



# Market Assessment Report for 1<sup>st</sup> Quarter of 2024

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26 December 2023 to 25 March 2024

**MAY 2024**

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

## Table of Contents

I.	Capacity Profile .....	3
II.	Power Plant Outages .....	5
III.	Demand and Supply Situation .....	7
IV.	Market Price Outcome .....	10
V.	Generator Offer Pattern.....	13
VI.	Market Pricing Conditions .....	16
VII.	Residual Supply .....	17
VIII.	Pivotal Suppliers .....	19
IX.	Capacity Factor .....	20
X.	Generation Mix.....	21
XI.	Market Concentration.....	22
XII.	Spot Exposure .....	23

## List of Figures

Figure 1.	Capacity Profile, 1 <sup>st</sup> Quarter 2024 .....	4
Figure 2.	Plant Outage Capacity (by Plant Type), 1 <sup>st</sup> Quarter 2024.....	6
Figure 3.	Plant Outage Capacity (by Outage Category), 1 <sup>st</sup> Quarter 2024.....	7
Figure 4.	Monthly Demand, Supply, Demand plus Reserve Schedule and Supply Margin, 1 <sup>st</sup> Quarter 2024 .....	8
Figure 5.	Market Price Trend vs. Supply Margin, 1 <sup>st</sup> Quarter 2024 .....	10
Figure 6.	Market Price Trend - Luzon, 1 <sup>st</sup> Quarter 2024 .....	11
Figure 7.	Market Price Trend - Visayas, 1 <sup>st</sup> Quarter 2024.....	11
Figure 8.	Market Price Trend - Mindanao, 1 <sup>st</sup> Quarter 2024.....	12
Figure 9.	Price Distribution, 1 <sup>st</sup> Quarter 2024 .....	13
Figure 10.	Coal Plants Offer Pattern – 1 <sup>st</sup> Quarter 2024 .....	14
Figure 11.	Natural Gas Plants Offer Pattern – 1 <sup>st</sup> Quarter 2024 .....	14
Figure 12.	Hydro Plants Offer Pattern – 1 <sup>st</sup> Quarter 2024.....	15
Figure 13.	Oil-based Plants Offer Pattern – 1 <sup>st</sup> Quarter 2024 .....	16
Figure 14.	Market RSI vs. Pivotal Suppliers, 1 <sup>st</sup> Quarter 2024.....	18
Figure 15.	Top Pivotal Suppliers, 1 <sup>st</sup> Quarter 2024 .....	19
Figure 16.	System Capacity Factor (Registered Capacity vs Actual Generation) – 1 <sup>st</sup> Quarter 2024.....	20
Figure 17.	System Capacity Factor Per Resource Type (Registered Capacity vs Actual Generation) – 1 <sup>st</sup> Quarter 2024.....	21
Figure 18.	Generation Mix (Based on Metered Quantity) – 4 <sup>th</sup> Quarter 2023 and 1 <sup>st</sup> Quarter 2024 .....	21
Figure 19.	Market Share by Major Participant Group based on Registered Capacity, Offered Capacity, Actual Generation, 4 <sup>th</sup> Quarter 2023 and 1 <sup>st</sup> Quarter of 2024 .....	22
Figure 20.	Hourly HHI based by Major Participant Grouping, 1 <sup>st</sup> Quarter 2024.....	23
Figure 21.	Spot Market Exposure, 1 <sup>st</sup> Quarter 2024 .....	23
Figure 22.	Hourly Profile of Spot Market Exposure, 1 <sup>st</sup> Quarter 2024 .....	24

## List of Tables

Table 1. Capacity Profile, 4 <sup>th</sup> Quarter 2023, and 1 <sup>st</sup> Quarter 2024 .....	4
Table 2. Monthly Capacity Profile, 1 <sup>st</sup> Quarter 2024 .....	4
Table 3. Outage Summary, 1 <sup>st</sup> Quarter 2024, and 4 <sup>th</sup> Quarter 2023 .....	6
Table 4. Monthly Outage Summary, 1 <sup>st</sup> Quarter 2024 .....	6
Table 5. Outage Summary, by Outage Category, 4 <sup>th</sup> Quarter 2023, and 1 <sup>st</sup> Quarter 2024.....	7
Table 6. Monthly Outage Summary, by Outage Category, 1 <sup>st</sup> Quarter 2024.....	7
Table 7. Demand and Supply Summary, 4 <sup>th</sup> Quarter 2023, and 1 <sup>st</sup> Quarter 2024.....	9
Table 8. Monthly Demand and Supply Summary, 1 <sup>st</sup> Quarter 2024.....	9
Table 9. Market Price Summary, 1 <sup>st</sup> Quarter 2024, and 4 <sup>th</sup> Quarter 2023.....	10
Table 10. Monthly Market Price Summary, 1 <sup>st</sup> Quarter 2024 .....	10
Table 11. Monthly Regional Price Summary, 1 <sup>st</sup> Quarter 2024.....	12
Table 12. Monthly Price Distribution, 1 <sup>st</sup> Quarter 2024 .....	13
Table 13. PEN, PSM, MI, and Sec Cap Summary, 1 <sup>st</sup> Quarter 2024.....	17

## QUARTERLY MARKET ASSESSMENT REPORT

This quarterly report assesses the results of the WESM operations for the First Billing Quarter of 2024, covering the period: 26 December 2023 to 25 March 2024, and how the market performed compared with the previous quarter/s of the year.

### I. Capacity Profile

The total WESM registered capacity stood at 27,566.9 MW by the end of the first billing quarter of 2024, recording a 330.43 MW increase from 27,236.47 MW on 25 December 2023. The increase was attributed to the entry of the following facilities:

1. Biomass facility from Trustpower Corporation (1.7 MW),
2. Coal facility from Mariveles Power Generation Corporation (150 MW),
3. Biliran Geothermal Incorporated (2MW),
4. Hydro facility from Enervantage Suppliers Co., Inc. (2MW),
5. Wind facility from Amihan Renewable Energy Corp. (50MW), and
6. Two (2) Solar power plant
  - i. PV Sinag Power Inc. (58.6 MW), and
  - ii. Jobin-SQM Inc. (62.7 MW)

Furthermore, one (1) Biomass, four (4) Coal, one (1) Geothermal, six (6) Hydro, four (4) Oil, and two (2) Solar power plants posted changes in their registered capacity, which contributed to the total registered capacity this quarter.

Of the total registered capacity, only 65 percent was offered/nominated in the market averaging at 17,753 MW during the quarter- an average increase of 2 percent from 17,471 MW during the fourth quarter of 2023, due to the entry Preferential/Must Dispatch and scheduled generating units effectively allowing these generators to only submit real-time available capacities which shall be considered in the WESM optimization. In addition, there were also noted increases in the Nomination and Loading level which likewise contributed to the increase in the offered/nominated capacities. On another note, about 0.5 percent or an average of 130 MW was the capacity designated for Malaya TPP as Must-Run Unit (MRU)<sup>1</sup>, while 6 percent or an average of 1,551 MW was accounted to the registered capacities of plants which were still undergoing commissioning tests.

The remaining registered capacity was either unavailable due to outage, comprising an average of 3,512 MW or 13 percent of the total registered capacity, or was not offered/nominated in the market<sup>2</sup>, amounting to 4,382 MW or 16 percent of the total registered capacity due to the derating of plants caused by, among other things, technical limitations.

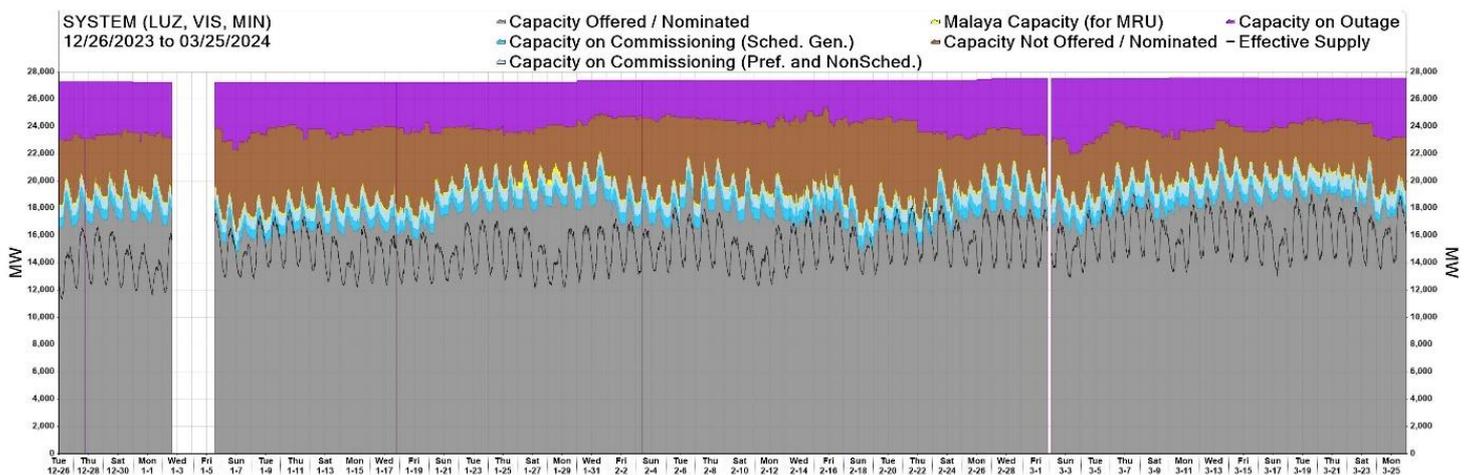
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<sup>1</sup> Per DOE Department Circular 2014-01-0003, designating the 650-MW Malaya Thermal Plant as a Must-Run Unit in the Wholesale Electricity Spot Market in cases of supply shortfall and to address system security.

<sup>2</sup> Subject to compliance monitoring or investigation for possible non-compliance with the submission of offers under the WESM Rules

Tables 1 and 2 below provide for the breakdown of Quarterly and Monthly Capacity Profiles for the covered period.

**Figure 1. Capacity Profile, 1<sup>st</sup> Quarter 2024**



Note: Missing portions represent the existence of a Market Intervention/Market Suspension

**Table 1. Capacity Profile, 4<sup>th</sup> Quarter 2023, and 1<sup>st</sup> Quarter 2024**

	4th Quarter 2023 (26 Sep to 25 Dec 2023)		1st Quarter 2024 (26 Dec to 25 Mar 2024)		% Average Change
	Average (in MW)	% of RegCap	Average (in MW)	% of RegCap	
Capacity on Outage	3,154	12%	3,512	13%	11%
Capacity Not Offered/Nominated	4,926	18%	4,382	16%	-11%
Capacity of Plants on Commissioning	1,165	4%	1,551	6%	34%
Malaya Capacity (for MRU)	130	0%	130	0.5%	5%
Capacity Offered/Nominated	17,471	64%	17,753	65%	2%

**Table 2. Monthly Capacity Profile, 1<sup>st</sup> Quarter 2024**

	January 2024 (26 Dec 2023 to 25 Jan 2024)		February 2024 (26 Jan to 25 Feb 2024)		March 2024 (26 Feb to 25 Mar 2024)	
	Average (in MW)	% of RegCap	Average (in MW)	% of RegCap	Average (in MW)	% of RegCap
Capacity on Outage	3,678	14%	3,066	11%	3,830	14%
Capacity Not Offered/Nominated	4,703	17%	4,863	18%	3,552	13%
Capacity of Plants on Commissioning	1,387	5%	1,637	6%	1,635	6%
Malaya Capacity (for MRU)	130	0%	130	0%	130	0%
Capacity Offered/Nominated	17,206	63%	17,663	65%	18,383	67%
Registered Capacity (by the end of the billing month)	27,247	100%	27,398	100%	27,567	100%

## II. Power Plant Outages

### a. Capacities on Outage by Plant Type

Capacities on outage rose by an average of 12 percent in the 1<sup>st</sup> quarter of 2024 or at an average of 3,512 MW, compared to 3,154 MW on 4<sup>th</sup> quarter of 2023. Coal and Natural gas plants have the highest share in the total capacities on outage, while it was also noted that come the month of March, Hydro plants posted a significant increase on their outage level, noting that only hydro power plants are allowed to be on outage during summer months<sup>3</sup>. On another note, Geothermal and Oil-based power plants had observed improvements in the levels of capacities not on outage. Coal plants' capacity on outage during this quarter was attributable to the planned outages of the following plants:

Resource Name	Capacity	Duration
GNPD CFTPP	668 MW	16 February 2024 to Present
QPPL CFTPP	460 MW	13 February 2024 to Present
SBPL CFTPP	455 MW	01 December 2023 to 19 January 2024
Pagbilao CFTPP unit 3	420 MW	06 January 2024 to Present
Calaca CFTPP unit 2	300MW	06 March 2024 to Present
THVI unit 1	169MW	14 February 2024 to Present
THVI unit 2	169MW	24 February 2024 to Present
SMC CFTPP unit 4	150MW	02 March to 16 March 2024
MPGC unit 3	150MW	15 February to 09 March 2024

*Note: The "present" duration on the table above refers to the end of quarter period.*

Hydro plants' capacities on outage was attributed to the planned and unplanned outage of Kalayaan HEPP unit 4 (185 MW) from 2-19 March 2024, Kalayaan HEPP units 1&2 (183 MW each) from 23-29 March 2024, Casecan unit 1 (82.5 MW), Pulangi unit 3 (75 MW) from 08 January 2024, and Agus units 1&2 (60 MW) from 28 December 2023.

Oil-based plants' capacities on outage averaged at 353 MW due to the forced and maintenance outage of TMO units from 21 February to 09 March 2024.

