



Market Assessment Report Rainy Season

26 May to 25 November 2020

January 2021

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

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Market Assessment Report for Rainy Season 2020

This report assesses the results of the integrated Luzon and Visayas operations of the Wholesale Electricity Spot Market (WESM) for the Rainy Season 2020 (26 May to 25 November 2020) 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 Rainy Season of 2020 observed an uptick in demand compared to the Hot Dry Season of 2020 (26 March to 25 May 2020). It may be recalled that the Hot Dry Season despite the expected high level of demand brought about by the onset of the summer season contrarily showed a substantial reduction in demand 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 Rainy Season 2020.
- Easing in quarantine restrictions was implemented during the Rainy Season resulting in improved economic activity and business operation. Notwithstanding, this year's system demand was still lower than previous year's figures.
 - The National Capital Region, which is the load center of the Philippine Grid, was placed under a more Modified Enhanced Community Quarantine (MECQ) from 16 to 31 May, coming from the Enhanced Community Quarantine (ECQ) implemented from 17 March to 15 May.
 - From 3 to 18 August which reverted the NCR and nearby provinces to MECQ as a response to the medical community's appeal for stricter lockdown to prevent the collapse of the health care system and for the government to craft a more effective response against the pandemic¹.
 - From 1 June to 30 November, except from 2 to 18 August, 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.
- This season generally observed a comfortable supply cushion throughout the period at record-breaking monthly averages since 2014.
- Correspondingly, 95 percent of the prices were below PhP4,000/MWh during this season. This notwithstanding, market trigger² events were noted this season breaching the price spike threshold for 30 intervals and the price creep-up threshold for one (1) event.
- Secondary price cap was not imposed this season.

Part II. Assessment of the Market

- For majority of the time during the Rainy Season of 2020, at 93 percent, the market price outcome was a result of normal pricing condition (Figure 1).
 - Price Substitution Methodology (PSM) was applied to 3 percent of the price outcomes due to frequent congestion events on Samboan-Amlan line 1 and Balingueo - Kadampat line 1.

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"

- Prices issued with pricing error notices (PEN) affected 3 percent of the price outcomes mainly due to inappropriate input data affecting Luzon and Visayas prices and schedules.
- The declaration of Market Intervention and Market Suspension in the Luzon region affected a total of 47 trading intervals which all occurred in the November billing month related to the power system disturbance brought about by the Typhoon Ulysses.
 - i. System Operator (SO) declared the Market Intervention starting 0100H of 12 November 2020, categorizing the event as Force Majeure.
 - ii. Energy Regulatory Commission (ERC) declared the Market Suspension from 1000H of 12 November 2020 to 2300H of 13 November 2020.
- Secondary price cap³ was not imposed during the period.

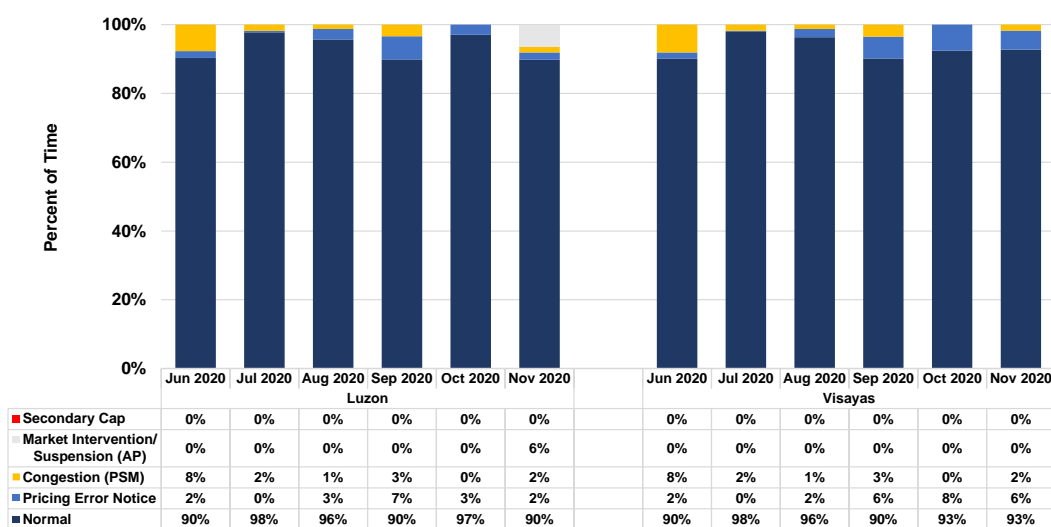


Figure 1. Summary of Pricing Conditions

Part III. Market Outcome

i. Price and Supply Margin

a. Supply Margin⁴ and Price⁵

- Supply margin this year was generally higher the previous year's record except for the September billing month (Figure 2).
 - The September billing month observed a relatively higher level of unavailable capacity from plants on outage and plants' capacity not offered in the market.

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.

- Correspondingly, average market prices were almost cut in half at PhP2,535/MWh this year compared to PhP4,547/MWh last year.
- This year's June, July, August, October, and November of 2020 broke the record for the highest supply margin and lowest market price compared to the respective similar months from 2014 to 2019. This indicates the unusual market outcome for the year 2020 following the impact of the coronavirus pandemic in the Luzon-Visayas System.

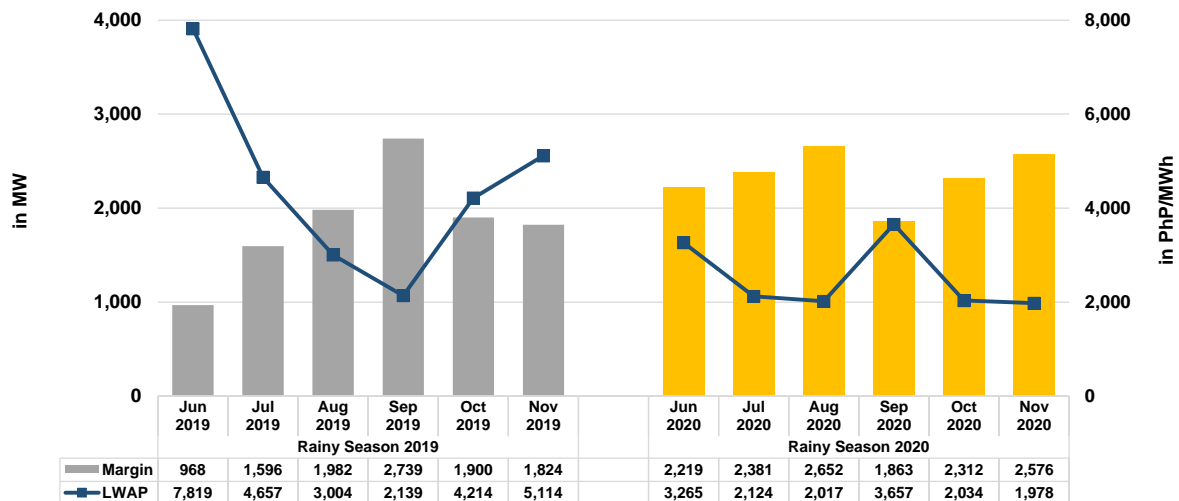


Figure 2. Average Supply Margin and Average Price

- Historically, notable disparity is observed for prices during peak hours⁶ against during off-peak⁷ hours. However, in Figure 4, it may be seen that less steeper prices are noted in this year peak prices following the low level of demand as a result of the restrictions in industrial and commercial activities.
- Price peaks during 1100H, 1400H, and 2200H peaks were retained. However, prices declined by 1600H and plateaued from 1700H to 1900H contrary to the peaks at 1600H and 1900H in the previous year.
- Both Figures 5 and 6 show the reduction in average prices albeit more notable in peak prices than in off-peak prices.
 - Average Peak Prices : Rainy Season 2019 at PhP5,821/MWh;
Rainy Season 2020 at PhP3,011/MWh
 - Average Off-Peak Prices: Rainy Season 2019 at PhP3,375/MWh;
Rainy Season 2020 at PhP2,052/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

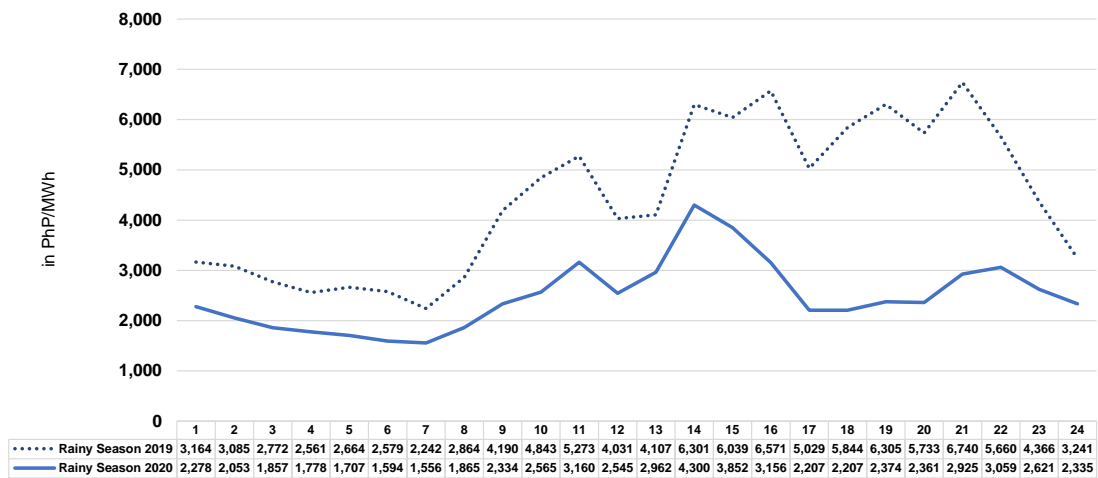


Figure 3. Average Price, Hourly Profile

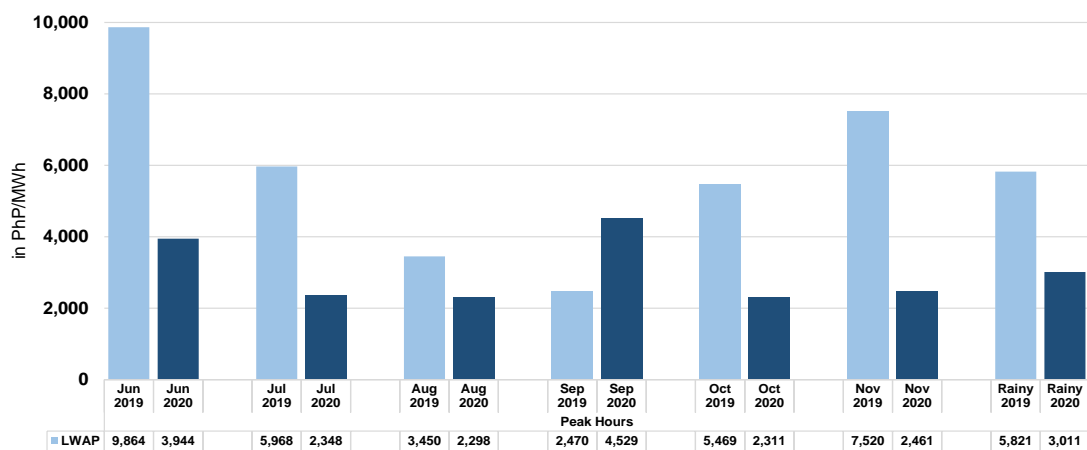


Figure 4. Average Price, Peak Hours

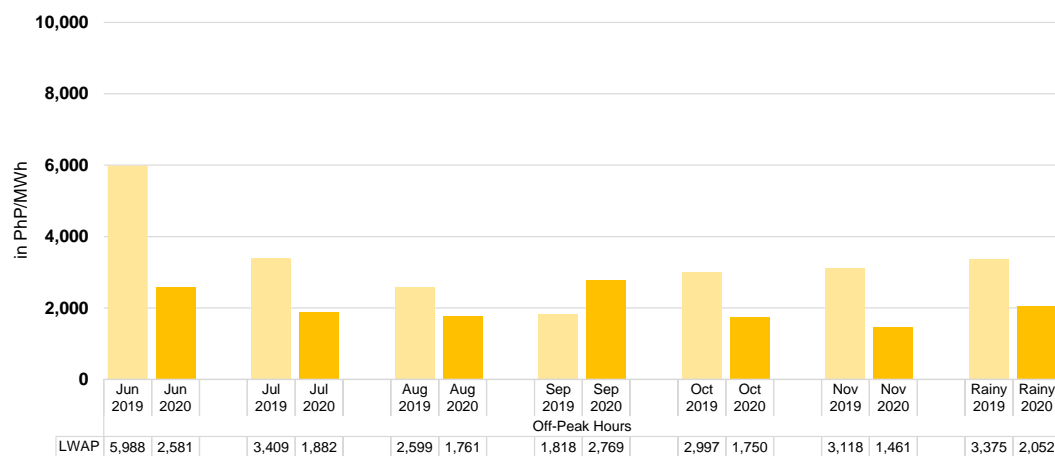


Figure 5. Average Price, Off-Peak Hours

- About 95 percent of the prices ranged from PhP0/MWh up to below PhP5,000/MWh coming from 79 percent in the previous year (Figure 6). In particular, majority of the prices or about 55 percent of this year's rainy season were below PhP2,000/MWh. This was significantly higher than the 13 percent record in the previous year;
- Prices cleared beyond the PhP10,000/MWh-mark were mostly set by oil-based plants PPC DPP, Millennium GTPP, Bauang DPP, SLPGC GTPP, and Subic DPP.

