COAL	CEDC 3	GBPC	82	02/21/2021 0:29			Forced Outage	TO CONDUCT REPAIR OF COAL FEEDER	Jan 2011
LUZON	NATG	Ilijan B1	SMC	190	02/21/2021 0:32			Planned Outage	Maintenance Outage until 09 March 2021	Jun 2002
LUZON	OIL	Limay 3	MEI	60	02/23/2021 6:42			Forced Outage	Failed start-up. Blow-off valve air leak.	May 1993
LUZON	NATG	Ilijan B3	SMC	220	02/24/2021 0:34			Planned Outage	Planned Outage (GOP)	Jun 2002
LUZON	NATG	Ilijan B2	SMC	190	02/24/2021 0:47			Planned Outage	Planned Outage(GOP).	Jun 2002
VISAYAS	COAL	CEDC 1	GBPC	82	02/24/2021 0:52			Planned Outage	UNIT SHUTDOWN TO FACILITATE ANUAL PMS UNTIL 17 MARCH 2021	Apr 2010
VISAYAS	COAL	THVI 1	AP	169	02/24/2021 23:32			Planned Outage	UNIT TRIPPED DURING RAMPING DOWN TO ZERO LOAD (RTD is 0) WITH INDICATI	Dec 2017
LUZON	HYD	Binga 4	AP	35	02/25/2021 8:01			Planned Outage	Planned outage(GOP).	Jan 1960

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	Testing and Commissioning, Other Causes, etc.	Outages	Resource Constraints	Security Limits, Market System , Transmission Related Constraints,	Start-up/Shutdown Process and Other Plant Operations Related Constraints	**Inadequate Explanation/ For Investigation**	Grand Total
Luzon	Battery	95%		5.4%								100%
Luzon	Biomass	52%				41.1%	0.1%	6.9%	0.1%			100%
Luzon	Coal	58%		1.0%	1.2%	9.1%	30.1%		0.1%	0.1%	**0.1%**	100%
Luzon	Geothermal	48%			0.6%	0.2%	28.2%	22.5%	0.3%			100%
Luzon	Hydro	65%	0.1%	9.9%	0.1%	1.0%	10.4%	13.0%	0.6%			100%
Luzon	Natural Gas	81%			0.5%	0.2%	17.3%		0.3%	0.4%		100%
Luzon	Oil-Based	57%	2.3%		0.2%	33.9%	4.6%		0.0%	1.8%		100%
Luzon	Solar	28%				33.5%		38.6%	0.1%			100%
Luzon	Wind	100%										100%
Visayas	Battery					100.0%						100%
Visayas	Biomass	22%				77.1%	0.6%	0.2%	0.0%			100%
Visayas	Coal	80%			0.6%		18.4%		0.5%	0.1%		100%
Visayas	Geothermal	73%			0.9%	2.2%	6.4%	17.7%	0.0%			100%
Visayas	Hydro	87%				6.5%		4.4%	2.2%			100%
Visayas	Oil-Based	67%	3.0%		0.7%	16.7%	12.7%					100%
Visayas	Solar	37%				12.0%	0.0%	50.7%	0.1%			100%
Visayas	Wind	100%							0.0%			100%
Grand Total		64%	0.3%	1.6%	0.7%	9.6%	18.5%	5.1%	0.2%	0.3%	**0.03%**	100%