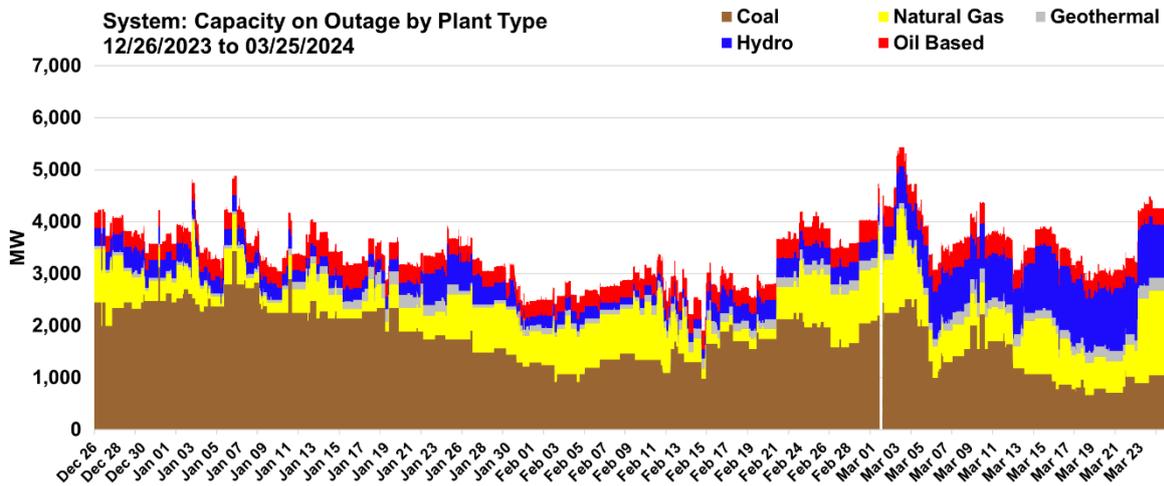
On the other hand, natural gas plants' capacities on outage averaged at 691 MW which were mostly attributable to the forced outages of San Gabriel NGPP unit (420 MW) from 21 February 2024, and Ilijan NGPP Blocks from January due to gas supply issues.

The level of capacities on outage was also observed to have generally increased towards the end of the quarter. On a month-on-month observation, the March 2024 billing month had the highest monthly average value at 3,827 MW during the quarter.

*Provided in Appendix A is the list of major plant outages.*

*Note: Outage duration with no date in, means continues outage duration.*

<sup>3</sup> DOE-DC2020-02-0004: Providing guidelines on the planned outage schedules of power plants and transmission facilities and the public posting of the grid operating and maintenance program.

**Figure 2. Plant Outage Capacity (by Plant Type), 1<sup>st</sup> Quarter 2024**

**Table 3. Outage Summary, 1<sup>st</sup> Quarter 2024, and 4<sup>th</sup> Quarter 2023**

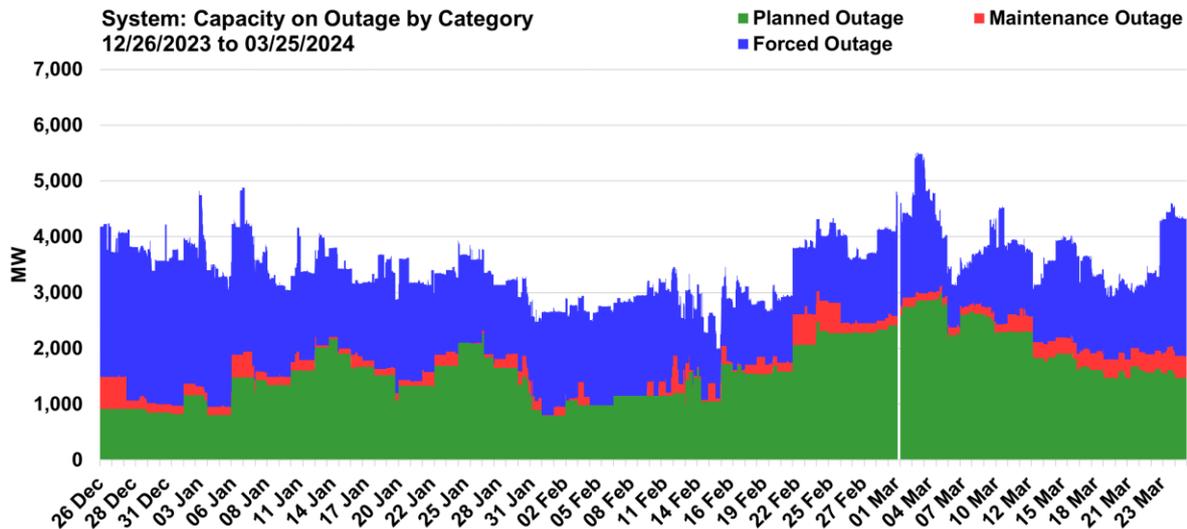
	4th Quarter 2023 (26 Sep to 25 Dec 2023) in MW			1st Quarter 2024 (26 Dec to 25 Mar 2024) in MW			% Average Change
	Max	Min	Avg	Max	Min	Avg	
Coal	3,833	256	1,580	3,433	668	1,749	11%
Natural Gas	2,773	190	462	1,884	190	691	50%
Geothermal	401	90	166	310	59	148	-11%
Hydro	1,045	271	503	1,295	128	483	-4%
Oil-based	696	306	402	593	306	353	-12%

**Table 4. Monthly Outage Summary, 1<sup>st</sup> Quarter 2024**

	January 2024 (26 Dec 2023 to 25 Jan 2024) in MW			February 2024 (26 Jan to 25 Feb 2024) in MW			March 2024 (26 Feb to 25 Mar 2024) in MW		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	3,433	1,731	2,304	2,249	919	1,507	2,512	668	1,412
Natural Gas	1,456	190	505	1,385	190	695	1,884	420	888
Geothermal	296	60	126	243	59	132	310	117	189
Hydro	817	199	320	744	128	285	1,295	326	871
Oil-based	593	306	352	545	306	337	506	306	372

## b. Capacities on Outage by Category

Consistent with the discussion above, the increase in the level of capacities on outage this quarter was mostly attributable to planned and forced outages which recorded an average of 1,621 and 1,658 MW respectively. These likewise posted a 13 and 23 percent increase compared to the previous quarter's 1,435 and 1,346 MW, respectively.

**Figure 3. Plant Outage Capacity (by Outage Category), 1<sup>st</sup> Quarter 2024**

**Table 5. Outage Summary, by Outage Category, 4<sup>th</sup> Quarter 2023, and 1<sup>st</sup> Quarter 2024**

	4th Quarter 2023 (26 Sep to 25 Dec 2023) in MW			1st Quarter 2024 (26 Dec to 25 Mar 2024) in MW			% Average Change
	Max	Min	Avg	Max	Min	Avg	
Planned	2,048	129	1,435	2,989	798	1,621	12.9%
Maintenance	933	32	300	697	5	211	-29.7%
Forced	3,738	511	1,346	3,497	673	1,658	23.1%

**Table 6. Monthly Outage Summary, by Outage Category, 1<sup>st</sup> Quarter 2024**

	January 2024 (26 Dec 2023 to 25 Jan 2024) in MW			February 2024 (26 Jan to 25 Feb 2024) in MW			March 2024 (26 Feb to 25 Mar 2024) in MW		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	2,170	803	1,360	2,475	798	1,429	2,989	1,470	2,109
Maintenance	608	5	198	697	5	191	424	140	247
Forced	3,497	1,267	2,051	1,939	873	1,438	2,620	673	1,472
Total	4,880	2,875	3,604	4,337	1,987	3,058	5,517	2,918	3,827

### III. Demand and Supply Situation

System demand decreased by an average of 3 percent from 13,170 MW in 4<sup>th</sup> quarter of 2023 to 12,753 MW in 1<sup>st</sup> quarter of 2024, due to cooler temperatures during the first

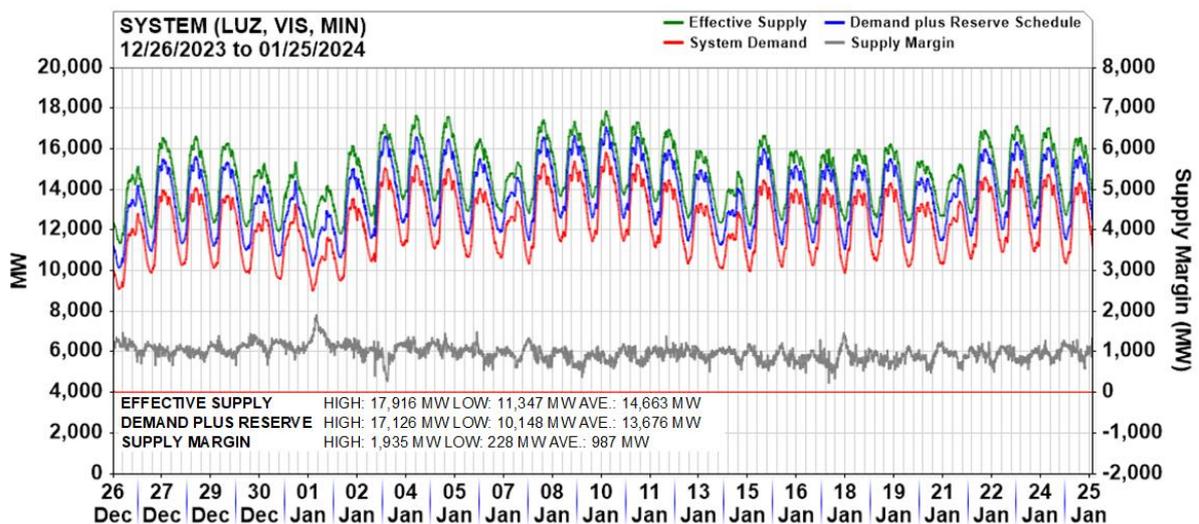
two (2) months, and the observance of long holidays during the period. On the other hand, the effects of the El Niño, which was experienced on the latter part of February, drove the increasing trend of demand during the quarter.

As anticipated, the scheduled reserve capacities significantly increased, due to the commercial operations of the Reserve Market on 26 January 2024<sup>4</sup>.

The effective supply<sup>5</sup> was slightly higher by 0.3 percent at an average of 15,311 MW coming from 15,268 MW in the fourth quarter of 2023, mainly attributed to the relatively higher levels of capacities on outage and ramp limited capacities which was observed on the latter and subsequently affected the over-all supply pool. Meanwhile, a consistently increasing trend of the monthly average effective supply was observed throughout the covered billing months from January to March 2024.

With the dynamics in the interplay between effective supply and system demand, quarterly supply margin<sup>6</sup> plunged by 6 percent at an average of 945 MW this quarter from 1,005 MW during the fourth quarter of 2023.

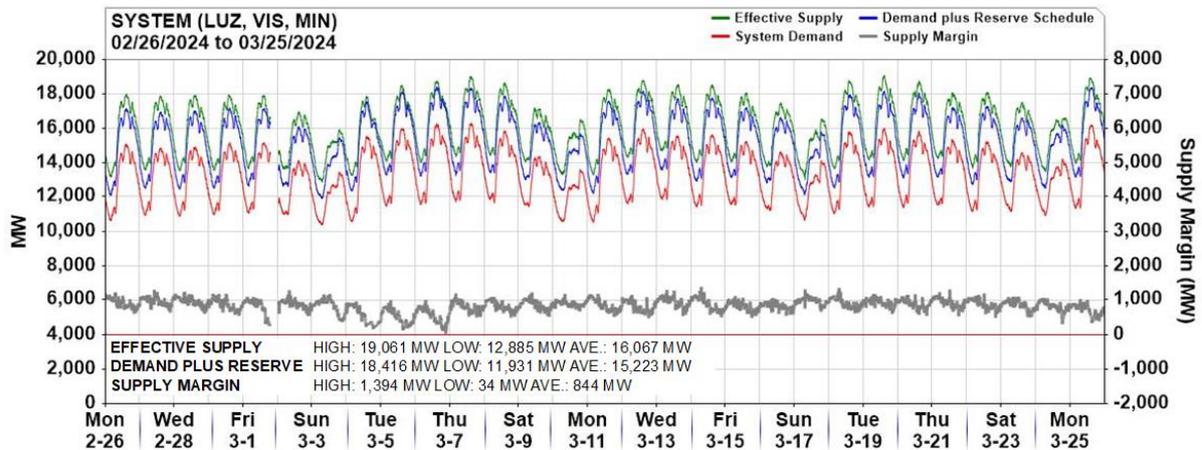
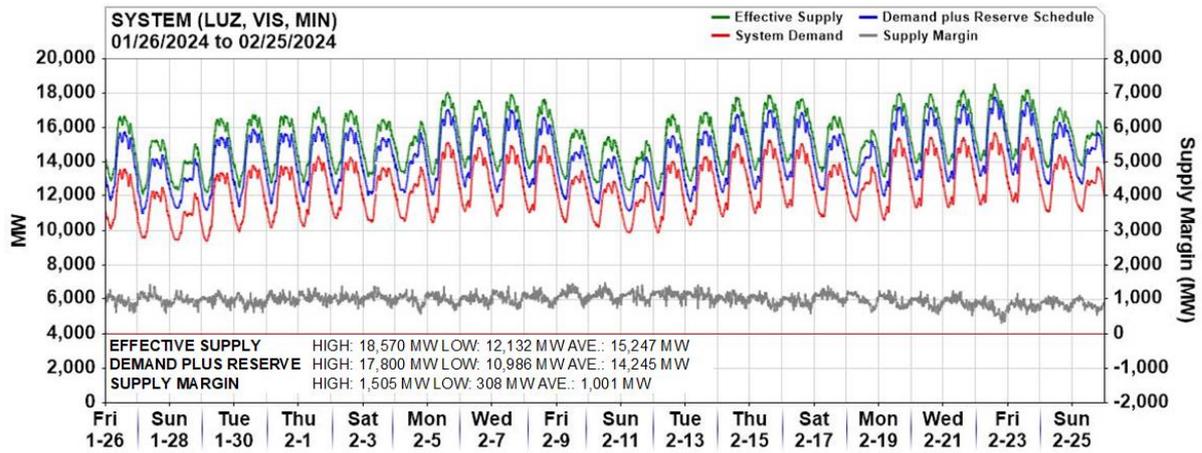
**Figure 4. Monthly Demand, Supply, Demand plus Reserve Schedule and Supply Margin, 1<sup>st</sup> Quarter 2024**



<sup>4</sup> Pursuant to DOE DC No. DC2023-09-0026, the DOE announced the commencement of the full commercial operations of the Reserve Market at dispatch interval 0005H of 26 January 2024

<sup>5</sup>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 effective supply. Likewise included is the scheduled output of Malaya plant when it is called to run as Must Run Unit (MRU).

<sup>6</sup>The supply margin is equal to the effective supply less system demand requirement plus reserve schedule.


**Table 7. Demand and Supply Summary, 4<sup>th</sup> Quarter 2023, and 1<sup>st</sup> Quarter 2024**

	4th Quarter 2023 (26 Sep to 25 Dec 2023) in MW			1st Quarter 2024 (26 Dec to 25 Mar 2024) in MW		
	Max	Min	Avg	Max	Min	Avg
System Demand	16,545	8,843	13,170	16,294	9,008	12,753
Reserve Schedule	1,669	349	1,092	2,204	1,038	1,613
Demand plus Reserve Schedule	17,564	10,097	14,262	18,416	10,148	14,366
Effective Supply	18,373	11,571	15,268	19,061	11,347	15,311
Supply Margin	1,901	395	1,005	1,935	34	945

Note: The derived values were non-coincidental.