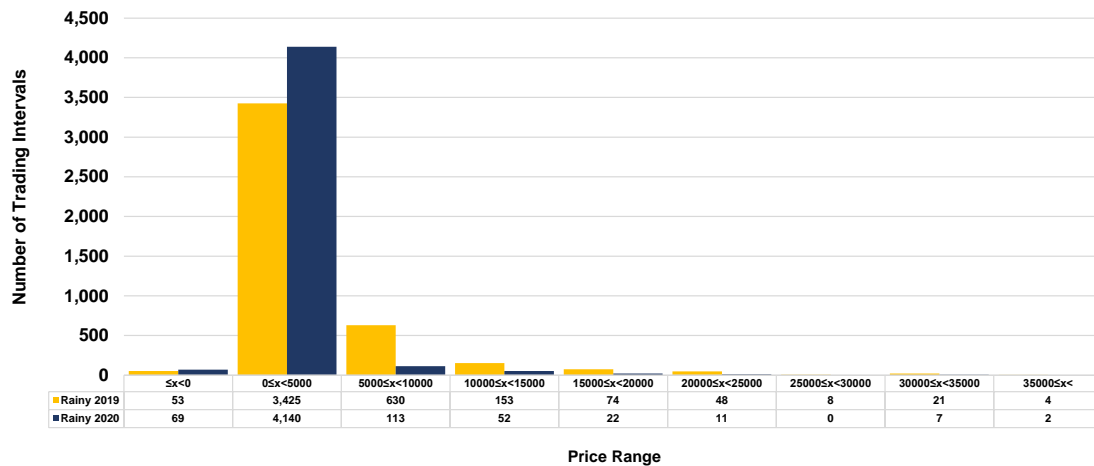


Figure 6. Price Frequency Distribution

- Based on the supply margin analysis⁸, nine (9) peak trading intervals (Figure 7) and one (1) off-peak trading interval (Figure 8) exceeded the upper price thresholds corresponding to their supply margin.

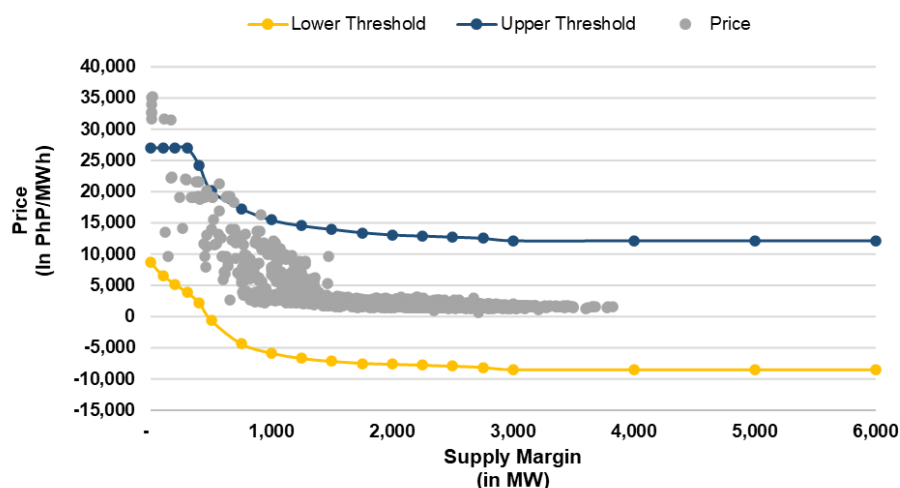


Figure 7. Supply Margin Analysis – Peak

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"

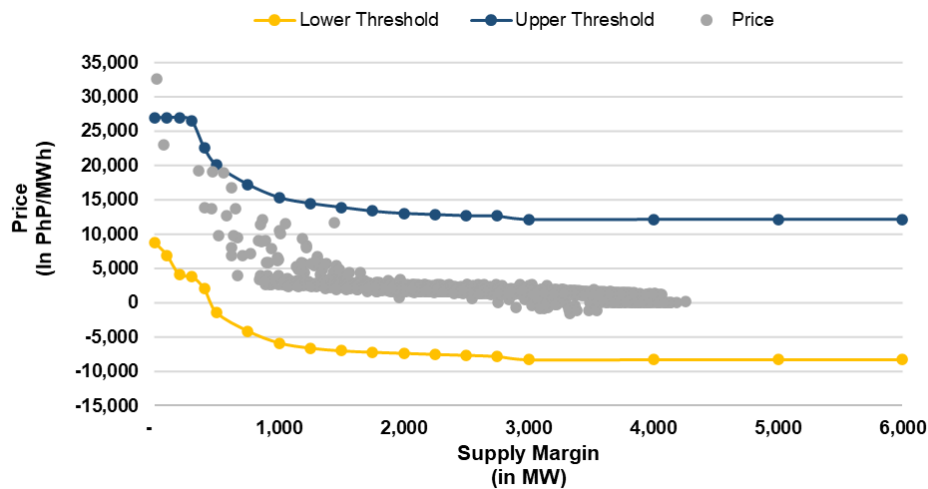


Figure 8. Supply Margin Analysis – Off-Peak

2. Supply

a. Capacity Profile

- Out of the 20,859 MW registered in the WESM, about 36 percent or 7,557 MW of the registered capacity which are less than 10 years in operations⁹. This involved a total of 143 plants with most of which are coal plants.
- Plants aging 10 to 20 years accounted for 19 percent or about 4,039 MW (involving 28 plants) while plants aging 20 to 30 years accounted for 27 percent or about 5,579MW (involving 32 plants).
- Twelve plants were more than 50 years in age contributing 470 MW in the registered capacity.

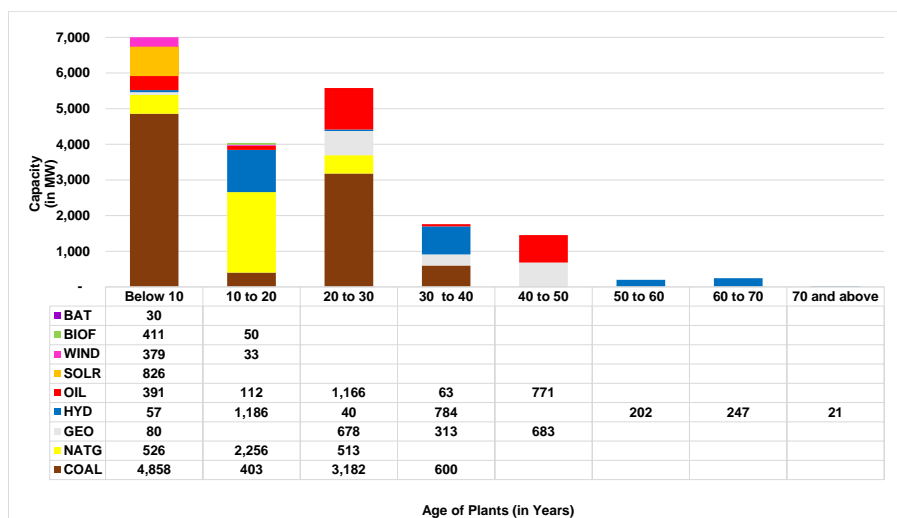


Figure 9. Age of Plants

⁹ Based on registration date or commercial operations date

- Available capacity in the market during the rainy season accounted for 73 percent of the total registered capacity in WESM (Figure 10). This slight decrease from previous year's 74 percent was attributable to the higher level of capacity not offered or nominated in the market at about 15 percent from previous year's 13 percent.
- Capacity on outage, on the other hand, decreased modestly to about 12 percent from previous year's 13 percent.
- Accounting for security limits and ramp limitations, effective supply¹⁰ averaged at 13,276 or about 65 percent of the total WESM registered capacity.
- HVDC power flow was more frequently directed towards the Luzon region ranging at about 85 percent of the time from June to September billing months. It is noteworthy that the October and November billing months recorded more frequent HVDC power flow towards the Visayas region at about 61 percent of the time which was unusual based on historical pattern.

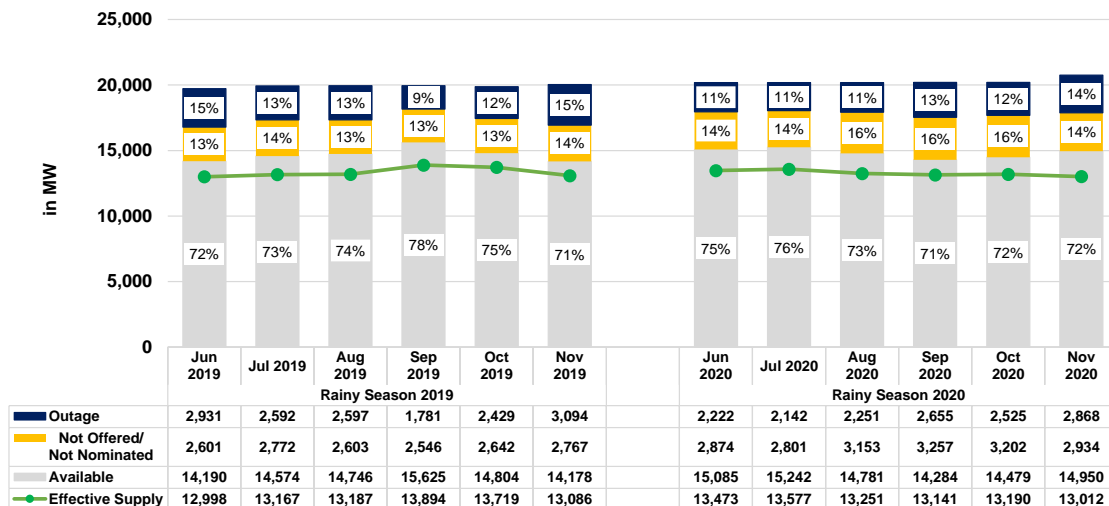


Figure 10. Capacity Profile

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 November 2020 billing month following the entry of 668-MW GNP Dinginin and 25-MW Bataan 2020 CFTPP (Figure 11).
- Natural gas and hydro plants accounted for about 19 percent and 15 percent of registered capacity, respectively.
- In terms of actual generation, coal and natural gas plants contribution increased to 58 percent and 27 percent, respectively, indicating high utilization as a result of low-priced offers in the market.
- Year-on-year comparison also showed an increase in the dispatch for coal plants from previous year's 54 percent to 58 percent.
- On the contrary, lower shares in generation mix were noted in hydro and oil-based plants relative to their share in the capacity mix.

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).

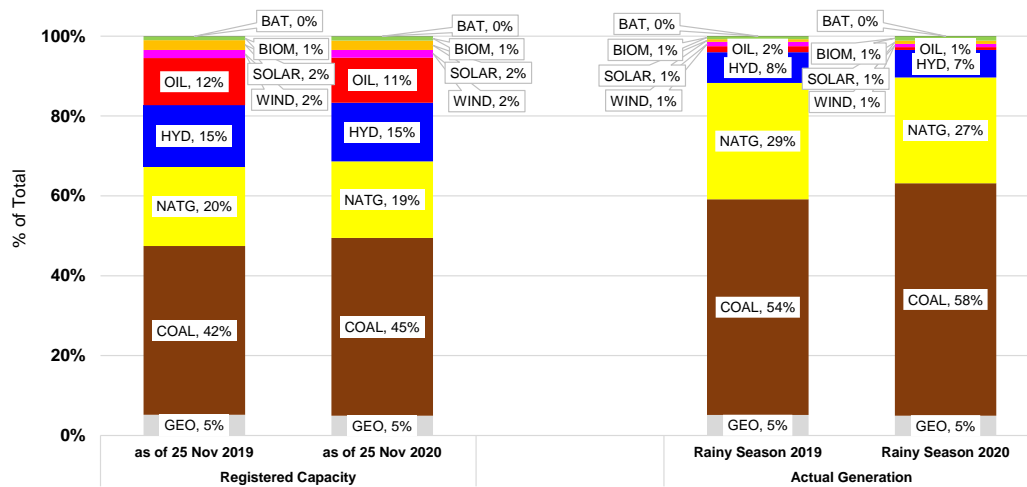


Figure 11. Capacity and Generation Mix – Luzon

- In Visayas, geothermal plants and coal plants accounted for 25 percent and 38 percent of registered capacity, respectively (Figure 12). These plants' shares then increased to 47 percent and 43 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, 5 percent, and 1 percent, respectively.

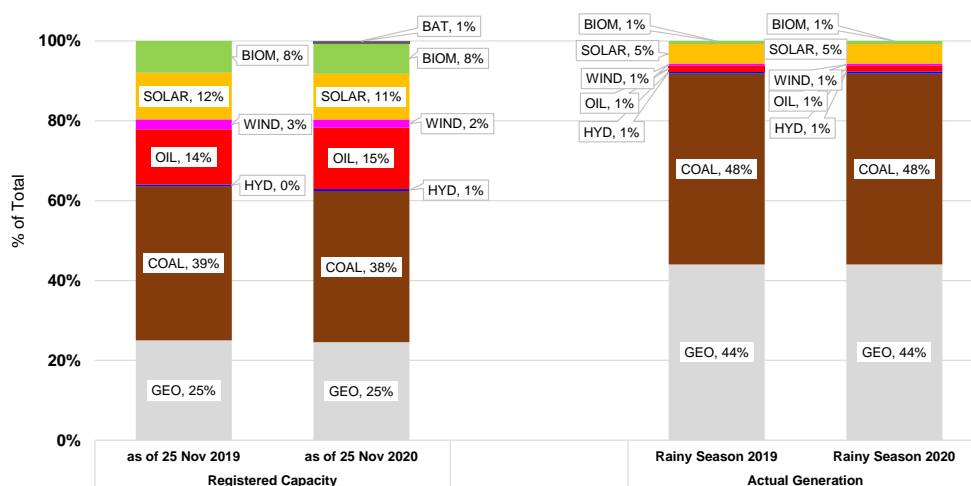


Figure 12. Capacity and Generation Mix – Visayas

c. Outage Capacity

- Coal plants accounted for half of the outage capacity this season (Figure 13 averaging at 1,229 MW of the 2,446 total MW capacity on outage). This mainly involved the planned outages of Masinloc

CFTPP unit 1 (315 MW), Pagbilao CFTPP units 1 and 2 (382 MW each) and forced outages of Sual CFTPP unit 2 (647 MW), Masinloc CFTPP unit 3 (335 MW), and TPC Sangi CFTPP unit 1 (60 MW).

- In terms of outage type, forced outages accounted for about 71 percent of the season's outages, averaging 1,704 MW. Bulk of which involved Malaya TPP unit 1 (300 MW) and San Gabriel NGPP (420 MW) in addition to the above discussed coal plants which underwent forced outages.
- Planned outages during this season averaged at 478 MW.
- Deactivated shutdown purely involved geothermal plant Makban GPP unit 6 (55 MW) which was on forced outage since 11 April 2013.
- Palinpinon GPP II unit 4 (20 MW) ended its 6-year-long outage beginning 27 June 2014 on 2 November 2020.
- Aside from Makban GPP unit 6 and Palinpinon GPP II unit 4, other outages date back to as early as 2019 namely Makban GPP unit 5 (55 MW), Malaya TPP unit 1 (300 MW), and Tiwi GPP unit 1 (59 MW)
- Appendix B provides the details of the plant outages during the season which lasted for more than 5 days.

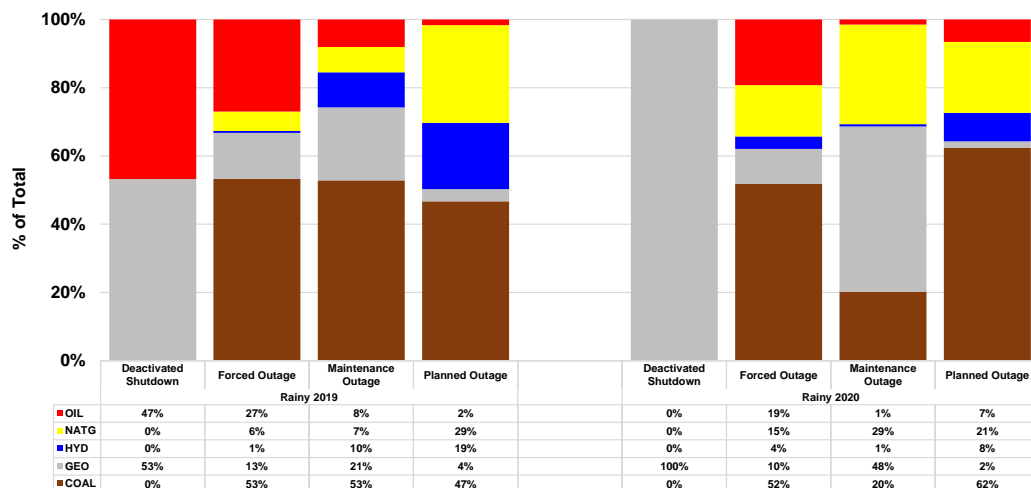


Figure 13. Outage Capacity by Plant Type

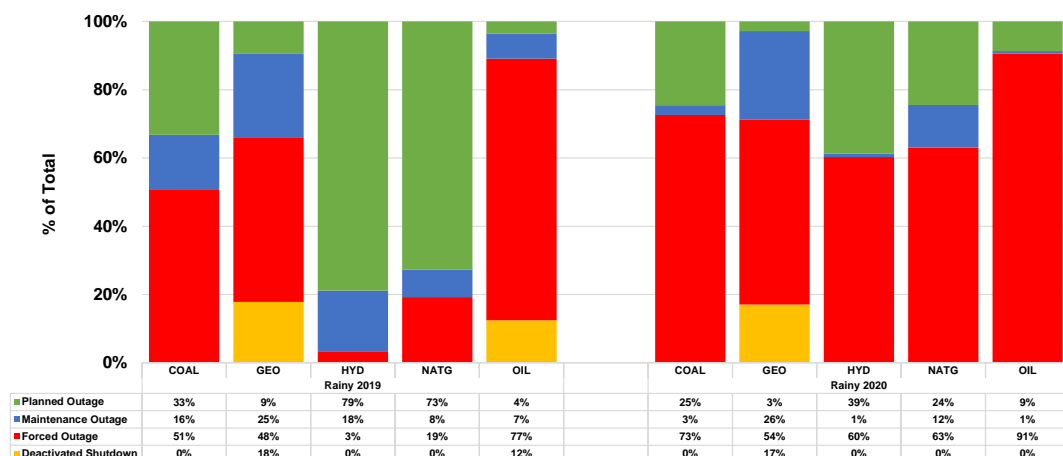


Figure 14. Outage Capacity by Outage Type

3. Demand¹¹

- The continuous implementation of the quarantine measures since March 2020 which aimed to combat the spread of the coronavirus disease also restricted economic activity which resulted in a lower demand from industrial and commercial activities. Although slight relaxation of quarantine measures to revive the businesses was observed this season, this year's demand was still lower than the 2019 records (Figure 15). Appendix A shows the summary of the quarantine declarations during the Rainy Season 2020.
- October and November billing months showed more notable decreases in year-on-year average demand which was partly attributable to the decrease in average temperatures.
- Contractions were tallied in the annual GDP growth rate at -16.9 percent for second quarter, -11.4 percent for third quarter, and at -8.3 percent for fourth quarter¹².

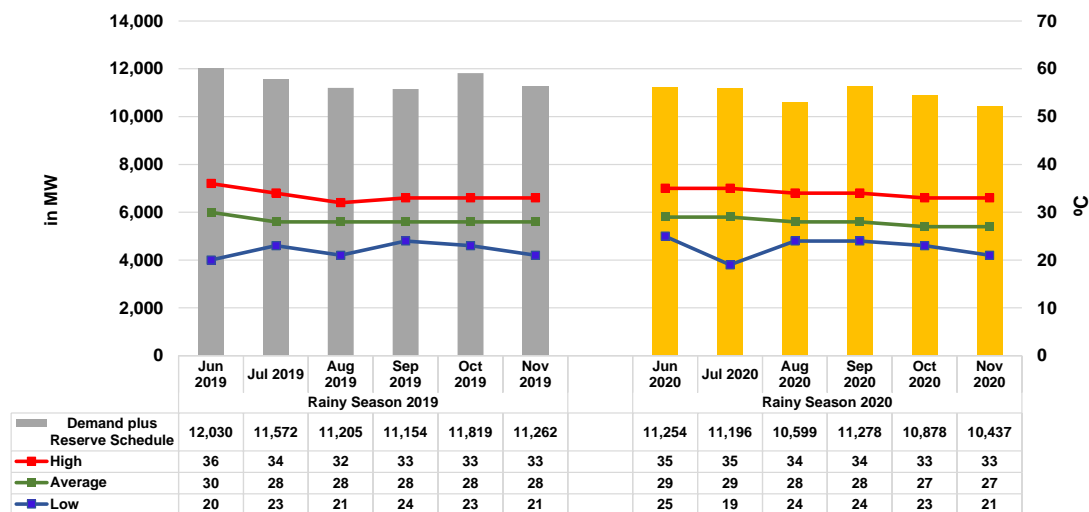


Figure 15. Demand and Temperature

- As seen in Figure 16, the demand generally climbed up starting at 0700H, peaked at 1100H and 1400H, and sloped down at 1700H (October and November) or 1800H (June, July, August, and September).
- June and July observed evening peaks at 2100H while September and October were recorded at 1900H.
- Year-on-year comparison of the demand profile showed a consistent decline all throughout the 24-hour period with a more prominent reduction from 1700H to 2000H (Figure 17).