**Table 8. Monthly Demand and Supply Summary, 1<sup>st</sup> Quarter 2024**

	January 2024 (26 Dec 2023 to 25 Jan 2024)			February 2024 (26 Jan to 25 Feb 2024)			March 2024 (26 Feb to 25 Mar 2024)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
System Demand	15,866	9,008	12,364	15,713	9,380	12,556	16,294	10,391	13,346
Reserve Schedule	1,681	1,038	1,256	2,163	1,260	1,690	2,204	1,273	1,877
Demand plus Reserve Schedule	17,126	10,148	13,621	17,800	10,986	14,245	18,416	11,931	15,223
Effective Supply	17,916	11,347	14,608	18,570	12,132	15,247	19,061	12,885	16,067
Supply Margin	1,935	228	988	1,505	308	1,001	1,394	34	844

## IV. Market Price Outcome

### a. Market Prices

Notwithstanding the overall decrease in the market prices in the first quarter of 2024 as compared to the previous one, lower levels of supply margin still translated to consistent high market prices, which was specifically observed during the months of January and March. Additionally, the significant increase in the prices for the month of March, was a result of the co-optimized price outcome of energy and reserves in the market.

The monthly average prices were also observed to have varying changes, which was mainly driven by the interplay between supply and demand. Throughout the period in review, there were noted price spikes during both off-peak hours attributed to the observed reductions in the offers of hydro power plants. Additionally, the 160 MW pumping operation of Kalayaan and the shifting from energy to reserve of some hydro power plants were also identified as factors for the observed price spikes. In addition, most of the price spikes were observed during the intervals between 2100h to 2300h.

The abrupt change in the level of demand on 21 March 2023, led to the increase of supply margin and subsequently resulted in negative price outcome.

Figure 5. Market Price Trend vs. Supply Margin, 1<sup>st</sup> Quarter 2024

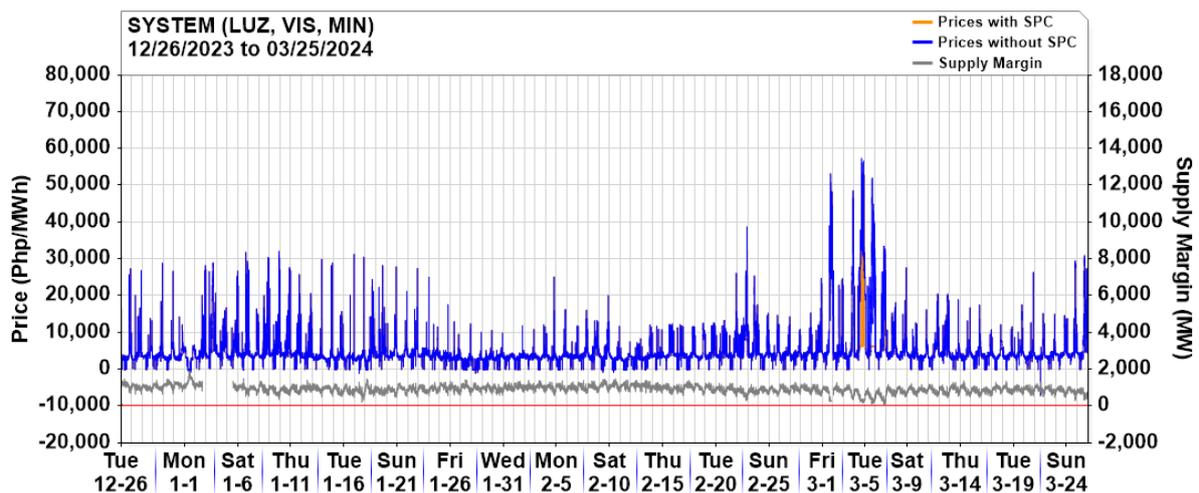
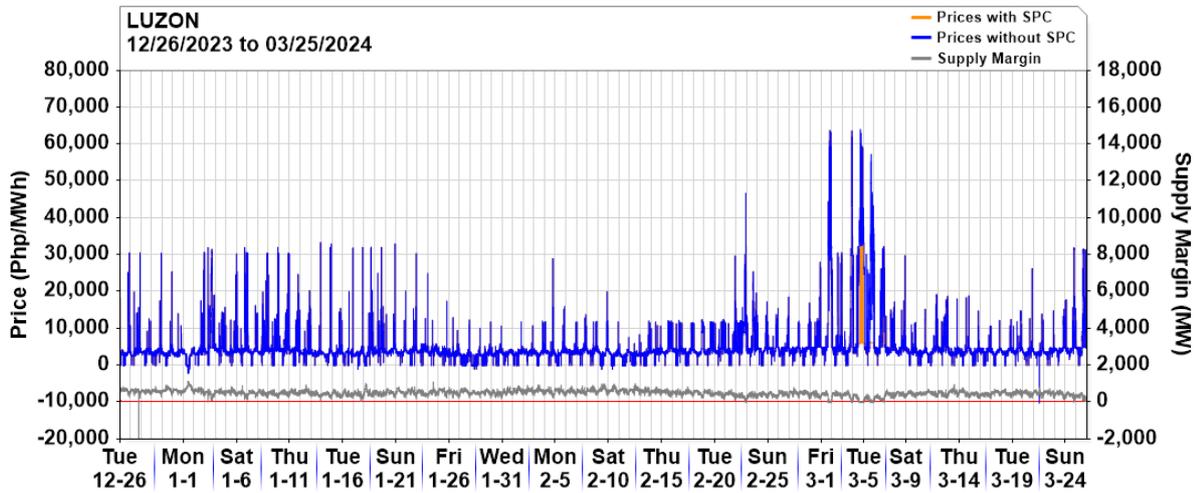
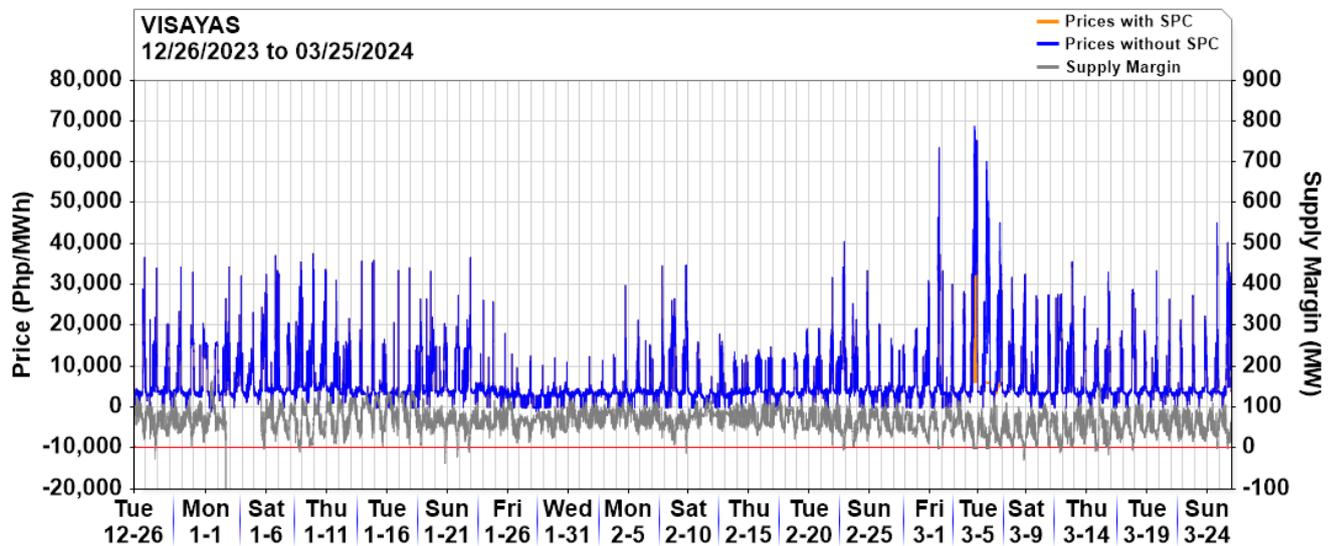


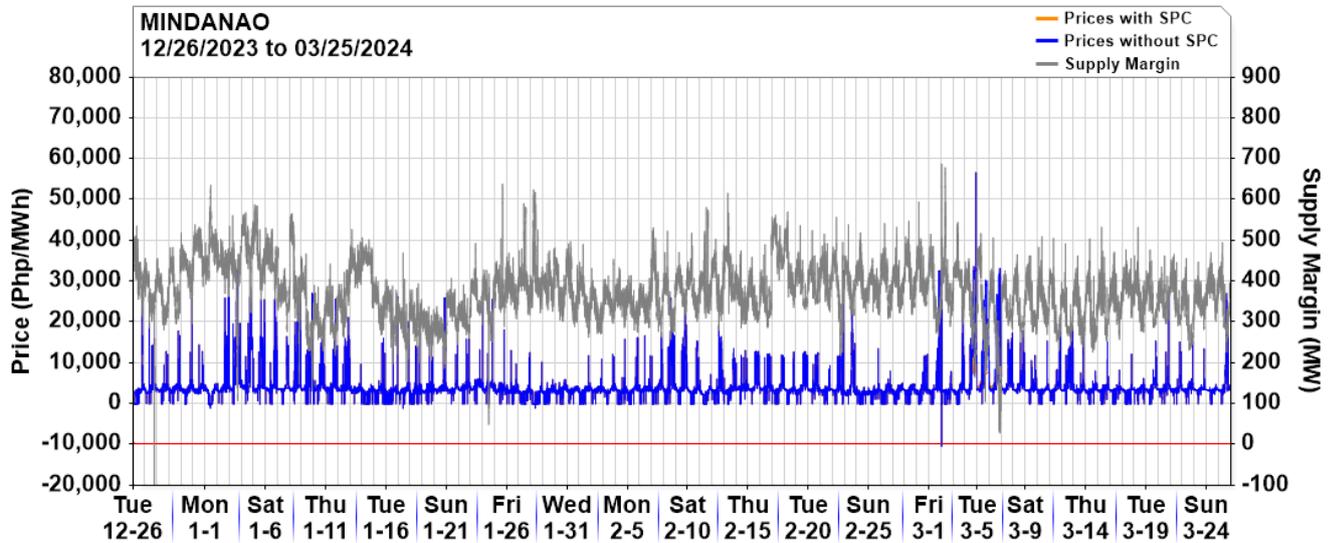
Table 9. Market Price Summary, 1<sup>st</sup> Quarter 2024, and 4<sup>th</sup> Quarter 2023

	4th Quarter 2023 (26 Sep to 25 Dec 2023) in Php/ MWh			1st Quarter 2024 (26 Dec 2023 to 25 Mar 2024) in Php/ MWh			% Change		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
System	34,644	-10,229	5,044	56,728	-7,138	4,695	63.7%	-30.2%	-6.9%

Table 10. Monthly Market Price Summary, 1<sup>st</sup> Quarter 2024

	January 2024 (26 Dec 2023 to 25 Jan 2024) in Php/ MWh			February 2024 (26 Jan to 25 Feb 2024) in Php/ MWh			March 2024 (26 Feb to 25 Mar 2024) in Php/ MWh		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
System	32,151	-1,713	4,582	38,779	-1,027	4,026	56,728	-7,138	5,532

**Figure 6. Market Price Trend - Luzon, 1<sup>st</sup> Quarter 2024**

**Figure 7. Market Price Trend - Visayas, 1<sup>st</sup> Quarter 2024**


**Figure 8. Market Price Trend - Mindanao, 1<sup>st</sup> Quarter 2024**

**Table 11. Monthly Regional Price Summary, 1<sup>st</sup> Quarter 2024**

	Luzon in Php/ MWh				
	Max		Min		Avg
January 2024	33,966	17 January 2024, 1535h	-2,007	01 January 2024, 1130h	4,302
February 2024	46,777	22 February 2024, 2115h	-1,062	09 February 2024, 0805h	3,974
March 2024	63,807	01 March 2024, 1920h	-10,189	21 March 2024, 1205h	5,616

	Visayas in Php/ MWh				
	Max		Min		Avg
January 2024	39,031	18 January 2024, 1925h	-1,478	06 January 2024, 1225h	6,221
February 2024	45,777	22 February 2024, 2115h	-1,008	28 January 2024, 0805h	4,577
March 2024	65,460	04 March 2024, 1945h	-1,002	18 March 2024, 0705h	6,379

	Mindanao in Php/ MWh				
	Max		Min		Avg
January 2024	33,928	25 January 2024, 1445h	-1,124	17 January 2024, 0905h	4,368
February 2024	32,616	22 February 2024, 2115h	-1,057	28 January 2024, 0805h	3,715
March 2024	56,728	04 March 2024, 2050h	-10,426	01 March 2024, 1220h	4,214

## b. Price Distribution

As seen in Figure 9, the frequency of prices fell within the PhP2,000/MWh to PhP6,000/MWh range in 78-85 percent of the trading intervals in a given billing month for the billing quarter. /

Figure 9. Price Distribution, 1<sup>st</sup> Quarter 2024

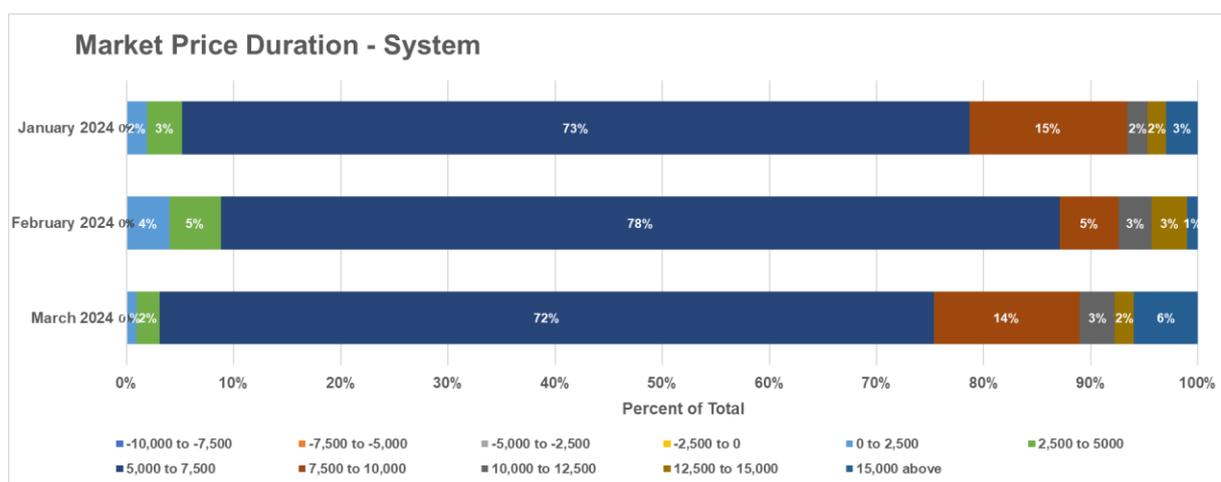


Table 12. Monthly Price Distribution, 1<sup>st</sup> Quarter 2024

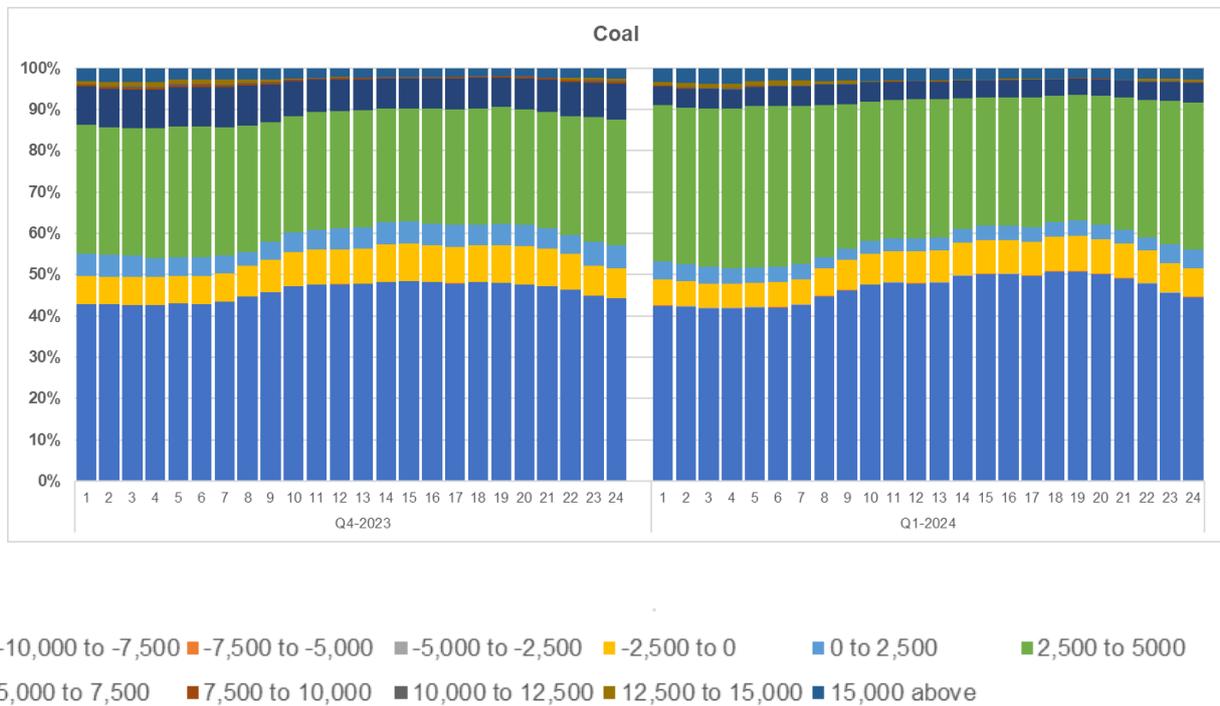
Price Range (Php/MWh)	% Distribution		
	January 2024	February 2024	March 2024
0 and below	2%	4%	1%
0 to 2,000	1%	2%	1%
2,000 to 4,000	55%	64%	45%
4,000 to 6,000	30%	20%	34%
6,000 to 8,000	6%	2%	9%
8,000 to 10,000	1%	2.7%	2.3%
10,000 to 12,000	1%	3%	1%
12,000 to 14,000	1%	1%	1%
14,000 to 16,000	1%	0%	1%
16,000 to 18,000	0%	0%	0%
18,000 to 20,000	0%	0%	0%
More than 20,000	1%	0%	4%

## V. Generator Offer Pattern

As depicted in Figure 10, there was no significant change in the offer pattern of Coal plants, when compared to the previous quarter. The majority of Coal plants offered, were either negative or 0 to 5,000PHP/MWh. The former indicates that most of these

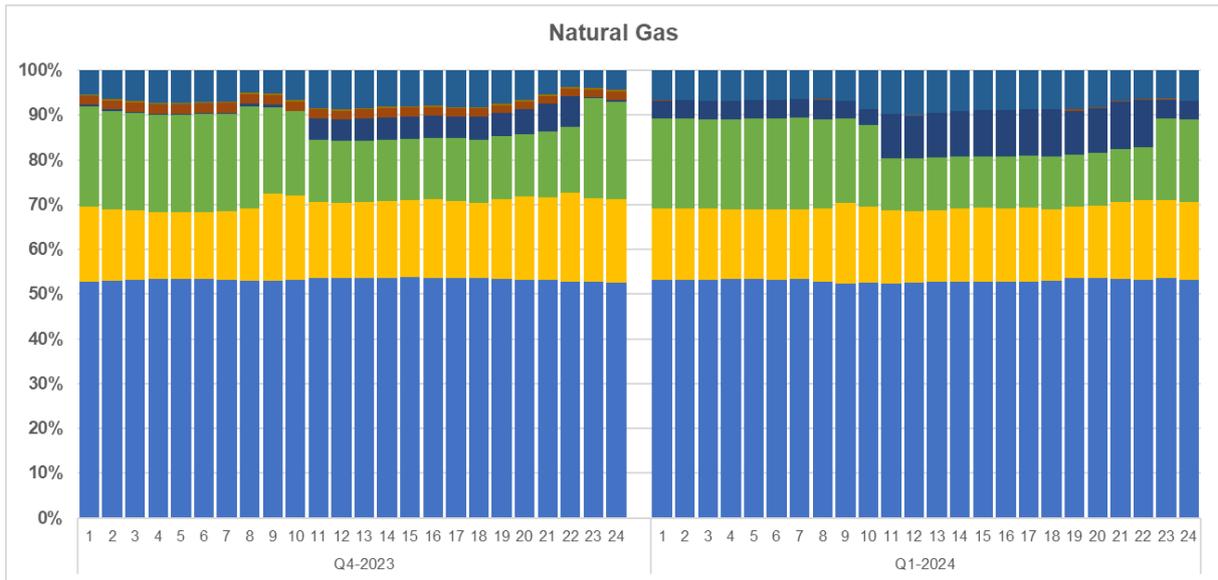
capacities are covered under bilateral contracts, while the latter signals that some of the capacities from Coal plants serve as mid-merit plants. From the submitted offers from Coal power plants, only around 58.5 percent were scheduled for dispatch in the system.

**Figure 10. Coal Plants Offer Pattern – 1<sup>st</sup> Quarter 2024**



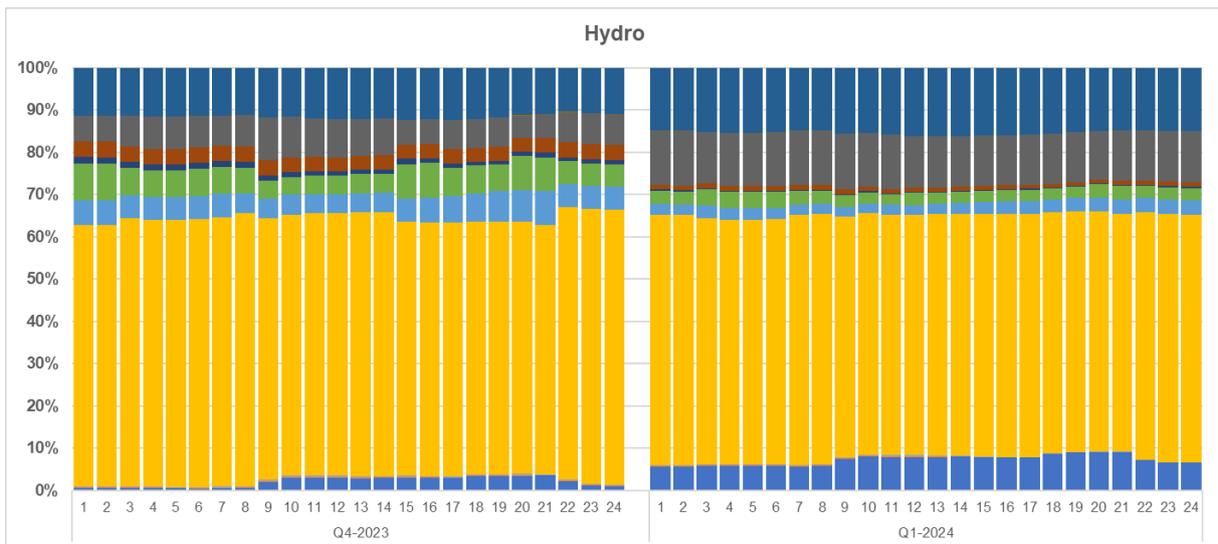
On another note, Natural gas power plants had relatively lower-priced offers this quarter as compared to previous. About 69.45 percent of Natural gas offered capacity were offered at Php0/MWh and below while 23 percent were offered at Php2,500/MWh to Php7,500/MWh, and the remaining 7.5 percent were offered at Php15,000/MWh and above, as seen in Figure 11.

**Figure 11. Natural Gas Plants Offer Pattern – 1<sup>st</sup> Quarter 2024**



For the hydro power plants, there were observed changes in the offer behavior of these plants during the quarter in review mostly affected by the unavailability of the generators due to low availability of water which was effectively seen on the latter part of the subject billing quarter.

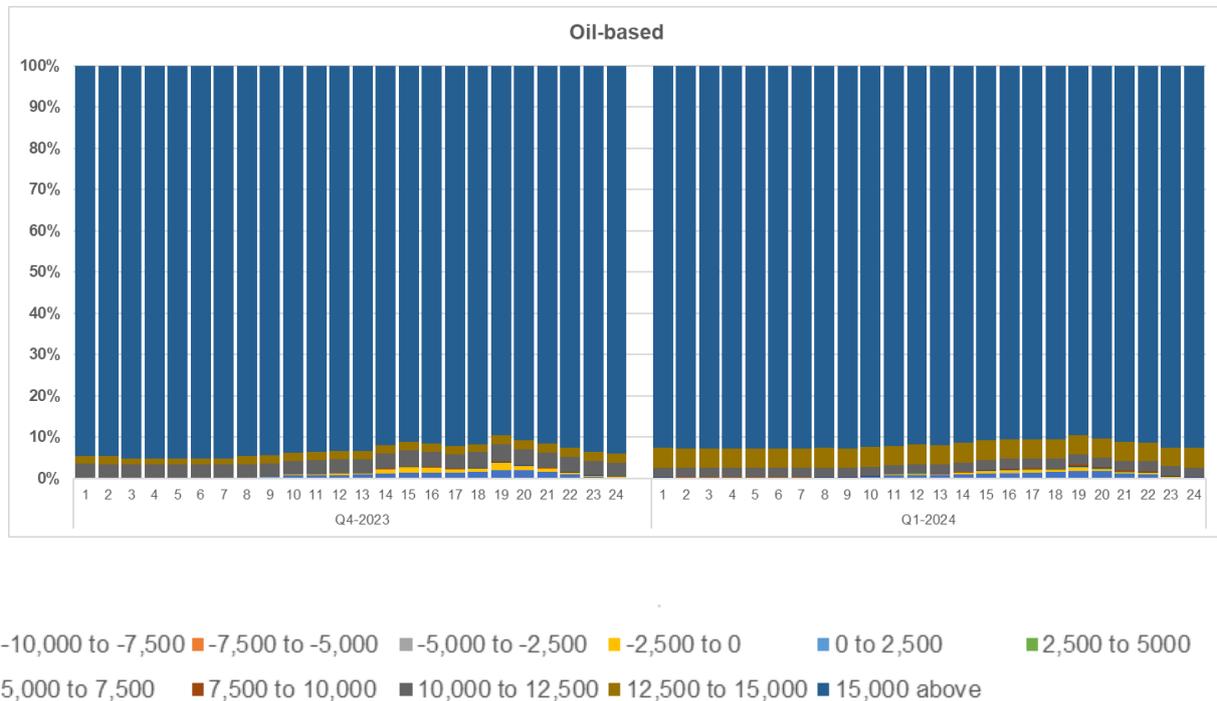
**Figure 12. Hydro Plants Offer Pattern – 1<sup>st</sup> Quarter 2024**



- -10,000 to -7,500
- -7,500 to -5,000
- -5,000 to -2,500
- -2,500 to 0
- 0 to 2,500
- 2,500 to 5000
- 5,000 to 7,500
- 7,500 to 10,000
- 10,000 to 12,500
- 12,500 to 15,000
- 15,000 above

Oil-based plants consistently offered their available capacities at the higher spectrum of offered prices due to their naturally high operational costs and the consideration of these plants as peaking plants.

**Figure 13. Oil-based Plants Offer Pattern – 1<sup>st</sup> Quarter 2024**



## VI. Market Pricing Conditions

The WESM was under normal pricing condition for 23,758 intervals or at 90% of the time. However, other intervals were placed under various market pricing conditions discussed below.

System-wide and regional pricing error notices were issued during the 1<sup>st</sup> quarter which were related to inappropriate input data that subsequently affected the generation of market outcomes. The pricing errors during the subject billing quarter affected 562 system-wide trading intervals. Also, there were 10 and 12 intervals regionally affected trading intervals in Luzon and Mindanao, respectively.

Meanwhile, system-wide Price Substitution Methodology (PSM) was implemented in several instances due to network constraints attributable to the congestion of Mexico-Hermosa Line 2 and Bauang-La Trinidad Lines 1&2. Apart from these PSM affected intervals, there have been congestions from Cebu-Negros and Maasin-Ubay submarine cables which is evident from 15-20% of the time.

In addition, there were noted several Market Interventions initiated by both the Market Operator (MO) and System Operator (SO) during the month in review. Most of the reasons for the intervention logged by MO/SO is due to threat to system security and force majeure which affected 915 trading intervals.