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/>, "Philippine GDP posts -8.3 percent in the fourth Quarter 2020; -9.5 percent for full-year 2020"

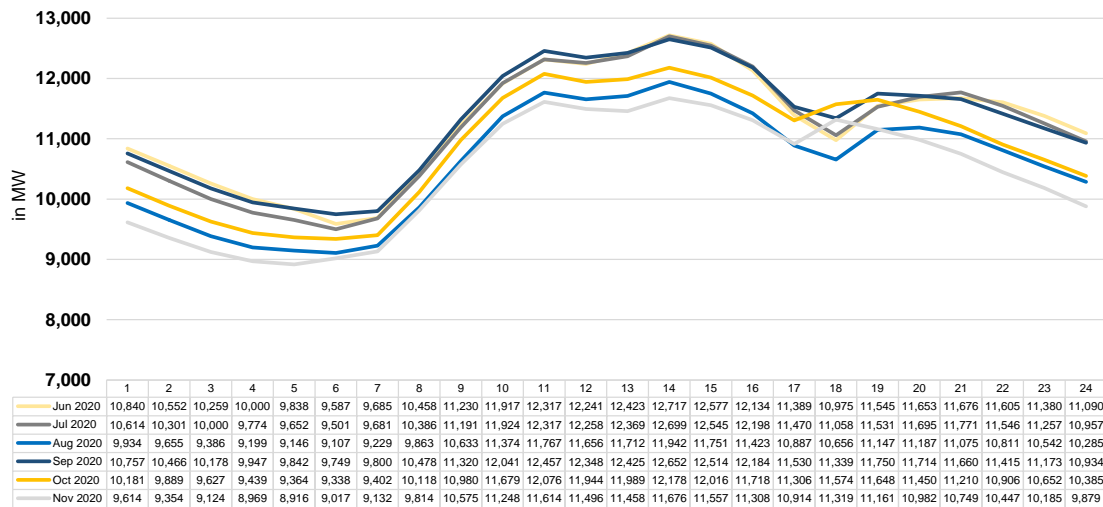


Figure 16. Monthly Demand Hourly Profile, Rainy Season 2020

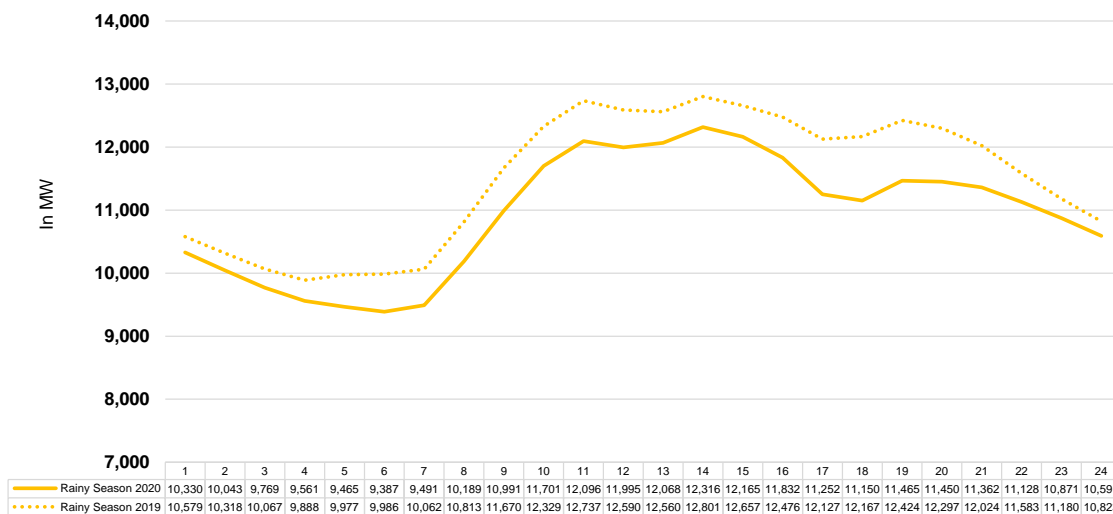


Figure 17. Demand Hourly Profile, Rainy Season 2020 and Rainy Season 2019

Part IV. Competitiveness Analysis

- 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 rainy season, pivotal suppliers were rarely recorded at mere 9 percent of the time compared to 29 percent in the previous year (Figure 18).

- The June 2019 billing month particularly recorded frequent presence of pivotal suppliers, at 69 percent of the time, while the same was kept at a minimum, at 12 percent, this June 2020 billing month.
- Meanwhile, the September 2020 billing month recorded the most frequent occurrence of pivotal suppliers setting prices at Php10,000/MWh and above for a total of 20 generator-trading intervals which majorly involved by Limay CCGT, Calumangan DPP, and Bauang DPP.

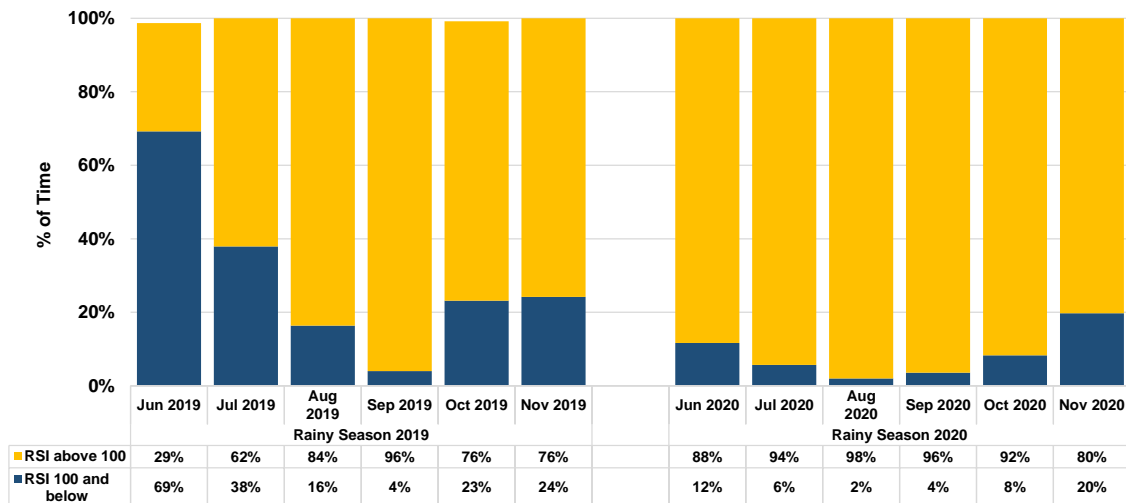


Figure 18. Residual Supply Index

- 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 19).
- Semirara Mining Power Corporation (SMPC) followed with only about 5 percent of the market share in registered capacity but with 28 percent share when measured in terms of spot quantity and 26 percent in terms of total trading amount denoting its heavy exposure to the market at about 57 percent during the rainy season.
- Similarly, PSALM obtained 19 percent of market share based on spot quantity and total trading amount given that 55 percent of its quantities were sold to the spot market.
- Meanwhile, SMC, and FGC recorded minimal spot exposures to the market at 3 percent and 6 percent, respectively, indicating bilateral contract coverage in most of their transactions. Correspondingly, their shares in terms of spot quantity and total trading were less than 10 percent amidst their significant share in terms of registered capacity.
- Corresponding to the market shares recorded, the Herfindahl-Hirschman Index (HHI)¹³ calculation indicated a moderately concentrated market when measured in terms of registered capacity, offered capacity, actual generation, spot quantities, and total trading amount (Figure 20).

¹³ 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.

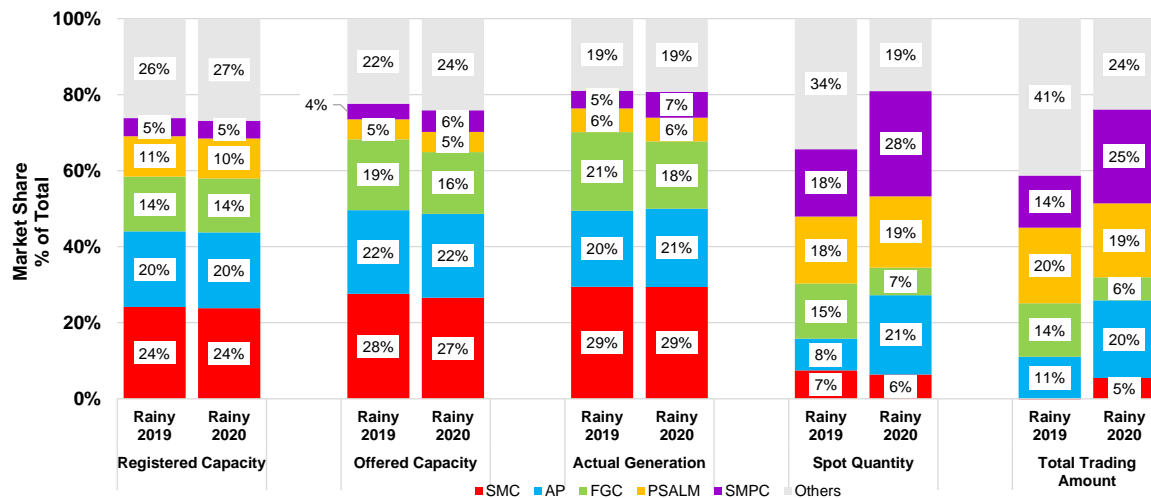


Figure 19. Market Share

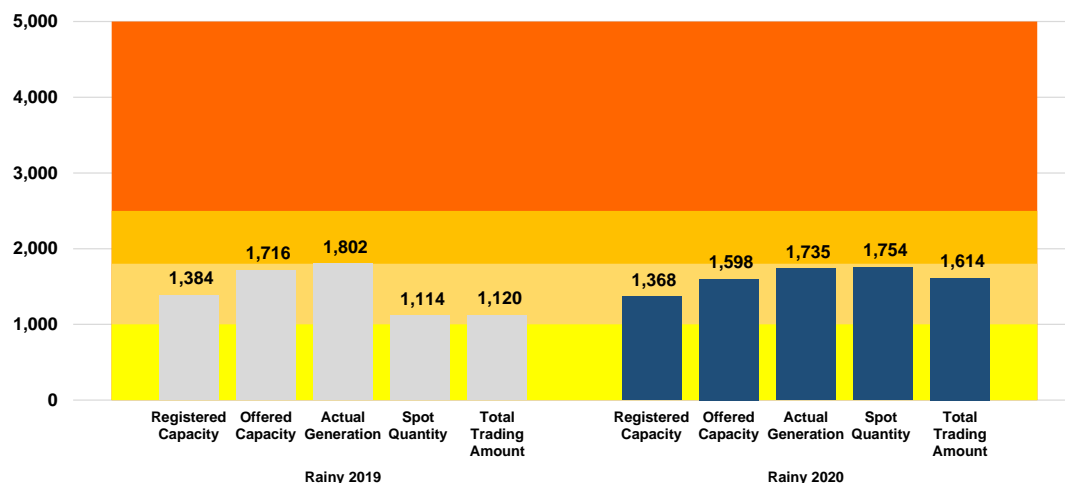


Figure 20. Herfindahl-Hirschman Index (HHI)

Part V. Generator Trading Behavior

- Difference Calculation¹⁴ 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 using the rainy season 2019 prices, and the *Average Subject Price*, which is the weighted average price using rainy season 2020 prices, were calculated per trading interval 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

¹⁴ 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.

capacity. In line with this, the *Average Difference* as well as *Percent Difference* is not calculated if either the *Average Reference Price* or *Average Subject Price* is not available.

- The supply curve per plant type (Figures 21 to 25) is established by stacking all the offers of plants, excluding the minimum stable loading (Pmin), broken down to 1-MW block sizes, under the plant type arranged in monotonically increasing price for each trading interval. The hourly average supply curve is then calculated based on all the supply curves during the period per trading interval.

i. Difference Calculation by Plant Type

- Geothermal plants' offers were generally similar to previous year's pattern for the first 200 MW of its capacity. Offers for the succeeding capacities were lower this season compared to previous year (Figure 21).
- In terms of the hourly offer profile, offers during 0800H to 1600H, were lower this year than last year.

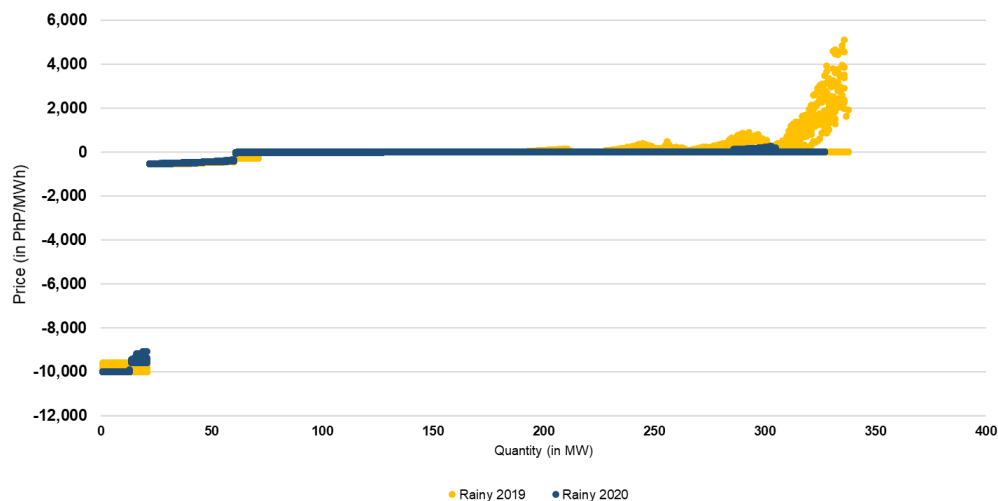


Figure 21. Average Supply Curve – Geothermal

- Coal plants' offers this rainy season were lower compared to the previous year (Figure 22).
- Significant decrease was noted from the 2,000th up to 3,500th MW in the supply curve.
- Higher level of capacity offered in the market was noted this year relative to the previous year's record.
- In terms of hourly offer profile, coal plants recorded lower offer prices across all trading intervals.