**Table 13. Market Interventions, 1<sup>st</sup> Quarter 2024**

Date	Interval	No. of Interval/s	Initiated by	Regions	Classification	Reason
December 27, 2023	1755h - 1830h	8	SO	Visayas	Threat to the Systems Security	Due to Manual Load Dropping (MLD) implementation to prevent overloading of Amlan-Samboan 138kV Line 1.
January 2-5, 2024	1510h - 1235h	834	SO	Visayas	Emergency	Due to major system disturbance caused by the multiple tripping of plants that led to the tripping of Bacolod-Barotac Viejo 138kV submarine cable at 1507h which further resulted in the Black-out of Panay Sub-grid
January 17, 2024	1850h - 1910h	5	SO	Visayas	Threat to the Systems Security	Due to overloading of Samboan-Amlan 138kV Lines 1 and 2
February 3, 2024	1925h	1	MO	System (LVM)	Force Majeure	Due to infeasible solution brought about by the SCADA bad data that resulted from the intermittent OFFLINE and ONLINE status of the communication line between System Operator – Mindanao Regional Control Center (SO-MRCC) and Agus 6 Remote Terminal Units (RTUs) located in Lanao, Mindanao
March 1-2, 2024	1900h - 0030h	67	SO	Visayas	Threat to the Systems Security	Due to multiple tripping of generators and loads at Visayas grid

Finally, consistent with the ERC Issuance on the imposition of the Secondary Price Cap under ERC Resolution No. 7 Series of 2021, system-wide and regional issuances of SPC were observed in March 2024 billing periods affecting a total of 583 intervals. During these intervals, the cumulative price trigger threshold of PHP9,000/MWh has been hit by the rolling calculation of the Generator-weighted Average Prices (GWAPs) in the WESM. In these intervals, the effective settlement rate will be capped at PHP6,245/MWh with methodologies for additional compensation, subject to further assessment of filing for such claims in accordance with the aforementioned ERC Issuance.

**Table 14. PEN, PSM, MI, and Sec Cap Summary, 1<sup>st</sup> Quarter 2024**

	Luzon						Visayas						Mindanao					
	January 2024		February 2024		March 2024		January 2024		February 2024		March 2024		January 2024		February 2024		March 2024	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
<b>PEN</b>	71	1%	395	4%	106	1%	72	1%	96	1%	95	1%	73	1%	96	1%	106	1%
<b>PSM</b>	35	0%	185	2%	402	5%	34	0%	0	0%	309	4%	33	0%	0	0%	315	4%
<b>SEC</b>	0	0%	0	0%	588	7%	0	0%	0	0%	583	7%	0	0%	0	0%	583	7%
<b>AP</b>	0	0%	1	0%	0	0%	847	9%	1	0%	67	1%	0	0%	1	0%	0	0%

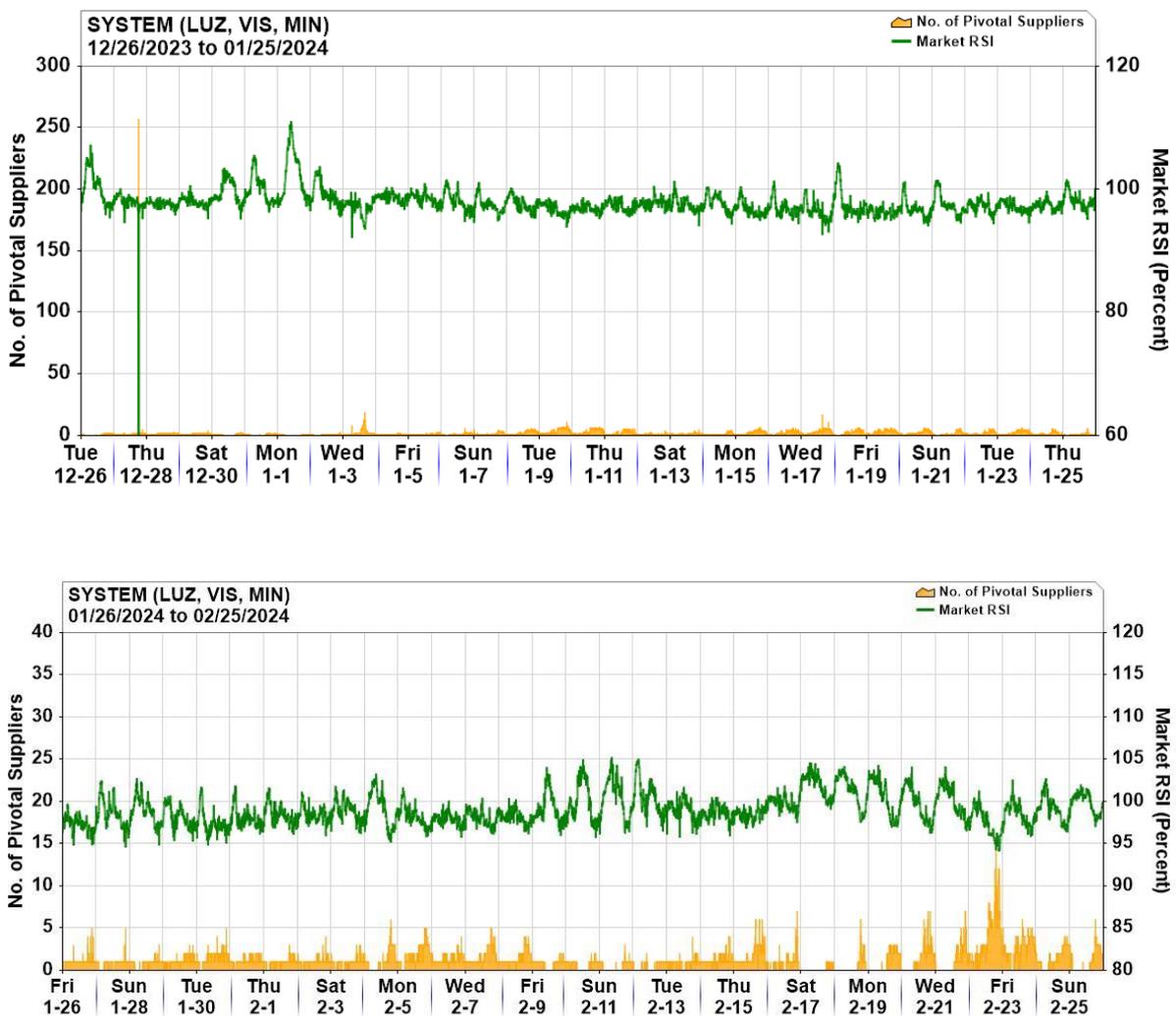
## VII. Residual Supply

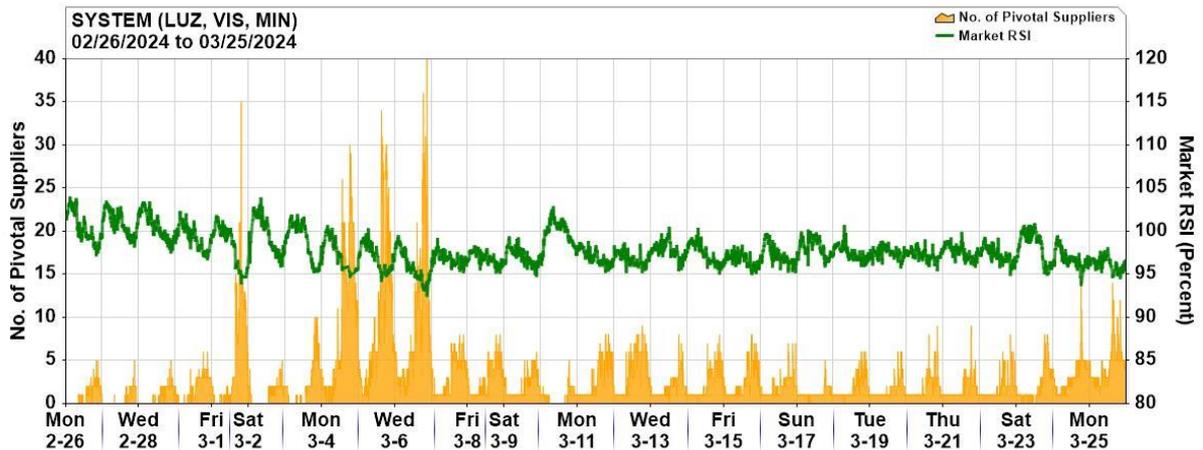
The figure below shows the hourly trend of the Market Residual Supply Index (Market RSI)<sup>7</sup> plotted against the corresponding number of pivotal supplier/s.

<sup>7</sup> For a generator, the Residual Supply Index (RSI) is a dynamic continuous index measured as ratio of the available generation without that generator to the total generation required to supply the demand. The Market RSI is measured as the lowest RSI among all generators in the market. A Market RSI less than 100% indicates the presence of pivotal generator/s or supplier/s.

During the period, the market resulted in RSIs ranging from 92.1% to 111.1%, averaging at 98.3%. Out of 26,208 intervals, 21,756 intervals had a Residual Supply Index (RSI) below the 100 percent mark with an average market prices for intervals with RSI below 100% was PHP5,186/MWh, while those with RSIs above 100 was at PHP3,066/MWh, indicating ample supply during intervals with high RSI values and presence of pivotal suppliers.

Figure 14. Market RSI vs. Pivotal Suppliers, 1<sup>st</sup> Quarter 2024

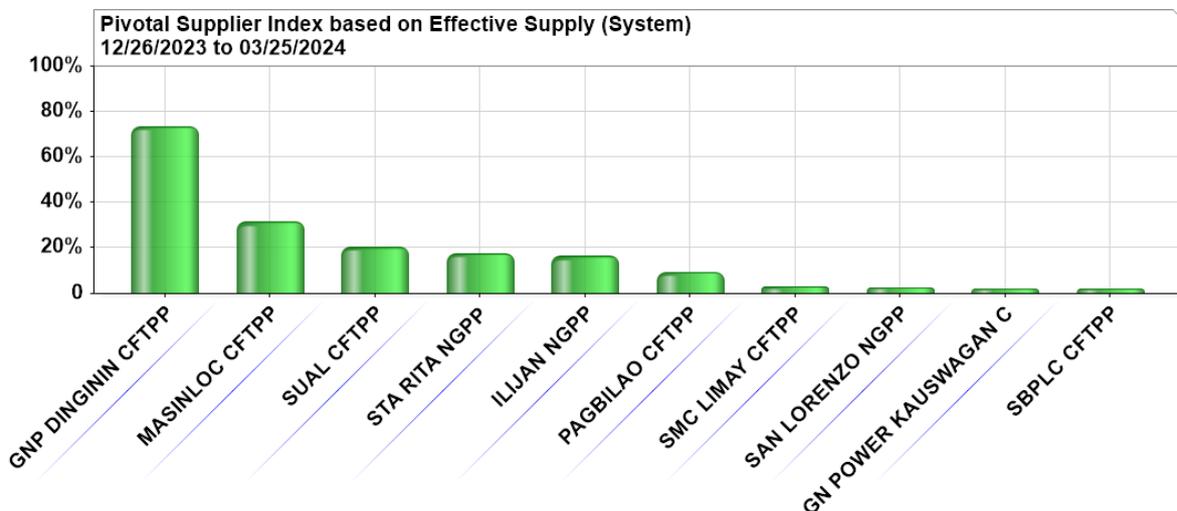




### VIII. Pivotal Suppliers<sup>8</sup>

Provided in Figure 11 are the top pivotal suppliers in the market during the billing quarter, which was led by GNP Dinginin CFTPP, Sual CFTPP, Sta. Rita NGPP, Masinloc CFTPP, Ilijan NGPP, and Pagbilao CFTPP. In line with the RSI discussion above, the highest presence of pivotal suppliers was observed this quarter for 19,250 out of 26,208 generator-trading intervals.

Figure 15. Top Pivotal Suppliers, 1<sup>st</sup> Quarter 2024



<sup>8</sup> The Pivotal Supply Index (PSI) measures how critical a particular generator is in meeting the total demand at a particular time. It is a binary variable (1 for pivotal and 0 for not pivotal) which measures the frequency that a generating is pivotal for a particular period.

**IX. Capacity Factor**

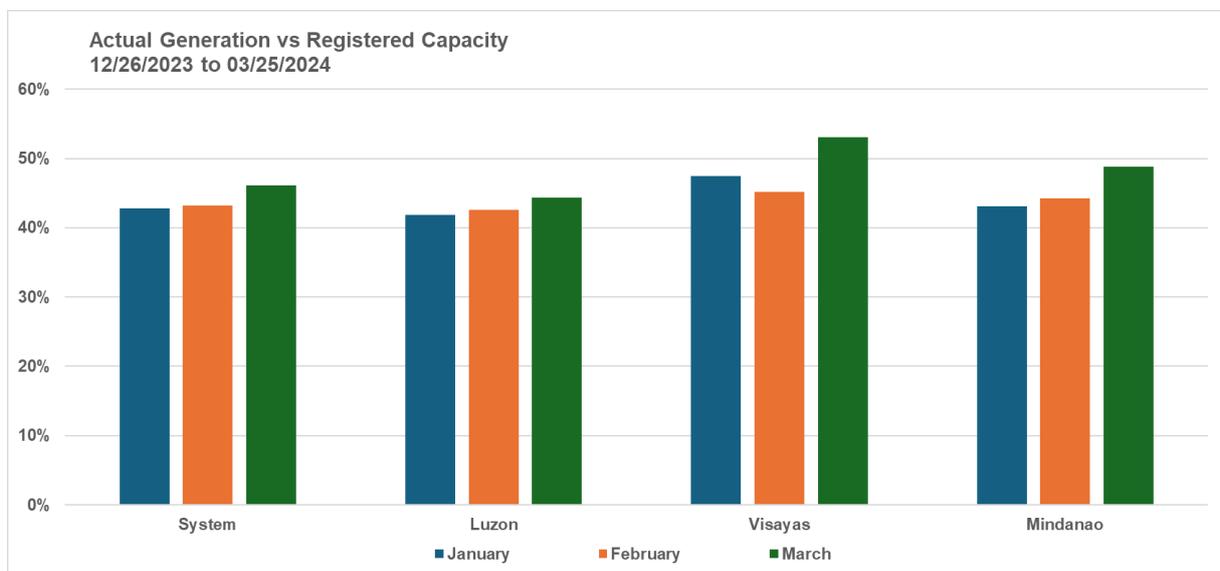
The Capacity Factor during the quarter ranged from 39.3 to 56.7 percent in peak hours while it was 38.6 to 59.2 percent in off-peak hours. As anticipated, the highest utilization was seen during weekdays where the demand is relatively high.

In terms of utilization per plant category, it was expected that baseload power plants would have the highest results due to their frequent dispatch in the WESM. Geothermal power plants were consistently observed to be with the highest utilization during the quarter when measured in terms of their metered quantity vis-à-vis the registered capacity noting that 57 percent of the total registered capacity of the Geothermal power plants were categorized as preferential/must dispatch units. Its capacity factor registered at 69.1 percent for the whole 1<sup>st</sup> quarter of 2024. Coal plants followed with a capacity factor of 58.5 percent. Natural gas plants came next reaching 57.3 percent, while Hydro power plants’ utilization was observed to become lower this quarter, reaching only 28.1 percent due to its scheduled planned outage, due to reduced water level specifically observed in March 2024. Oil-based plants had the lowest utilization with only 2.8 percent due to its consistent high-priced offers and its characteristic as peaking plants.