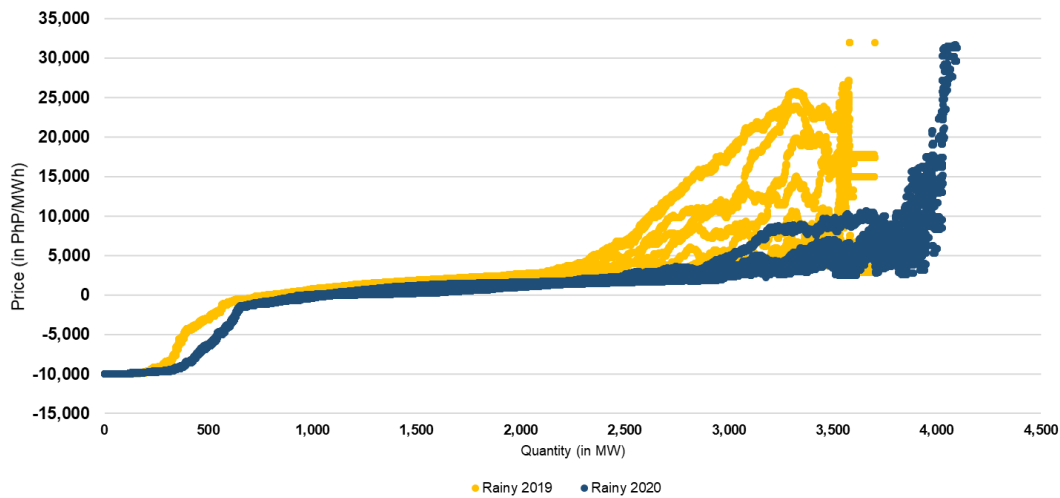


Figure 22. Average Supply Curve – Coal

- The first 200 MW of natural gas plants were offered at lower prices during this year's rainy season (Figure 23)
- Capacities at the 200th up to 1,400th MW were generally similar to previous year's pattern.
- Slight increase was noted for remaining offers above 1,400MW.
- Capacity offered in the previous year was evidently higher.
- Average offer prices this year was kept below PhP8,000/MWh coming from a high PhP30,000/MWh in 2019.

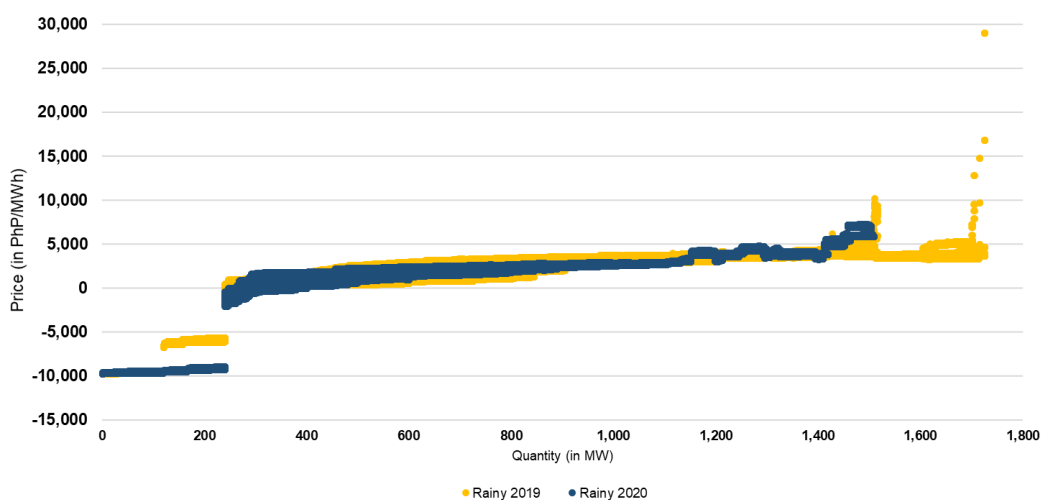


Figure 23. Average Supply Curve – Natural Gas

- Hydro plants demonstrated considerably higher offer prices this year quite significantly more visible at capacities above 1,200MW (Figure 24).
- In terms of hourly offer pattern, year-on-year increase was observed throughout the 24-hour profile.

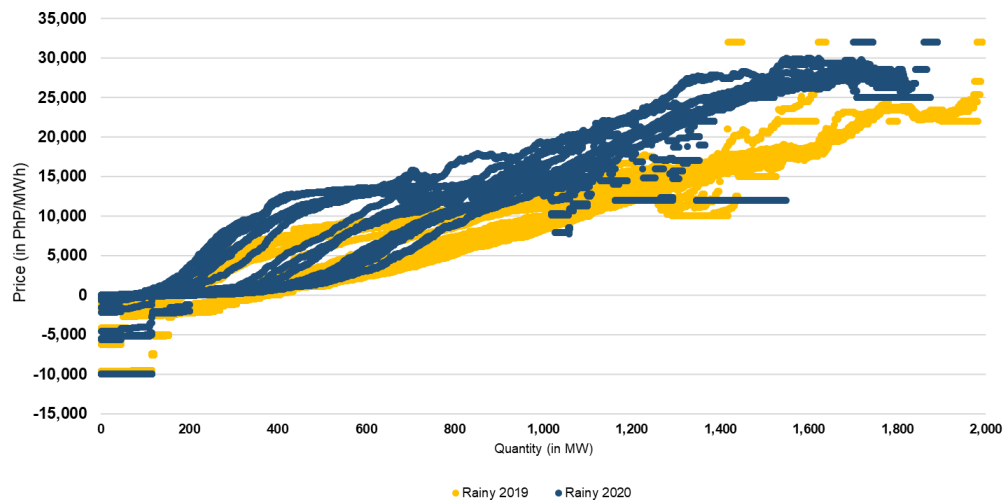


Figure 24. Average Supply Curve – Hydro

- Offer prices for the first 600 MW of oil-based plants showed a year-on-year increase with a more drastic shift at the first 200 MW of the supply curve (Figure 25).
- It may also be noted that the oil-based plants' offers were fixed regardless of the trading interval.

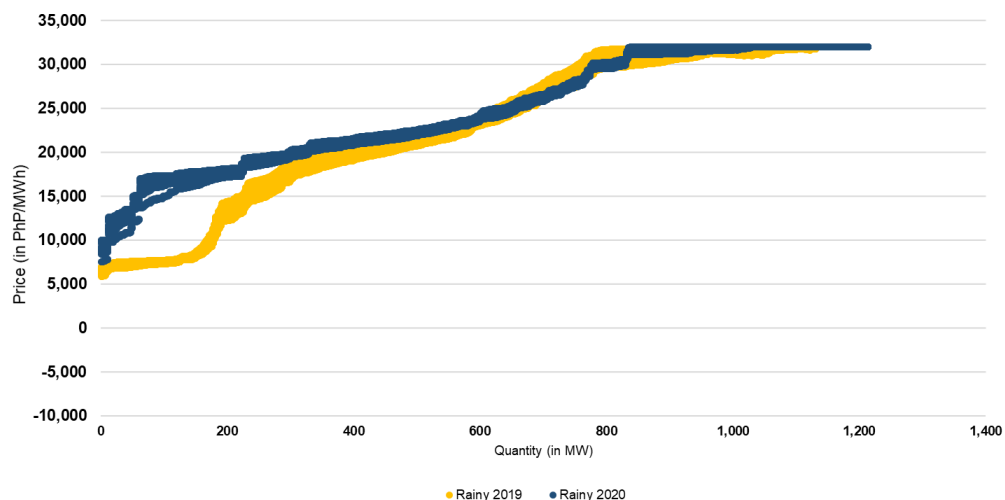


Figure 25. Average Supply Curve – Oil-based

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.
- Five (5) plants demonstrated bid splitting in their offer strategy during the season in a total of 461 occurrences. In the previous year, when supply margin was tighter, 14 plants had the similar strategy in 2,844 occurrences.

Part VI. Spot Market Transactions

- While the total metered quantity showed a slight decrease, the total spot quantity was almost unchanged year-on-year.
- In terms of percentage, notably higher spot market exposure was noted in June and July billing months (Figure 26). Similarly, the entire rainy season 2020 recorded higher spot exposure at 14 percent compared to 13 percent in 2019.

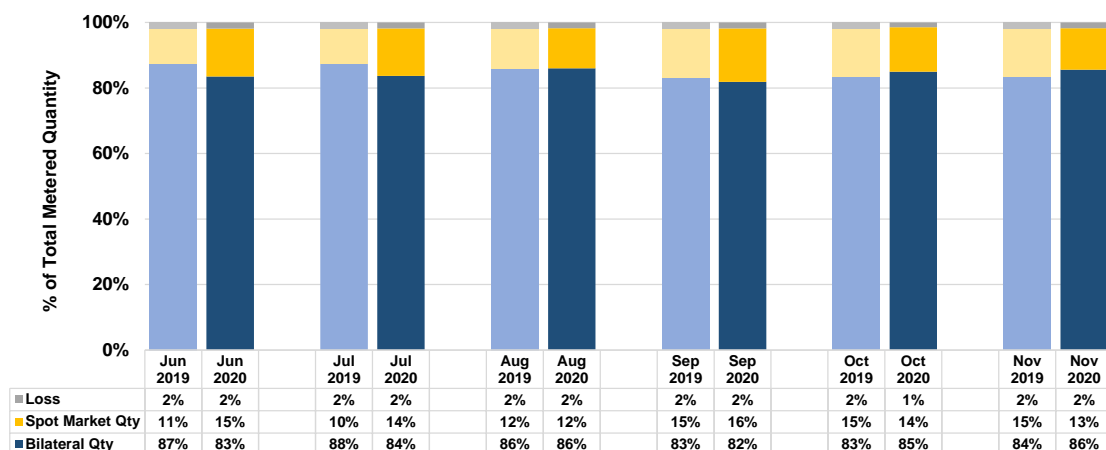


Figure 26. Spot Market Exposure

- In a general, a year-on-year increase in spot exposure was noted in all the hours throughout the day at a more significant rise from 0100H to 0900H and 1800H. (Figure 27)
- Despite the more substantial decrease in LWAP during peak hours, spot exposure during said period were almost unchanged.

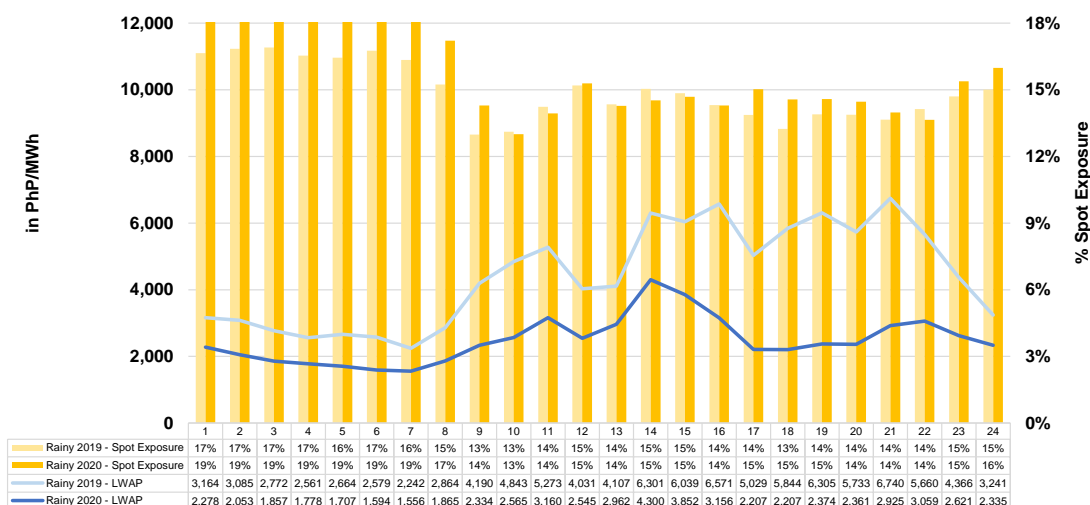


Figure 27. Hourly Spot Market Exposure and Market Price

- Around 98 percent of the spot quantities (per generator per trading interval) were below 200 MWh (Figure 28).