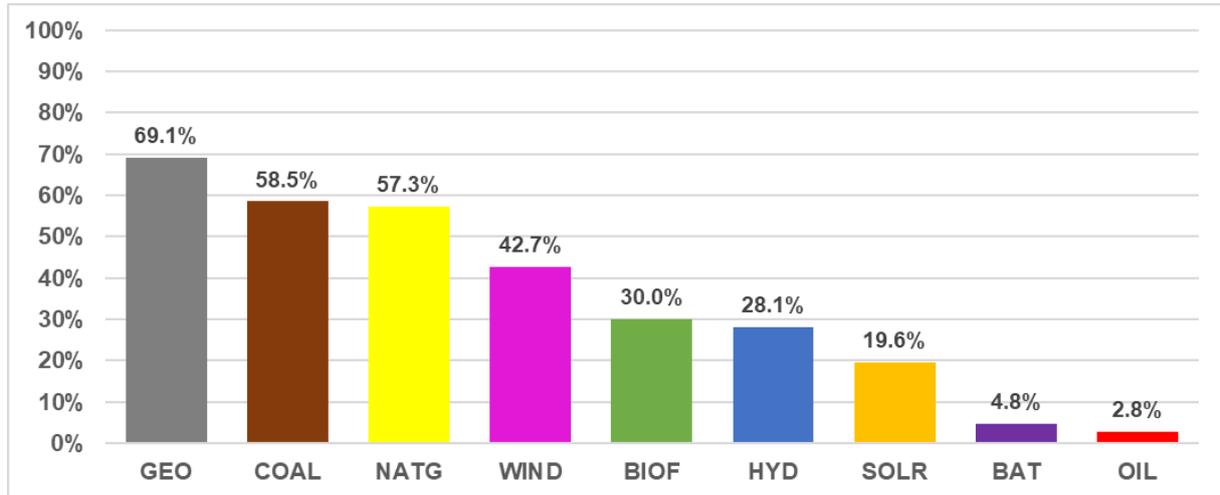
On another note, Biomass plants’ capacity factor was recorded at 30 percent utilization rate, Wind plants’ capacity factor had a high level of utilization among the preferential must-dispatch power plants at 42.7 percent, capitalizing on the vast available wind energy brought about by the Amihan during the first two (2) months of the quarter. Furthermore, relatively lower utilization from Solar plants was observed due to its natural low dependable capacity.

Lastly, Battery Energy Storage facilities in the WESM, posted consistently low-capacity factors at 4 percent, due to their relatively short-term operations which are effectively used as peaking capacities or as reserve provisions.

**Figure 16. System Capacity Factor (Actual Generation vs Registered Capacity) – 1<sup>st</sup> Quarter 2024**



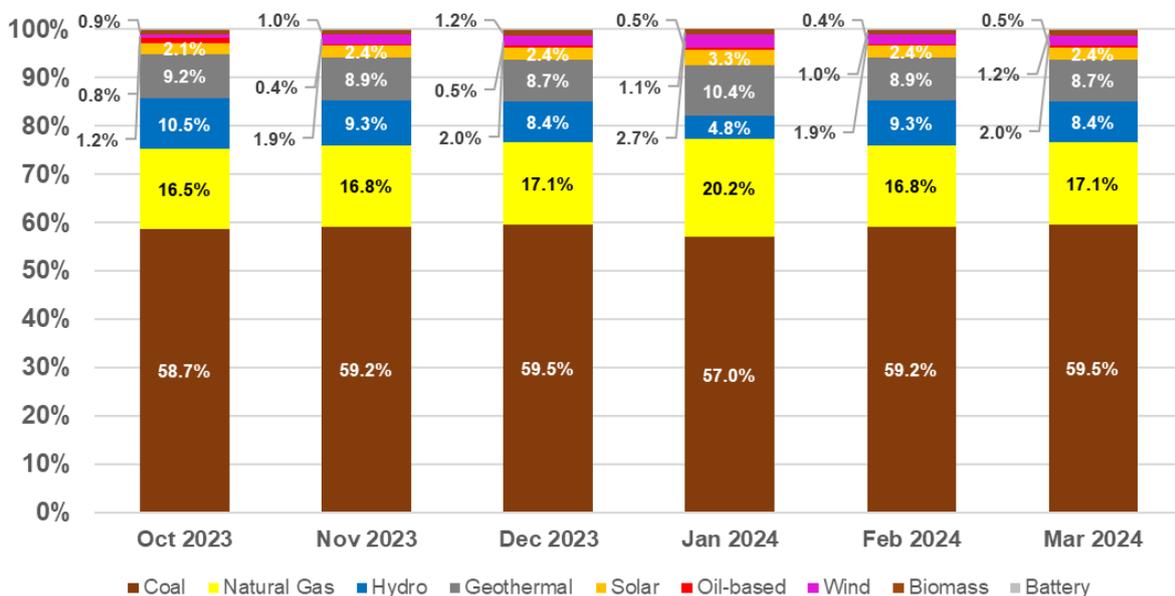
**Figure 17. System Capacity Factor Per Resource Type (Actual Generation vs Registered Capacity) – 1<sup>st</sup> Quarter 2024**



**X. Generation Mix**

Coal plants have consistently contributed to the largest chunk of the generation in all observed monthly billing periods ranging from 57 percent to 59.5 percent demonstrating the country’s reliance on this type of resource. This is followed by Natural gas plants comprising about 16.8 to 20.2 percent of the generation mix. Hydro plants and Geothermal plants came next accounting for 4.8 percent to 9.3 percent and 8.7 percent to 10.4 percent shares, respectively. Oil-based plants’ contribution was the lowest at 0.4 percent to 0.5 percent due to the previous discussion on the nature of their dispatching. Meanwhile, the contribution of preferential and must-dispatch generating units ranged from 1 to 3.4 percent.

**Figure 18. Generation Mix (Based on Metered Quantity) – 4<sup>th</sup> Quarter 2023 and 1<sup>st</sup> Quarter 2024**



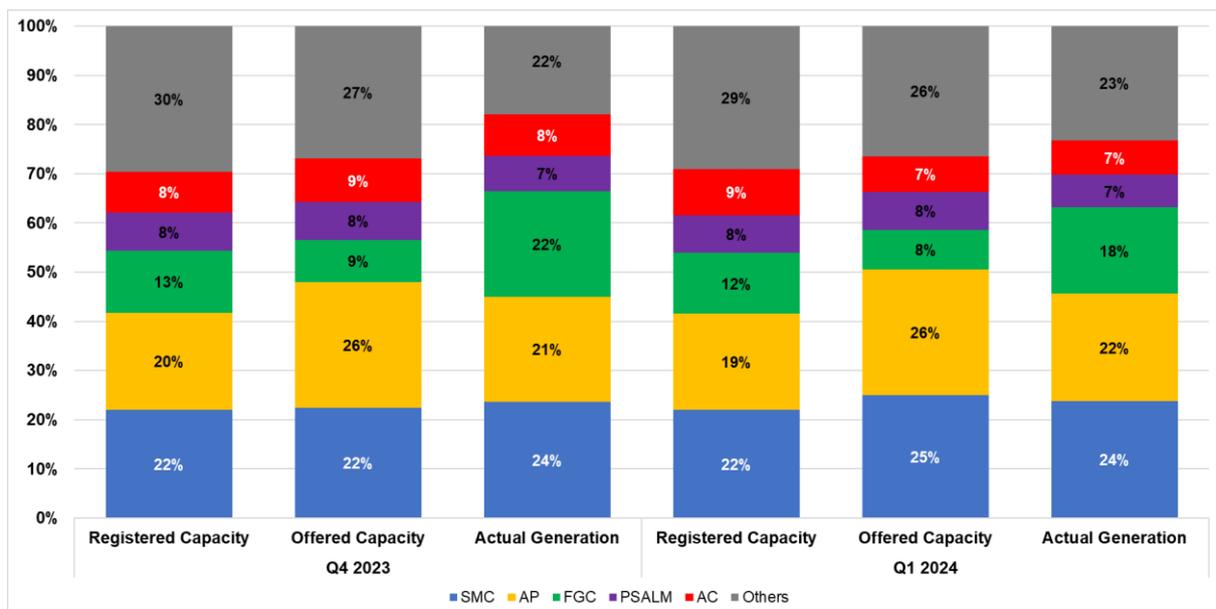
## XI. Market Concentration

### a. Market Share

The integrated Luzon, Visayas, and Mindanao market remained dominated by five (5) major participant groups, based on registered capacity. They are led by San Miguel Corporation (SMC) with a market share of 22 percent throughout the billing quarter. Aboitiz Power Corporation (AP) came in next with a market share of about 19 percent followed by First Gen Corporation (FGC), Ayala Corporation (AC) and Power Sector Assets and Liabilities Management (PSALM) at 12 percent, 9 percent, and 8 percent, respectively.

It may be noted that higher market shares were recorded for AP at 26 percent when based on offered capacity while it was only 22 percent when based on actual generation. The same was observed with SMC's market share in terms of comparison of offered capacity as opposed to actual generation at 25 percent while it had a 24 percent share in actual generation, which is anticipated as these Major Participant Groups holds the most numbers of baseload power plants.

**Figure 19. Market Share by Major Participant Group based on Registered Capacity, Offered Capacity, Actual Generation, 4<sup>th</sup> Quarter 2023 and 1<sup>st</sup> Quarter of 2024**



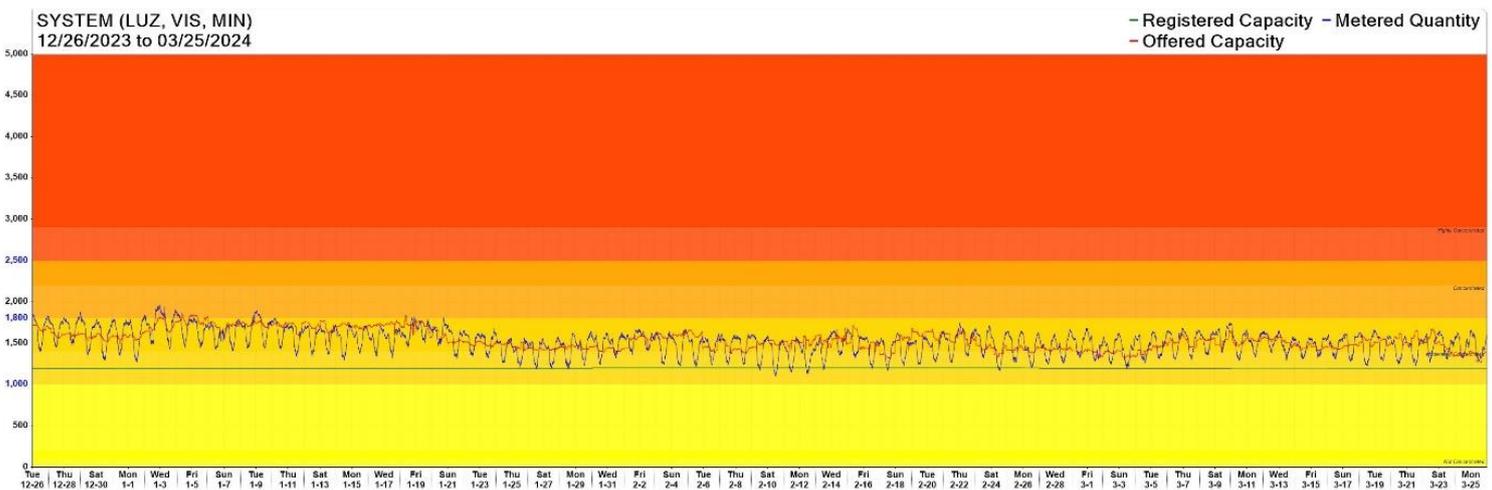
### b. Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI)<sup>9</sup> by major participant grouping indicated a moderately concentrated market during the first quarter of 2024 in terms of registered

<sup>9</sup> 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

capacity. In terms of offered capacity, the market was moderately concentrated 99.96 percent of the time, brought about by the effects of changes in the availability of generators which subsequently affected the resulting market share. Based on metered quantity, the market is also moderately concentrated 98 percent of the time. Three (3) major participant groups have consistently covered more than 50% of the MQ shares, which was due to their frequent dispatch and subsequently affected the resulting market concentration.

**Figure 20. Hourly HHI based by Major Participant Grouping, 1<sup>st</sup> Quarter 2024**



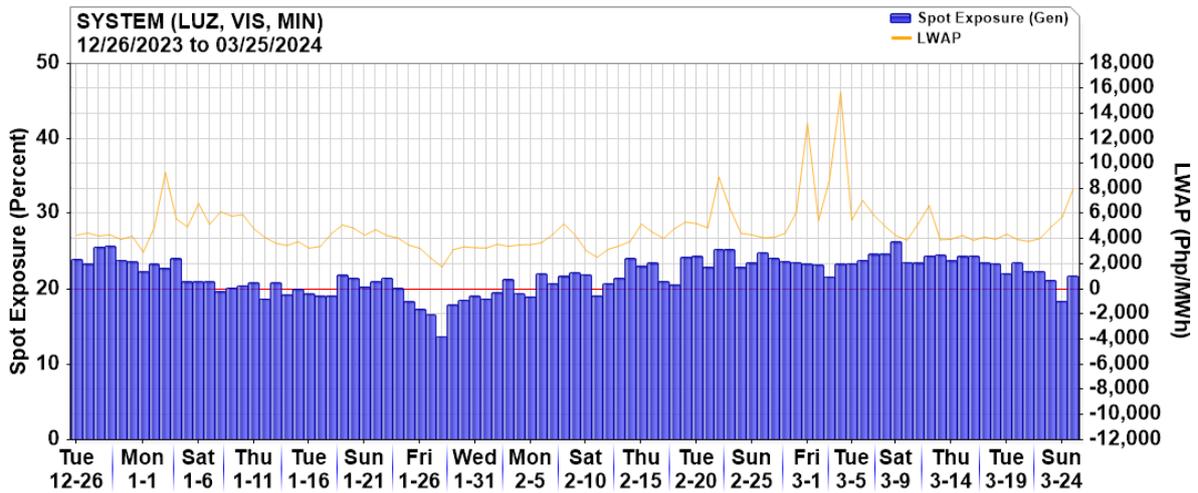
## XII. Spot Exposure

Spot market transactions of generator-trading participants during the quarter ranged from approximately 19.2 percent to 24.9 percent, from only 10-15 percent of spot quantities prior to the commercial operation of the 5-minute market. Although most of the total energy injected into the grid was covered by bilateral contracts, almost 25 percent of the total generation was sold from the spot market. The increase in spot exposure was mostly affected by the expired contracts of the generators with Distribution Utilities. However, despite the exploration of ways to obtain contracts through Competitive Selection Process (CSP), some Distribution Utilities were still forced to enter into an Emergency Power Supply Agreements (EPSAs) or source electricity from the WESM.