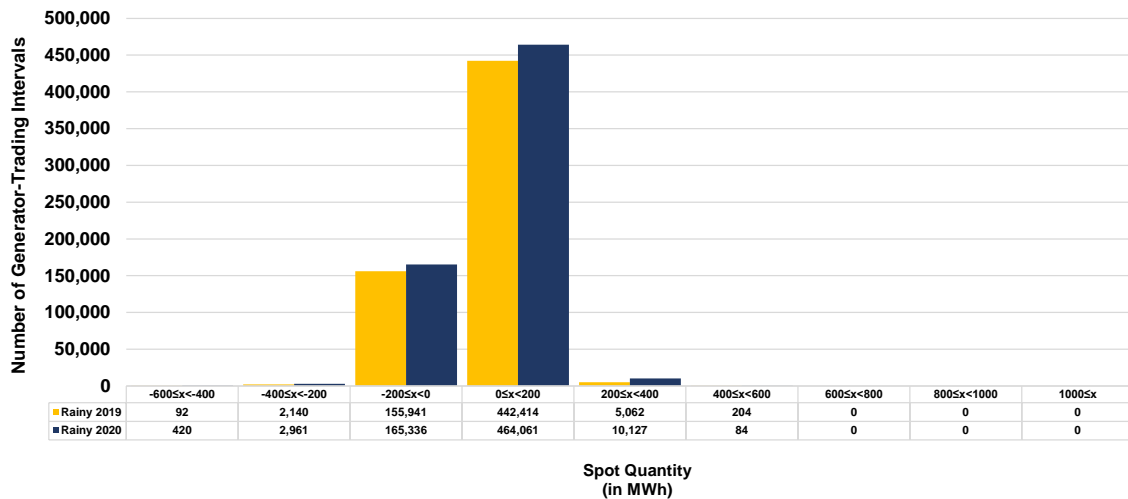


Figure 28. Spot Quantity Frequency Distribution

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 69.4 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 9.4 percent of the registered capacity.
- Resource constraints, which mostly involved geothermal, solar, and hydro plants, accounted for 8.8 percent.
- Registered capacity of plants which underwent Testing and Commissioning accounted for 4.6 percent.
- Only 0.04 percent of the registered capacity were non-compliant and were not justified. These instances will be issued with Request for Investigation (RFI).



Figure 29. Compliance Monitoring per Resource Type

Appendix A. Quarantine Declaration

Period Covered	Quarantine Declaration			
	ECQ	MECQ	GCQ	MGCQ
16 to 31 May ¹⁵		Metro Manila, Laguna, and Cebu City		
1 to 15 June ¹⁶			NCR, Davao, Region II, Region III, Region IVA and Albay	
16 to 30 June ¹⁷	Cebu City	Talisay City, Cebu	<p>NCR</p> <p>Region II: Isabela, Nueva Vizcaya, Quirino, and Santiago City</p> <p>Region III: Aurora, Bataan, Bulacan, Tarlac, Olongapo City</p> <p>Region IV: Cavite, Laguna, Batangas, Rizal, Quezon and Occidental Mindoro</p> <p>Region VII: Bohol, Cebu, Negros Oriental, Siquijor, Mandaue City, Lapu-Lapu City</p> <p>Mindanao: Zamboanga City and Davao City</p>	Remaining parts of the country
1 to 15 July ¹⁸			<p>National Capital Region, Benguet, Cavite, Rizal, Lapu-Lapu City, Mandaue City, Leyte, Ormoc, Southern Leyte as well as Talisay City, Minglanilla and Consolacion in Cebu province</p>	<p>CAR: Abra, Baguio, Ifugao, Kalinga</p> <p>Region I: Ilocos Norte, La Union, Pangasinan</p> <p>Region II: Cagayan, Isabela</p> <p>Region III: Bataan, Bulacan, Nueva Ecija, Pampanga, Angeles City</p> <p>Region IV: Batangas, Laguna, Quezon, Lucena City Palawan, Puerto Princesa City</p> <p>Region V: Albay, Camarines Norte, Camarines Sur, Naga City</p> <p>Region VI: Capiz, Iloilo, Iloilo City, Negros Occidental, Bacolod City.</p> <p>Cebu province (except Cebu City, Talisay City, Minglanilla and Consolacion), Bohol, Tacloban City and Negros Oriental</p>

¹⁵ https://pcoo.gov.ph/news_releases/palace-releases-mecq-details/
¹⁶ https://pcoo.gov.ph/news_releases/prrd-places-metro-manila-under-gcq-starting-june-1/
¹⁷ https://pcoo.gov.ph/news_releases/president-duterte-extends-gcq-in-ncr-puts-cebu-city-under-ecq/
¹⁸ https://pcoo.gov.ph/news_releases/metro-manila-remains-under-general-community-quarantine-until-july-15/

Period Covered	Quarantine Declaration			
	ECQ	MECQ	GCQ	MGCQ
				Zamboanga, Bukidnon, Davao del Norte, Davao del Sur, Davao City, and Davao de Oro are also under MGCQ. Cotabato and South Cotabato (Soccsksargen); Agusan del Norte and Butuan (Caraga Region); and Lanao del Sur and Maguindanao (BARMM)
16 to 31 July ¹⁹			Metro Manila Laguna, Cavite, Rizal, Lapu-Lapu City, Mandaue City, Ormoc City, Southern Leyte, Zamboanga City, Butuan City, Agusan del Norte, and Basilan. Talisay, Minglanilla, and Concepcion in Cebu	<p>Benguet province, Baguio City (CAR); Ilocos Sur, Pangasinan, Ilocos Norte, La Union and Dagupan City (Ilocos Region); Cagayan, Isabela, and Nueva Vizcaya (Cagayan Valley Region); Bataan, Nueva Ecija, Pampanga, Bulacan, Tarlac, Zambales, Angeles City (Central Luzon);</p> <p>Batangas, Quezon, and Lucena City (Calabarzon); Oriental Mindoro, Occidental Mindoro, and Puerto Princesa City (Mimaropa); Albay, Masbate, Camarines Norte, Camarines Sur, Catanduanes, Sorsogon, and Naga City (Bicol Region).</p> <p>Iloilo, Negros Occidental, Capiz, Antique, Aklan, Guimaras, Iloilo City, and Bacolod City (Western Visayas); Negros Oriental, Bohol, and Cebu Province (Central Visayas); Western Samar, Leyte, Biliran, and Tacloban City (Eastern Visayas)</p> <p>Zamboanga del Sur, Zamboanga Sibugay, and Zamboanga del Norte (Zamboanga Peninsula); Misamis Occidental, Bukidnon, Lanao del Norte, Cagayan de Oro City, and Iligan City (Northern Mindanao); Davao Oriental, Davao del Norte, Davao del Sur, Davao de Oro and Davao City (Davao Region); Sultan Kudarat, Cotabato, South Cotabato, and General Santos City</p>

¹⁹ https://pcoo.gov.ph/news_releases/metro-manila-remains-under-gcq-until-july-31/

Period Covered	Quarantine Declaration			
	ECQ	MECQ	GCQ	MGCQ
				(Soccsksargen); Agusan del Sur, Dinagat Island, Surigao del Norte, and Surigao del Sur (Caraga Region); and Lanao del Sur and Maguindanao (BARMM) The rest of the country
1 to 15 August ²⁰			National Capital Region, Bulacan, Batangas, Cavite, Laguna, and Rizal for Luzon ²¹ ; Lapu-Lapu City, Mandaue City, Talisay City, Minglanilla and Consolacion for the Visayas; and Zamboanga City for Mindanao.	Cebu City and the rest of the country
3 to 18 August ²²		National Capital Region and the provinces of Laguna, Cavite, Rizal and Bulacan		
16 to 31 August ²³		Tuguegarao City ²⁴ (26 August to 4 September) Catbalogan ²⁵ (19 August to 3 September)	National Capital Region and the provinces of Laguna, Cavite, Rizal and Bulacan ²⁶ Nueva Ecija, Batangas, Quezon, Iloilo City, Cebu City, Mandaue City, Lapu-Lapu City, Talisay City, towns of Minglanilla and Consolacion	Rest of the country
1 to 30 Sep ²⁷		Iligan City ²⁸ Catbalogan ²⁹ (4 to 20 September) Bacolod City and Lanao del Sur ³⁰ (8 to 30 September) Iloilo City ³¹ (25 September to 9 October)	Metro Manila, Bulacan, Batangas, Tacloban City, and Bacolod	Rest of the country
1 to 30 Oct ³²		Iligan City ³³ (6 to 16 October)	Metro Manila, Batangas, Tacloban City, Bacolod City, Iligan City, and Iloilo City	Lanao del Sur, including Marawi City, and the rest of the country
1 to 30 Nov			Metro Manila, Batangas, Tacloban City, Bacolod City, Iligan City, Iloilo City, Lanao del Sur	Rest of the country

²⁰ <https://cnnphilippines.com/news/2020/7/31/Metro-Manila-Cebu-City-general-community-quarantine-August.html>
²¹ Changed to MECQ for 1 to 18 August

²² https://pcoo.gov.ph/news_releases/metro-manila-put-under-stricter-mecq-for-two-weeks/
²³ <https://www.thesummitexpress.com/2020/08/palace-announces-gcq-mgcq-areas-august-16-31-2020.html>
²⁴ <https://www.cnn.ph/news/2020/8/25/Tuguegarao-city-10-day-MECQ.html>
²⁵ <https://www.pna.gov.ph/articles/1112869>
²⁶ <https://ptvnews.ph/metro-manila-now-in-gcq/>
²⁷ <https://newsinfo.inquirer.net/1329495/duterte-metro-manila-remains-under-gcq>
²⁸ <https://manilastandard.net/news/top-stories/332932/iligan-city-placed-under-stricter-lockdown-metro-manila-remains-under-gcq.html>
²⁹ <https://www.pna.gov.ph/articles/1114504>
³⁰ <https://www.cnnphilippines.com/news/2020/9/7/MECQ-in-Lanao-del-Sur-and-Bacolod-City-gets-IATF-nod.html>
³¹ <https://www.pna.gov.ph/articles/1116636>
³² <https://cnnphilippines.com/news/2020/9/28/PH-new-quarantine-classifications-October.html>
³³ <https://newsinfo.inquirer.net/1344614/mecq-imposed-on-iligan-city-kids-among-33-new-covid-19-patients>

Period Covered	Quarantine Declaration			
	ECQ	MECQ	GCQ	MGCQ
			Davao City ³⁴ (20 to 30 November) Laoag City ³⁵ (27 Nov to 11 December)	

³⁴ <https://www.sunstar.com.ph/article/1877454/Manila/Local-News/Davao-City-reverts-to-GCQ-as-infections-continue-rising>

³⁵ <https://news.abs-cbn.com/news/11/27/20/quarantine-lockdown-mecq-laoag-city-covid19-coronavirus-response>