High prices in the spot market were the result of high levels of capacities that were on outage.

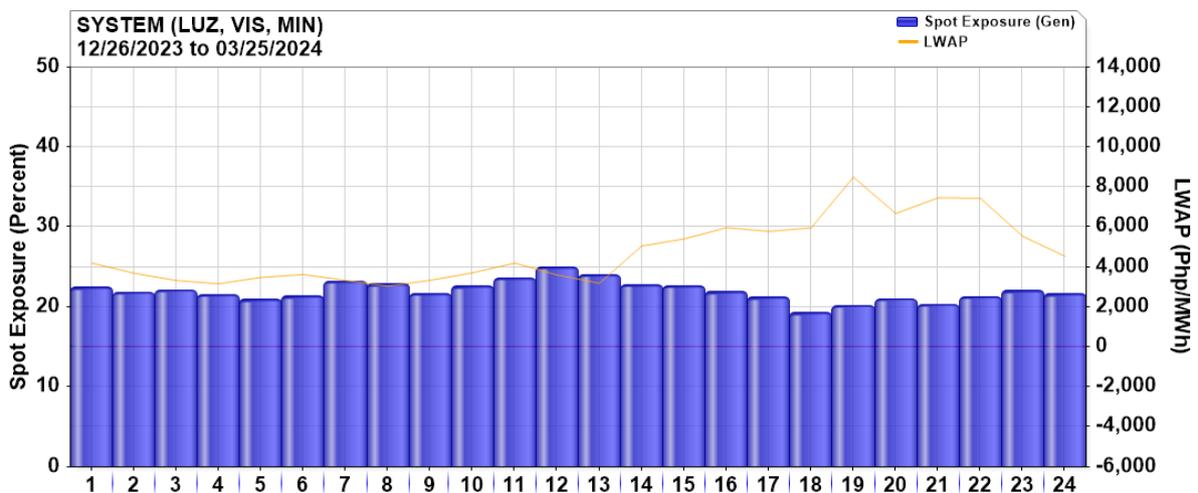
**Figure 21. Spot Market Exposure, 1<sup>st</sup> Quarter 2024**

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.



Furthermore, Figure 21 shows the hourly profile of the spot exposure plotted against the average hourly price. A relatively higher average spot exposure was noted during the peak hours, particularly from 1100h-1400h and 2000h-2400h, both belonging to the peak hours. Generally, levels of spot exposures during this quarter is almost the same with 4<sup>th</sup> quarter of 2023. However, spot market prices during this quarter is relatively higher compared to previous.

Figure 22. Hourly Profile of Spot Market Exposure, 1<sup>st</sup> Quarter 2024



## Appendix A. Major Plant Outages

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
<b>Luzon</b>							
BAT	ALAMNOS BAT1	20	02/18/2024 9:30			Forced Outage	Unit problem on investigation.
BAT	ALAMNOS BAT2	20	02/19/2024 0:09	02/29/2024 19:25	11	Forced Outage	Declared unavailable due to internal failure at incomer.
BIOF	CLEANG 1	10.8	02/13/2024 0:00			Forced Outage	Unplanned shutdown due to insufficient fuel.
BIOF	G2REC	10.8	03/06/2024 17:41	03/09/2024 7:03	3	Forced Outage	Unplanned outage due to leak at waterwalls.
BIOF	CBEC	13.5	03/05/2024 0:01	03/08/2024 0:00	3	Planned Outage	Planned outage until March 20 2024.
BIOF	CBEC	13.5	03/05/2024 0:01			Planned Outage	Planned Outage.
BIOF	GIFT	12	02/20/2024 0:00			Planned Outage	Annual Preventive Maintenance until March 22 2024.
BIOF	CBEC	13.5	02/18/2024 21:44			Forced Outage	Generator exciter diode failure.
BIOF	G2REC	10.8	02/14/2024 7:01	02/24/2024 11:01	10	Forced Outage	Affected by the oil leak at transformer.
BIOF	IPower 2	10.8	02/11/2024 21:00	02/18/2024 9:31	7	Forced Outage	Turbine trouble
BIOF	GFI1	15.8	02/11/2024 18:00	02/13/2024 18:40	2	Forced Outage	Unplanned outage due to insufficient fuel.
BIOF	CLEANG 1	10.8	01/17/2024 17:02	02/01/2024 8:04	15	Forced Outage	Emergency shutdown due to high vibration of ID fan
BIOF	GFI1	15.8	01/14/2024 4:07	01/22/2024 6:06	8	Forced Outage	Insufficient fuel.
BIOF	CLEANG 1	10.8	12/29/2023 18:07			Forced Outage	Boiler travelling grate problem.
BIOF	GFI1	15.8	08/19/2023 6:00	01/13/2024 12:47	147	Maintenance Outage	Off season maintenance shutdown
COAL	GMEC Power 1	316	03/22/2024 15:15			Forced Outage	Emergency shutdown due to boiler tube leak
COAL	MFGC U2	150	03/10/2024 23:46			Maintenance Outage	Post Test & Commissioning Shutdown
COAL	Petron Unit 1	140	03/08/2024 23:15	03/19/2024 6:16	10	Forced Outage	Unplanned outage due to high vibration on Induced Draft Fan(IDF) bearing.
COAL	Calaca 2	300	03/06/2024 23:51			Planned Outage	Planned outage until May 23 2024.
COAL	Calaca 2	300	03/06/2024 23:51			Planned Outage	Planned Outage
COAL	GNP Dinginin 2	668	02/16/2024 0:07	03/05/2024 22:10	19	Planned Outage	Planned outage until March 6 2024. (Early synchronization)
COAL	SMC 4	150	03/02/2024 4:01	03/16/2024 18:19	15	Planned Outage	Planned Outage until March 23 2024
COAL	Pagbilao 1	382	02/29/2024 1:04	03/04/2024 22:37	5	Forced Outage	Emergency shutdown due to boiler tube leak.
COAL	Pagbilao 1	382	02/22/2024 1:06			Maintenance Outage	Maintenance outage until February 25 2024.
COAL	QPPL	460	02/13/2024 0:00	03/13/2024 2:16	29	Planned Outage	Planned Outage until March 13 2024.
COAL	GMEC Power 1	316	02/20/2024 6:56	03/06/2024 6:36	15	Forced Outage	Tripped due to metal high temperature of turbine bearing no. 4
COAL	GNP Dinginin 2	668	02/16/2024 0:07			Planned Outage	Planned outage until March 6 2024.
COAL	MFGC 3	150	02/15/2024 9:04	03/09/2024 11:00	23	Planned Outage	Conducted 25% (38MW) Load Rejection Test
COAL	QPPL	460	02/13/2024 0:00			Planned Outage	Planned Outage
COAL	SMC 1	150	02/05/2024 6:43	02/12/2024 7:40	7	Forced Outage	Tripped. Agglomeration of bed material due to high temperature
COAL	SMC 2	150	01/14/2024 4:05	01/30/2024 21:12	17	Planned Outage	Planned Outage until February 4 2024
COAL	Pagbilao 3	420	01/09/2024 0:46			Planned Outage	Planned Outage until Feb 24 2024.
COAL	Masinloc 1	344	12/27/2023 12:20	01/09/2024 1:05	13	Forced Outage	Emergency shutdown due to Air Preheater (AH1A) support bearing failure
COAL	SLTEC 2	124	12/22/2023 0:00	01/29/2024 23:49	39	Planned Outage	Planned Outage until February 5 2024.
COAL	SLTEC 1	122	12/23/2023 1:11	12/29/2023 4:42	6	Forced Outage	Unit shutdown in preparation for the planned shutdown of Calaca-Salong 230kV line on Dec 26 2023.
COAL	SLPGC 1	150	12/22/2023 23:59			Forced Outage	Unplanned outage due to turbine bearing no.2 high vibration.
COAL	SBPL	455	12/01/2023 0:01	01/19/2024 18:00	50	Planned Outage	Planned outage as per GOP until January 19 2024.
COAL	QPPL	460	12/20/2023 8:00	12/26/2023 13:58	6	Forced Outage	Emergency shutdown due boiler tube leak.
COAL	GMEC Power 2	316	12/17/2023 21:30	02/03/2024 3:27	47	Forced Outage	Tripped at 106MW load while ongoing shutdown due to coal conveyor trouble
COAL	GMEC Power 1	316	12/17/2023 21:52	02/15/2024 14:10	60	Forced Outage	Tripped at 17MW load while ongoing shutdown due to coal conveyor trouble
COAL	ANDA 1	72	12/19/2023 0:05	01/08/2024 23:20	21	Planned Outage	Planned Outage until January 8 2024
GEO	Makban 7	20	03/09/2024 7:05	03/11/2024 20:06	3	Forced Outage	Affected by the shutdown of Makban B-Makban D 230kV Tie Line.
GEO	Bacman 3	20	03/08/2024 0:02			Planned Outage	Planned outage until March 31 2024.
GEO	Makban 8	20	03/05/2024 0:00			Planned Outage	Planned Outage until March 27 2024.
GEO	Makban 8	20	03/05/2024 0:00			Planned Outage	Planned Outage until March 7 2024.
GEO	MGPP 2	12	02/13/2024 0:25	02/16/2024 21:30	4	Planned Outage	Minor PMS until February 16 2024
GEO	MGPP 1	20	02/13/2024 0:39	02/16/2024 17:21	4	Planned Outage	Minor PMS until February 16 2024
GEO	MGPP 2	12	02/13/2024 0:25			Maintenance Outage	Maintenance Outage until February 16 2024.
GEO	MGPP 1	20	02/13/2024 0:39			Maintenance Outage	Maintenance Outage until February 16 2024.
GEO	MGPP 2	12	02/13/2024 0:25			Maintenance Outage	Maintenance Outage
GEO	MGPP 1	20	02/13/2024 0:39			Maintenance Outage	Maintenance Outage
GEO	Makban 6	15	04/11/2013 22:44			Deactivated Shutdown	Conducted Gas compressor test.
GEO	Tiwi 2	60	01/24/2024 12:17			Forced Outage	Mechanical Turbine tripped.
GEO	Tiwi 5	57	01/10/2024 0:02	01/12/2024 22:19	3	Planned Outage	Planned shutdown to facilitate intensive inspection of Transformer and correction of Generator hydrogen leak.(Until Jan 13 2024)
GEO	Makban 7	20	12/17/2023 0:11	01/08/2024 19:48	23	Planned Outage	Replacement of turbine.
GEO	Tiwi 1	60	11/30/2021 18:32			Forced Outage	Steam supply diverted to Unit 2.
HYD	Bakun 2	37	03/22/2024 0:00			Forced Outage	Insufficient water supply.
HYD	Bakun 1	37	03/22/2024 0:00			Forced Outage	Insufficient water supply.
HYD	Magat 2	97	03/21/2024 7:01			Planned Outage	Planned outage until April 21 2024.
HYD	Magat 1	97	03/21/2024 7:01			Planned Outage	Planned outage until April 14 2024.
HYD	Magat 3	97	03/19/2024 0:01			Planned Outage	Planned outage until April 17 2024.
HYD	Magat 3	97	03/15/2024 0:00	03/19/2024 0:00	4	Forced Outage	Due to suspension of IDR by NIA.
HYD	Magat 2	97	03/15/2024 0:00	03/21/2024 7:00	6	Forced Outage	Due to suspension of IDR by NIA.
HYD	Magat 1	97	03/15/2024 0:00	03/21/2024 7:00	6	Forced Outage	Due to suspension of IDR by NIA.
HYD	Casacnan 1	82.5	03/04/2024 0:00	03/24/2024 23:59	21	Planned Outage	Planned outage until March 24 2024.
HYD	Bakun 2	37	03/07/2024 0:00	03/21/2024 23:59	15	Planned Outage	Planned outage until March 21 2024.
HYD	Bakun 1	37	03/07/2024 0:00	03/21/2024 23:59	15	Planned Outage	Planned outage until March 21 2024.
HYD	Casacnan 1	82.5	03/04/2024 0:00			Planned Outage	Planned Outage
HYD	Magat 4	97	03/03/2024 7:03			Planned Outage	Planned Outage until April 4 2024.
HYD	Bakun 2	37	02/28/2024 6:23	03/06/2024 23:59	8	Forced Outage	Low water inflow.
HYD	Bakun 1	37	02/12/2024 14:47	03/06/2024 23:59	23	Forced Outage	Low water inflow.
HYD	AMPHAW 1	12.5	03/01/2024 9:03			Planned Outage	Planned outage until March 31 2024.
HYD	Kalayaan 4	185	03/02/2024 0:00	03/19/2024 0:51	17	Planned Outage	Planned Outage until April 04 2024.
HYD	Binga 4	35	02/20/2024 8:01	02/24/2024 23:35	5	Planned Outage	Annual Preventive Maintenance until February 25 2024.
HYD	Kalayaan 3	184.6	02/16/2024 0:00			Planned Outage	Planned outage until May 5 2024.
HYD	Binga 4	35	02/13/2024 8:01	02/17/2024 16:49	4	Planned Outage	Planned Outage
HYD	Binga 3	35	02/13/2024 8:01	02/17/2024 20:23	5	Planned Outage	Planned Outage until February 18 2024.
HYD	Binga 2	35	02/13/2024 8:01	02/17/2024 16:49	4	Planned Outage	Planned Outage
HYD	Binga 1	35	02/13/2024 8:01	02/17/2024 16:49	4	Planned Outage	Planned Outage
HYD	Binga 2	35	01/30/2024 8:04			Planned Outage	Planned Outage until February 11 2024.
HYD	Binga 1	35	01/30/2024 8:04			Planned Outage	Planned Outage until February 11 2024.
HYD	Kalayaan 2	183	01/23/2024 0:00	01/27/2024 18:53	5	Planned Outage	Planned Outage until January 29 2024
HYD	Kalayaan 1	183	01/23/2024 0:00	01/29/2024 16:29	7	Planned Outage	Planned Outage until January 29 2024
HYD	BINENG 1	19.8	12/23/2023 17:07			Forced Outage	Outage due to low water supply
HYD	Angat M4	50	02/14/2022 0:00			Planned Outage	Planned outage.
HYD	Angat M3	50	11/02/2021 8:15			Forced Outage	Draw-out of Main Unit 3 generator breaker.
HYD	Angat M2	50	11/06/2023 8:01	01/03/2024 18:08	58	Planned Outage	Total Plant shutdown (Planned Outage)
HYD	Angat M1	50	11/06/2023 8:01	01/03/2024 17:14	58	Planned Outage	Total Plant shutdown (Planned Outage)
NATG	Ilijan A2	190	03/23/2024 17:38			Forced Outage	Fuel gas supply interruption.
NATG	Ilijan A3	220	03/23/2024 17:27			Forced Outage	Fuel gas supply interruption.
NATG	Ilijan A1	190	03/23/2024 17:16			Forced Outage	Fuel gas supply interruption.
NATG	Ilijan B1	190	03/23/2024 16:48	03/26/2024 6:12	3	Forced Outage	Fuel gas supply interruption.
NATG	Ilijan B3	220	03/23/2024 16:25	03/26/2024 7:56	3	Forced Outage	Fuel gas supply interruption.
NATG	Avion 1	47.2	03/15/2024 0:04	03/17/2024 21:00	3	Planned Outage	Planned outage until March 19 2024.
NATG	Ilijan B1	190	03/13/2024 23:58			Forced Outage	Gas restrictions.