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
VISAYAS	GEO	PGPP2 Unit 4	FGC	20	06/27/2014 6:07	11/02/2020 20:11	2320.59	Forced Outage	Steam being utilized by Nasulo plant	Aug 1983
LUZON	GEO	Makban 5	AP	55	02/08/2019 16:08	09/14/2020 20:59	584.20	Forced Outage	Low Steam Supply. Divert Steam Supply to unit 3	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
LUZON	GEO	Tiwi 1	AP	59	10/31/2019 23:54	05/27/2020 0:01	208.00	Forced Outage	Low steam supply. Divert steam supply to unit 2	Jan 1979
VISAYAS	COAL	TPC Sangi 1	GBPC	60	12/17/2019 6:05			Forced Outage	Generator differential trip	Dec 2013
VISAYAS	SOLR	Islasol 3	AC	40.5	01/29/2020 18:14	08/30/2020 15:45	213.90	Planned Outage	69kV Cadiz-ISLASOL III Sub TL de-energized per ISLASOL III request (PANR NEGROS)	Mar 2016
VISAYAS	GEO	Mahanagdong A1	PSALM	5	02/04/2020 0:11	06/28/2020 10:09	145.42	Forced Outage	Annual PMS of 230kV bus bar.	Jul 1997
VISAYAS	GEO	Upper Mahiao 2	PSALM	32	02/14/2020 16:04	08/06/2020 1:07	173.38	Forced Outage	cut-in to the system	Jul 1997
LUZON	COAL	SLPGC 2	SMPC	150	02/19/2020 23:57	06/11/2020 4:23	112.18	Planned Outage	Maintenance outage.	Jan 2015
LUZON	COAL	SMC 3	SMC	150	03/10/2020 23:35	05/26/2020 16:56	76.72	Planned Outage	Maintenance outage.	Nov 2017
VISAYAS	GEO	Upper Mahiao 3	PSALM	32	03/24/2020 0:11	07/20/2020 21:56	118.91	Forced Outage	Reserved shutdown	Jul 1997
LUZON	COAL	Masinloc 3	SMC	335	03/24/2020 0:34	07/20/2020 8:42	118.34	Forced Outage	To facilitate repair on HP heater and induced draft fan. On commissioning test	Mar 2019
VISAYAS	COAL	CEDC 2	GBPC	82	05/11/2020 0:34	05/30/2020 19:34	19.79	Planned Outage	APMS	Jun 2010
VISAYAS	BIOF	VMC	VMC	34	05/12/2020 4:04	06/14/2020 6:14	33.09	Forced Outage	Offline due to low steam pressure	Nov 2015
VISAYAS	OIL	Bohol 3	SPC	4.2	05/14/2020 14:56	06/10/2020 17:37	27.11	Forced Outage	Auto-tripped due to excitation failure	Sep 1978
VISAYAS	BIOF	URC 1	URC	40	05/15/2020 2:41	09/18/2020 13:06	126.43	Forced Outage	Offline due to boiler problem	Dec 2014
LUZON	HYD	Angat M 2	SMC	50	05/16/2020 0:01	05/29/2020 0:01	13.00	Planned Outage	Maintenance Outage until 30 May 2020	Oct 1967
LUZON	COAL	Pagbilao 2	AP	382	05/16/2020 5:43	05/26/2020 22:44	10.71	Forced Outage	Tripped at 120MW load. System frequency at 59.32hz.	Mar 1996
LUZON	COAL	Calaca 2	SMPC	300	05/18/2020 2:20	05/29/2020 13:21	11.46	Forced Outage	Tripped at 150MW load. System Frequency at 59.46hz.	Sep 1984
VISAYAS	BIOF	URC 2	URC	40	05/20/2020 12:59	06/01/2020 12:06	11.96	Forced Outage	Offline due to navailability of Bagazze and repair of Boiler	Dec 2014
VISAYAS	OIL	Bohol 4	SPC	4	05/20/2020 14:16	06/01/2020 15:04	12.03	Forced Outage	Generator fault.	Sep 1978
LUZON	COAL	Pagbilao 1	AP	382	05/20/2020 18:44	06/03/2020 3:01	13.35	Forced Outage	Due to loss of field excitation (AVR problem)	Mar 1996
LUZON	COAL	SBPL	MGEN	455	05/23/2020 0:29	06/05/2020 7:10	13.28	Maintenance Outage	Maintenance Outage until 03 June 2020	Apr 2019
LUZON	COAL	SMC 1	SMC	150	05/25/2020 2:19	06/05/2020 21:14	11.79	Forced Outage	Emergency shutdown to rectify hotspot at Lamao Substation and repair of coal feeder	Nov 2016
LUZON	GEO	MGPP 2	AC	12	05/25/2020 15:46	06/04/2020 1:25	9.40	Forced Outage	Emergency shutdown to conduct trouble-shooting of main control valve.	Dec 2017
LUZON	GEO	Tiwi 1	AP	60	05/27/2020 0:02			Forced Outage	Low steam supply. Divert steam supply to unit 2	Jan 1979
VISAYAS	GEO	Upper Mahiao 4	PSALM	32	05/29/2020 0:01	07/27/2020 0:14	59.01	Forced Outage	Loss of power Servo Position Controller	Jul 1997
VISAYAS	GEO	Leyte 3	FGC	40.2	05/31/2020 1:27	08/03/2020 0:27	63.96	Forced Outage	completed repair of steam scrubber inlet pipeline leak.	Jun 1983
VISAYAS	BIOF	FFHC	Other IPPs	9	06/01/2020 0:10	06/13/2020 10:32	12.43	Maintenance Outage	Offline for weekly maintenance	Feb 2009
VISAYAS	COAL	TPC Sangi 2	GBPC	85	06/01/2020 0:50	06/24/2020 11:20	23.44	Planned Outage	UNIT CUT-OUT FROM THE SYSTEM. ANNUAL PMS	Dec 2013
LUZON	GEO	Bacman 3	FGC	20	06/04/2020 18:52	06/10/2020 19:42	6.03	Forced Outage	Control valve trouble.	Sep 1993
VISAYAS	COAL	THVI 2	AP	169	06/10/2020 11:04	06/20/2020 16:27	10.22	Forced Outage	TURBINE VIBRATION	Dec 2017
LUZON	NATG	San Lorenzo 1	FGC	264.8	06/10/2020 17:35	06/28/2020 0:42	17.30	Maintenance Outage	Maintenance outage(GOP)	Sep 2002
LUZON	NATG	San Lorenzo 2	FGC	261.8	06/11/2020 1:29	06/27/2020 22:34	16.88	Maintenance Outage	Maintenance outage (GOP).	Sep 2002
LUZON	HYD	Kalayaan 1	PSALM	180	06/17/2020 8:49	08/09/2020 16:17	53.31	Forced Outage	Declared unavailable due to generator radiator water leak	Aug 1982
LUZON	COAL	Pagbilao 1	AP	382	06/21/2020 0:31	07/18/2020 2:56	27.10	Planned Outage	Maintenance outage until 7.20.2020	Mar 1996
LUZON	HYD	Kalayaan 4	PSALM	180	06/23/2020 0:01	07/02/2020 23:59	10.00	Planned Outage	Maintenance Outage until 02 July 2020	May 2004
VISAYAS	COAL	CEDC 2	GBPC	82	06/24/2020 4:43	06/29/2020 6:46	5.09	Forced Outage	SUSPECTED BOILER TUBE LEAK	Jun 2010
LUZON	NATG	Sta. Rita 4	FGC	264	07/11/2020 2:42	07/16/2020 22:53	5.84	Planned Outage	Annual minor inspection and maintenance	Oct 2001
VISAYAS	COAL	THVI 1	AP	169	07/13/2020 10:37	07/24/2020 4:18	10.74	Forced Outage	Suspected Boiler Tube Leak	Dec 2017
LUZON	COAL	SLTEC 1	AC	121	07/16/2020 14:15	07/25/2020 1:31	8.47	Forced Outage	Emergency shutdown due to boiler tube leak	Sep 2014
LUZON	NATG	San Gabriel	FGC	420	07/18/2020 0:45	07/23/2020 19:27	5.78	Planned Outage	Maintenance outage until 13 Sep 2020	Mar 2016
LUZON	COAL	GN Power 2	AP	316	07/18/2020 19:32	07/30/2020 20:18	12.03	Forced Outage	Tripped due to boiler tube leak.	May 2013
LUZON	OIL	Limay 6	MEI	60	07/19/2020 9:06	09/18/2020 8:56	60.99	Forced Outage	Generator excitation problem	Dec 1994
LUZON	COAL	Masinloc 1	SMC	315	07/20/2020 12:59	10/11/2020 3:12	82.59	Planned Outage	Maintenance Outage until 13 September 2020	Jun 1998
VISAYAS	GEO	Upper Mahiao 3	PSALM	32	07/22/2020 17:01			Maintenance Outage	Trip with Loss of Excitation. Economic Shutdown	Jul 1997
LUZON	COAL	Pagbilao 2	AP	382	07/22/2020 17:22	08/21/2020 22:41	30.22	Planned Outage	Maintenance outage (GOP)	Mar 1996
LUZON	OIL	SLPGC 4	SMPC	25	07/23/2020 0:01	08/01/2020 16:39	9.69	Forced Outage	Generator Circuit Breaker trouble.	Mar 2017
VISAYAS	GEO	Upper Mahiao 4	PSALM	32	07/27/2020 0:15	10/01/2020 0:09	66.00	Forced Outage	Emergency repair due to steam leak	Jul 1997
LUZON	COAL	SLTEC 1	AC	121	07/27/2020 15:24	08/23/2020 18:26	27.13	Forced Outage	Boiler tube leak	Sep 2014
VISAYAS	COAL	THVI 1	AP	169	07/28/2020 11:18	08/02/2020 14:45	5.14	Forced Outage	AFFECTED BY TRIPPING OF CEDC - CALUNG2X L1	Dec 2017
VISAYAS	OIL	Bohol 3	SPC	4.2	07/28/2020 13:23	08/05/2020 13:10	7.99	Forced Outage	Emergency cut-out from the system due to defective cooling fan motor.	Sep 1978
LUZON	COAL	GN Power 1	AP	316	07/31/2020 13:26	08/09/2020 4:47	8.64	Forced Outage	Autotripped due to loss of power supply at 6kV bus.	May 2013
LUZON	COAL	SLPGC 2	SMPC	150	08/05/2020 16:46	09/02/2020 4:48	27.50	Forced Outage	Boiler tube leak.	Jan 2015
VISAYAS	GEO	Upper Mahiao 2	PSALM	32	08/06/2020 1:08	10/01/2020 0:10	55.96	Forced Outage	Turbine over speed failure	Jul 1997
LUZON	COAL	Pagbilao 1	AP	382	08/10/2020 1:26	08/15/2020 22:52	5.89	Forced Outage	Reason still to be determined	Mar 1996
LUZON	HYD	Casencan 2	PSALM	82.5	08/12/2020 3:53	08/17/2020 13:23	5.40	Forced Outage	High Oil Temperature at turbine side	Apr 2002
VISAYAS	OIL	PDPP3 C	SPC	12	08/15/2020 16:44	08/21/2020 12:13	5.81	Forced Outage	Affected by line disturbance	Mar 2005
VISAYAS	OIL	PDPP3 H	SPC	13	08/15/2020 16:44	08/21/2020 12:20	5.82	Forced Outage	Affected by line disturbance	Mar 2005
LUZON	COAL	SLPGC 1	SMPC	150	08/15/2020 18:59	09/17/2020 21:07	33.09	Forced Outage	Boiler tube leak.	Jan 2015
LUZON	GEO	Makban 2	AP	63.2	08/19/2020 3:27	09/25/2020 8:47	37.22	Maintenance Outage	Unit main transformer maintenance.	Apr 1979
LUZON	COAL	SMC 3	SMC	150	08/19/2020 10:18	08/29/2020 2:04	9.66	Forced Outage	Boiler evaporator leak.	Nov 2017
LUZON	OIL	Limay 7	MEI	60	08/22/2020 0:01	08/28/2020 14:01	6.58	Planned Outage	On maintenance outage until 28 Aug 2020.	Dec 1994
LUZON	GEO	Bacman 1	FGC	20	08/22/2020 0:05	09/10/2020 13:16	19.55	Planned Outage	Maintenance Outage until 09 September 2020(RECLASSIFIED FROM FORCE. OMC)	Sep 1993
LUZON	COAL	Sual 1	SMC	647	08/24/2020 20:28	08/30/2020 7:51	5.47	Forced Outage	Boiler tube leak.	Oct 1999
LUZON	COAL	SBPL	MGEN	455	08/25/2020 17:17	09/11/2020 5:23	16.50	Forced Outage	Condenser tube leak.	Apr 2019
LUZON	COAL	SMC 2	SMC	150	08/26/2020 8:30	09/05/2020 19:23	10.45	Forced Outage	Tripped due to high furnace pressure.	Mar 2017
VISAYAS	COAL	Keppo Salcon 2	SPC	103	08/29/2020 0:02	09/15/2020 4:26	17.18	Planned Outage	UNIT CUT-OUT FROM THE SYSTEM TO FACILITATE ANNUAL PMS	Mar 2011
VISAYAS	COAL	CEDC 2	GBPC	82	08/29/2020 8:54	09/08/2020 15:25	10.27	Forced Outage	POSSIBLE BOILER TUBE LEAK	Jun 2010
LUZON	NATG	Sta. Rita 2	FGC	255.7	09/05/2020 4:02	10/20/2020 9:59	45.25	Planned Outage	On planned outage.	Jun 2000
LUZON	NATG	San Gabriel	FGC	420	09/05/2020 17:14			Forced Outage	Tripped at 211MW load. System Frequency is 59.401hz.	Mar 2016
VISAYAS	OIL	TPVI 5	AP	6.8	09/05/2020 23:31	10/22/2020 15:26	46.66	Forced Outage	DUE TO LOW STEAM PRESSURE	Aug 1977
VISAYAS	GEO	Upper Mahiao 1	PSALM	32	09/13/2020 21:16	10/01/2020 0:09	17.12	Forced Outage	Voltage regulation offline trip	Jul 1997
LUZON	OIL	Limay 3	MEI	60	09/14/2020 0:01	11/20/2020 12:01	67.50	Planned Outage	Maintenance Outage until 28 October 2020	May 1993
LUZON	COAL	Sual 2	SMC	647	09/16/2020 14:45			Forced Outage	Tripped due to high turbine vibration	Oct 1999
VISAYAS	BIOF	URC 2	URC	40	09/18/2020 22:01	09/29/2020 7:03	10.38	Maintenance Outage	Offline due to scheduled maintenance	Dec 2014
VISAYAS	GEO	Leyte 2	FGC	39.3	09/19/2020 1:58			Maintenance Outage	Corrective maintenance. data gathering for the high vibration (0200H-0600H)	Jun 1983
VISAYAS	GEO	PGPP1 Unit 2	FGC	37.5	09/19/2020 23:40	10/16/2020 12:33	26.54	Maintenance Outage	Offline due to scheduled maintenance.	Aug 1983

Region	Plant Type	Plant/ Unit Name	Major Participant Group	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks	Date Commissioned/ Commercial Operation
VISAYAS	GEO	PGPP1 Unit 1	FGC	37.5	09/19/2020 23:47			Maintenance Outage	Offline due to scheduled maintenance.	Aug 1983
VISAYAS	GEO	PGPP1 Unit 3	FGC	37.5	09/19/2020 23:48	10/16/2020 4:15	26.19	Maintenance Outage	Offline due to scheduled maintenance.	Aug 1983
VISAYAS	OIL	Bohol 1	SPC	4	09/24/2020 20:47	09/30/2020 12:32	5.66	Forced Outage	Failure of turbo charger.	Sep 1978
VISAYAS	GEO	Upper Mahiao 1	PSALM	32	10/01/2020 0:10	10/10/2020 12:28	9.51	Planned Outage	Scheduled PMS by the customer	Jul 1997
VISAYAS	GEO	Upper Mahiao 4	PSALM	32	10/01/2020 0:10	10/13/2020 15:24	12.63	Planned Outage	Scheduled PMS by the customer	Jul 1997
VISAYAS	GEO	Upper Mahiao 2	PSALM	32	10/01/2020 0:11	10/13/2020 15:24	12.63	Planned Outage	Scheduled PMS by the customer	Jul 1997
LUZON	OIL	Limay 2	MEI	60	10/03/2020 0:02	10/11/2020 11:10	8.46	Planned Outage	Hotgas Inspection	May 1993
LUZON	OIL	TMO Unit 2	AP	49	10/10/2020 0:16	10/16/2020 16:01	6.66	Planned Outage	GOP.	Nov 2013
VISAYAS	GEO	Mahanagdong B1	PSALM	5	10/13/2020 0:20	10/25/2020 18:09	12.74	Maintenance Outage	To facilitate minor non-standard PMS.	Jul 1997
LUZON	COAL	Calaca 2	SMPC	300	10/16/2020 16:36	11/04/2020 15:36	18.96	Forced Outage	Boiler Tube Leak.	Sep 1984
VISAYAS	COAL	THVI 1	AP	169	10/16/2020 19:35	10/23/2020 8:36	6.54	Forced Outage	TRIPPED. UNDER ASSESSMENT	Dec 2017
VISAYAS	COAL	THVI 2	AP	169	10/21/2020 3:56	10/28/2020 1:28	6.90	Forced Outage	Under assessment	Dec 2017
LUZON	GEO	Makban 5	AP	55	10/21/2020 8:19	10/29/2020 4:55	7.86	Maintenance Outage	Maintenance Outage	Apr 1979
VISAYAS	GEO	Leyte 1	FGC	41	10/23/2020 0:38	11/22/2020 23:03	30.93	Maintenance Outage	Repair leaking steam line	Jun 1983
LUZON	GEO	Makban 2	AP	63.2	10/23/2020 12:20	11/05/2020 21:23	13.38	Forced Outage	Excessive oil leak at main oil pump	Apr 1979
LUZON	COAL	SLTEC 2	AC	122.9	10/23/2020 23:05	11/23/2020 6:13	30.30	Forced Outage	Coal feeder trouble (chute leak)	Aug 2015
VISAYAS	BIOF	SCBE	Other IPPs	7.4	10/31/2020 9:49	11/09/2020 8:10	8.93	Forced Outage	Auto-tripped due to phase imbalance along Escalante-San Carlos 69KV line section	Feb 2009
LUZON	GEO	Bacman 3	FGC	20	10/31/2020 20:11	11/08/2020 13:03	7.70	Forced Outage	Shutdown as contingency measures for incoming Typhoon ROLLY	Sep 1993
LUZON	GEO	Tiwi 5	AP	57	10/31/2020 20:11			Forced Outage	On houseload operation as contingency measures for incoming Typhoon ROLLY	Jan 1979
LUZON	COAL	SLPGC 1	SMPC	150	10/31/2020 21:25	11/16/2020 13:49	15.68	Forced Outage	Emergency shutdown due to boiler tube leak.	Jan 2015
LUZON	GEO	Bacman 2	FGC	60	10/31/2020 22:32	11/06/2020 14:24	5.66	Forced Outage	On houseload operation as contingency measures for incoming Typhoon ROLLY	Sep 1993
LUZON	GEO	Bacman 1	FGC	60	11/01/2020 2:12	11/10/2020 23:01	9.87	Forced Outage	Shutdown as contingency measures for incoming Typhoon ROLLY	Sep 1993
LUZON	GEO	Tiwi 2	AP	60	11/01/2020 3:33			Forced Outage	On houseload operation as contingency measures for incoming Typhoon ROLLY	Jan 1979
LUZON	GEO	Tiwi 6	AP	57	11/01/2020 5:58			Forced Outage	On houseload operation as contingency measures for incoming Typhoon ROLLY	Jan 1979
LUZON	HYD	Pantabangan 1	FGC	60	11/02/2020 0:01	11/14/2020 15:56	12.66	Planned Outage	Maintenance Outage until 30 November 2020.	Dec 2009
LUZON	HYD	Pantabangan 2	FGC	60	11/02/2020 0:01	11/20/2020 17:30	18.73	Planned Outage	Maintenance Outage until 30 November 2020.	Dec 2010
VISAYAS	COAL	THVI 2	AP	169	11/05/2020 20:23	11/11/2020 2:30	5.25	Forced Outage	EMERGENCY SHUTDOWN DUE TO COAL FORWARDING BELT PROBLEM	Dec 2017
LUZON	OIL	TMO Unit 4	AP	46.8	11/05/2020 23:40	11/13/2020 17:37	7.75	Maintenance Outage	Annual Switchyard PMS.	Nov 2013
LUZON	HYD	Kalayaan 2	PSALM	180	11/10/2020 0:01	11/20/2020 0:01	10.00	Planned Outage	Maintenance Outage until 19 November 2020.	Aug 1982
VISAYAS	SOLR	Cadiz	GAI	108.1	11/10/2020 4:20			Forced Outage	Isolated due to shutdown of 138kV Bacolod-Cadiz TL	Feb 2016
VISAYAS	SOLR	Isolasol 3	AC	40.5	11/10/2020 4:20			Forced Outage	Isolated due to shutdown of 138kV Bacolod-Cadiz TL	Mar 2016
LUZON	GEO	Makban 8	AP	20	11/14/2020 8:24			Forced Outage	Defective cooling tower fan	Apr 1979
VISAYAS	COAL	PALM 1	PCPC	135	11/17/2020 14:18	11/23/2020 9:01	5.78	Forced Outage	Turbine tripped	Mar 2016
VISAYAS	SOLR	San Carlos 2	SCSEI	19.8	11/21/2020 17:22			Forced Outage	Isolated. affected by tripping of 69KV Cadiz-San Carlos Sub TL	Sep 2015
LUZON	HYD	Kalayaan 3	PSALM	180	11/24/2020 0:01			Planned Outage	Maintenance Outage	May 2004
VISAYAS	BIOF	VMC	VMC	34	11/24/2020 18:09			Forced Outage	Isolated due to tripping of NONECOs 15MVA Transformer(secondary side PCB) at	Nov 2015
LUZON	COAL	Masinloc 3	SMC	335	11/24/2020 20:20			Forced Outage	Excitation Trouble	Mar 2019
LUZON	COAL	Calaca 1	SMPC	300	11/25/2020 0:44			Planned Outage	Maintenance Outage until 09 Jan 2021	Sep 1984
LUZON	COAL	Pagbilao 3	AP	420	11/25/2020 15:39			Forced Outage	Inspection and repair of governor valve	Jul 2017
LUZON	COAL	SLTEC 2	AC	122.9	11/25/2020 21:05			Forced Outage	Turbine bearing vibration high	Aug 2015

Appendix C. Details of ECO Compliance Monitoring

Region	Plant Type	Compliant	Ancillary Services	Co-Generation, MRU Designation, Pumped Storage, Security Limit, Station Use	Derating-Plant Equipment-Related Problem/Maintenance / Ambient Conditions	Other Causes	Outages	Plant Operations Related Constraint, Start-up/Shutdown Process, etc.	Resource Constraints	Testing and Commissioning	Transmission-Related Constraints	For Investigation	Grand Total
Luzon	Battery	100.0%											100.0%
	Biomass	44.7%					2.9%		5.6%	46.6%	0.2%		100.0%
	Coal	78.6%		0.7%	1.1%	0.1%	13.8%	1.0%		4.4%	0.2%		100.0%
	Geothermal	49.6%		0.2%	0.3%	1.7%	9.1%	0.1%	38.7%		0.3%		100.0%
	Hydro	44.9%	0.8%	2.1%		0.5%	4.0%	10.9%	34.7%	1.0%	1.1%		100.0%
	Natural Gas	86.2%		0.1%	0.3%	1.1%	10.7%	0.4%	1.0%	0.2%			100.0%
	Oil-Based	54.3%	1.2%	5.7%	1.0%	27.9%	5.5%	4.3%					100.0%
	Solar	29.4%							36.6%	33.9%			100.0%
	Wind	99.8%					0.2%						100.0%
Visayas	Battery									100.0%			100.0%
	Biomass	13.8%				0.3%			8.8%	77.1%			100.0%
	Coal	84.5%			0.4%	0.0%	13.8%	0.2%	0.0%		0.7%	0.3%	100.0%
	Geothermal	76.8%			0.3%	2.2%	3.7%		17.0%				100.0%
	Hydro	81.9%				0.1%			11.5%	6.4%		0.1%	100.0%
	Oil-Based	65.0%	3.8%		0.3%	4.3%	11.3%			15.3%			100.0%
	Solar	39.2%							48.7%	12.0%			100.0%
	Wind	100.0%											100.0%
Grand Total		69.4%	0.3%	1.1%	0.6%	3.3%	9.4%	2.2%	8.8%	4.6%	0.3%	0.04%	100.0%