### Appendix A. Major Plant Outages

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
<b>Luzon</b>							
NATG	Ilijan B3	220	03/13/2024 23:41	03/17/2024 1:45	3	Forced Outage	Gas restriction
NATG	Ilijan B2	190	03/13/2024 18:38			Forced Outage	Gas restriction
NATG	Ilijan B2	190	03/09/2024 23:27	03/13/2024 2:32	3	Forced Outage	Gas Restriction
NATG	Ilijan A3	220	02/23/2024 23:07	03/05/2024 11:46	11	Planned Outage	Planned Outage until March 7 2024.
NATG	Ilijan A1	190	02/23/2024 22:41	03/09/2024 21:04	15	Planned Outage	Planned Outage until March 9 2024.
NATG	San Gabriel	420	02/21/2024 23:34			Planned Outage	Planned Outage until March 31 2024.
NATG	Ilijan A2	190	02/16/2024 1:25	03/05/2024 8:05	18	Forced Outage	Due to gas supply restriction.
NATG	San Lorenzo 1	265	02/02/2024 23:26	02/13/2024 15:07	11	Planned Outage	Planned Outage until February 16 2024.
NATG	Ilijan B3	220	01/24/2024 23:42	02/12/2024 23:01	19	Planned Outage	Planned Outage until February 17 2024.
NATG	Ilijan B2	190	02/01/2024 0:00	02/12/2024 15:29	12	Forced Outage	Extended outage until February 12 2024.
NATG	Ilijan B1	190	01/24/2024 23:53	02/15/2024 23:42	22	Planned Outage	Planned Outage until February 17 2024.
NATG	Ilijan B1	190	01/24/2024 23:53			Planned Outage	Planned Outage
NATG	Ilijan B3	220	01/24/2024 23:42			Planned Outage	Planned Outage
NATG	San Lorenzo 2	265	01/19/2024 23:39	01/31/2024 1:59	11	Planned Outage	Planned Outage until February 2 2024.
NATG	Sta. Rita 3	265.5	01/10/2024 23:43	01/16/2024 3:03	5	Planned Outage	Planned Outage until January 15 2024.
NATG	Ilijan B2	190	01/08/2024 0:00	01/31/2024 23:59	24	Planned Outage	Planned Outage until January 31 2024.
NATG	Ilijan B2	190	01/05/2024 19:31	01/07/2024 23:59	2	Forced Outage	Gas restriction.
NATG	Ilijan B2	190	01/03/2024 6:24	01/05/2024 17:24	2	Forced Outage	Tripped due to gas supply problem
NATG	Sta. Rita 2	255.7	01/01/2024 23:45	01/03/2024 23:59	2	Planned Outage	Preparation for the Net Dependable Capacity(NDC) Test. (Until January 3 2024)
NATG	Ilijan A1	190	12/30/2023 14:29	01/03/2024 5:11	4	Forced Outage	Unplanned outage due to gas fuel restriction.
NATG	San Gabriel	420	12/24/2023 23:44	12/28/2023 5:14	3	Maintenance Outage	Maintenance Outage until December 29 2023.
NATG	Ilijan B3	220	12/24/2023 11:29	12/30/2023 7:51	6	Forced Outage	Gas supply problem.
NATG	Ilijan B2	190	12/24/2023 11:40	01/02/2024 13:54	9	Forced Outage	Gas supply problem.
NATG	Ilijan B1	190	11/17/2023 12:37	12/30/2023 5:35	43	Forced Outage	Shutdown due to rotor ground fault.
OIL	TMO Unit 4	52	02/29/2024 0:14	03/09/2024 23:38	10	Planned Outage	Annual Electrical PMS Feb 29 - March 9 2024
OIL	TMO Unit 3	55.2	02/21/2024 0:00	03/01/2024 0:05	9	Planned Outage	PMS until February 29 2024.
OIL	Ingrid 6	28	01/13/2024 0:18	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024.
OIL	Ingrid 5	22	01/13/2024 0:18	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024.
OIL	Ingrid 3	22	01/13/2024 0:18	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024.
OIL	Ingrid 2	22	01/13/2024 0:18	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024.
OIL	Ingrid 1	28	01/13/2024 0:18	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024.
OIL	Ingrid 4	28	01/13/2024 0:00	01/17/2024 23:06	5	Planned Outage	Planned Outage until January 17 2024
OIL	SLPGC 4	25	02/10/2022 18:07			Forced Outage	Due to low turbine lube oil supply. IEMOP deregistration effective on August 25 2022.
OIL	SLPGC 3	25	01/22/2022 21:39			Forced Outage	Declared unavailable due to turbine lube oil sump metal chips detected. IEMOP deregistration effective on August 25 2022.
OIL	Malaya 1	300	05/03/2019 18:21			Forced Outage	Declared unavailable due to motorization of unit generator caused by the non-opening of phase B of PCB 8-05CB08MAL.
SOLR	Subsol	85.5	02/01/2024 0:00	02/03/2024 22:49	3	Planned Outage	Annual Preventive Maintenance of HVE and Secondary Equipment until February 3 2024.
SOLR	ARAYSOL 2	30.933	01/05/2024 7:56			Forced Outage	Affected by the Planned Outage of Mexico-Clark 69kV line 2.
<b>Visayas</b>							
BIOF	South Negros	25	03/09/2024 3:49	03/18/2024 11:02	9	Forced Outage	Auto tripped due to Steam turbine generator cooling system problem.
BIOF	NTNEGB 1	25	03/08/2024 22:46	03/11/2024 18:10	3	Forced Outage	Offline due to corrective maintenance.
BIOF	South Negros	25	02/14/2024 21:54	03/03/2024 11:53	18	Maintenance Outage	Maintenance activity
BIOF	NTNEGB 1	25	01/26/2024 23:27	02/26/2024 12:45	31	Forced Outage	Insufficient fuel supply (bagasse).
BIOF	NTNEGB 1	25	01/19/2024 23:50	01/22/2024 12:02	3	Forced Outage	Offline due to bag house filter problem.
BIOF	South Negros	25	01/12/2024 13:42	02/12/2024 13:07	31	Forced Outage	Auto-tripped due to undervoltage relay activation.
BIOF	CABI 1	12	12/30/2023 15:06	01/03/2024 9:50	4	Forced Outage	Offline due to insufficient fuel supply (bagasse).
BIOF	South Negros	25	12/08/2023 0:35	01/08/2024 10:25	31	Maintenance Outage	Weekly maintenance.
BIOF	NTNEGB 1	25	12/06/2023 10:20	01/15/2024 15:46	40	Forced Outage	Shutdown due to tube leak.
COAL	CEDC 2	82	03/18/2024 10:20	03/21/2024 0:16	3	Forced Outage	EMERGENCY CUT-OUT DUE TO BOILER BACK PASS TUBE LEAK
COAL	PALM 1	135	02/18/2024 0:01			Maintenance Outage	Under PMS as per maintenance outage class 1.1.2.2.2
COAL	Keppo Salcon 1	103	02/08/2024 18:02	02/12/2024 3:52	3	Forced Outage	Unit cut-out due to possible tube leak Target cut-in days within 3-4 days
COAL	THW1	169	02/07/2024 0:23	02/24/2024 5:20	17	Planned Outage	UNIT MANUALLY CUT-OUT FOR PMS
COAL	PEDC 1	83.7	02/01/2024 0:06	02/16/2024 23:43	16	Planned Outage	PMS
COAL	CEDC 3	82	02/01/2024 0:00	02/13/2024 10:26	12	Forced Outage	Shutdown to conduct Major Overhaul (MOH) per approved GOMP schedule Extended
COAL	PEDC 2	83.7	01/29/2024 0:00			Maintenance Outage	Tube leak at furnace floor area
COAL	THW1 2	169	01/27/2024 0:00	02/14/2024 3:22	18	Planned Outage	Annual PMS
COAL	PEDC 3	150	01/17/2024 18:44	01/22/2024 23:15	5	Forced Outage	Auto-tripped due to High furnace pressure
COAL	PEDC 3	150	12/18/2023 0:35	01/13/2024 1:59	26	Maintenance Outage	Offline / RTD
COAL	CEDC 3	82	01/02/2024 0:01			Planned Outage	Shutdown to conduct Major Overhaul (MOH) per approved GOMP schedule; ECD: 01/31/2024 0000H
COAL	Keppo Salcon 1	103	01/04/2024 6:53	01/09/2024 4:48	5	Forced Outage	Shutdown due to boiler tube leak
COAL	PEDC 1	83.7	01/02/2024 12:06			Forced Outage	Tripped due to boiler feed pump problem
COAL	CEDC 3	82	01/02/2024 0:01			Planned Outage	Shutdown to conduct Major Overhaul (MOH) per approved GOMP schedule ECD 01/31/2024 0000H
COAL	THW1	169	12/23/2023 12:22	01/01/2024 13:28	9	Forced Outage	STEAM DRUM LOW LOW
COAL	PEDC 3	150	12/18/2023 0:35			Maintenance Outage	Offline
GEO	Nasuto	47.5	03/24/2024 0:04			Maintenance Outage	Offline for minor PMS.
GEO	Leyte 1	41	03/18/2024 10:52			Maintenance Outage	Scheduled PMS.
GEO	PGPP2 Unit 1	20	03/08/2024 6:30	03/10/2024 22:55	3	Forced Outage	emergency shutdown due to replacement of LRPV motor .
GEO	Malitbog 3	75.06	03/07/2024 17:18	03/10/2024 22:30	3	Forced Outage	Condenser Low Low Level indication
GEO	Malitbog 3	75.06	02/21/2024 0:12	03/01/2024 17:31	10	Forced Outage	Maintenance of MSV (ETC FEB 29 2024-0000H)
GEO	Upper Mahiao 2	30	02/14/2024 17:32			Forced Outage	Due to activation of main transformer differential relay trip phase A & B.
GEO	Leyte 1	40.2	02/10/2024 10:25	02/20/2024 13:15	10	Forced Outage	Emergency shutdown
GEO	PGPP1 Unit 2	37.5	02/03/2024 0:00			Forced Outage	Forced outage.
GEO	Upper Mahiao 4	27.5	12/15/2023 13:08	02/04/2024 2:12	51	Forced Outage	Insufficient steam.
GEO	Upper Mahiao 1	26.9	11/25/2022 11:07			Forced Outage	Insufficient steam.
GEO	Upper Mahiao 4	32	12/15/2023 13:08			Forced Outage	Insufficient steam.
GEO	Upper Mahiao 1	32	11/25/2022 11:07			Forced Outage	Insufficient steam.
GEO	PGPP1 Unit 1	37.5	01/17/2024 0:01	01/22/2024 2:59	5	Maintenance Outage	Replacement of unit oil trip test device.
GEO	PGPP1 Unit 3	35.5	01/11/2024 11:23	01/24/2024 16:19	13	Forced Outage	Auto tripped with indication condenser level very high.
GEO	PGPP1 Unit 2	37.5	11/21/2023 0:00	02/03/2024 0:00	74	Maintenance Outage	PGPP1 U2 tripped due to tripping of hot well pump during shutdown process. Scheduled total plant shutdown at 0006H.
GEO	PGPP1 Unit 2	37.47	11/21/2023 0:00			Maintenance Outage	PGPP1 U2 tripped due to tripping of hot well pump during shutdown process. Scheduled total plant shutdown at 0006H.
HYD	THC 2	5.1	02/12/2024 13:54	02/15/2024 10:19	3	Forced Outage	Affected by auto-tripping of Paranas-Quinapondan line.
HYD	THC 3	5.1	02/04/2024 7:51	02/12/2024 14:15	8	Forced Outage	Affected by Auto-tripping of Paranas-Quinapondan 69kV Line.
HYD	THC 2	5.1	01/31/2024 8:49	02/04/2024 7:56	4	Forced Outage	Change unit
HYD	THC 3	5.1	01/28/2024 22:15	01/31/2024 8:04	4	Forced Outage	Emergency stopped.
HYD	THC 2	5.31	01/21/2024 6:53	01/25/2024 7:32	4	Maintenance Outage	Clearing inspection at spiral tube
HYD	THC 1	5.31	01/06/2024 15:15	01/12/2024 10:14	6	Forced Outage	Normal stop low forebay water level.
OIL	PDPP3 C	12	03/21/2024 11:57			Forced Outage	Abnormal sound T/C A bank
OIL	PDPP3 C	12	03/18/2024 13:21	03/20/2024 17:14	2	Forced Outage	abnormal sound at Turbo Charger A-Bank
OIL	TPC Carmen 1	10	03/15/2024 11:41			Forced Outage	UNABLE TO CUT-IN DUE TO UNIT BREAKER AND GENERATOR PROBLEM
OIL	PDPP3 E	12	03/15/2024 0:01	03/22/2024 10:18	7	Planned Outage	To conduct 8000 RH PMS
OIL	PDPP3 C	12	03/08/2024 12:37	03/11/2024 0:07	2	Forced Outage	Unable to start due to HT water leak
OIL	PDPP3 H	13	03/07/2024 19:24	03/13/2024 16:25	6	Forced Outage	turbo charger surging A bank
OIL	TPV1 6	5.5	03/07/2024 8:01	03/11/2024 23:00	5	Planned Outage	Annual PMS
OIL	TPV1 5	5.5	03/07/2024 8:01	03/11/2024 23:00	5	Planned Outage	Annual PMS
OIL	TPV1 4	5.5	03/07/2024 8:01	03/11/2024 23:00	5	Planned Outage	Annual PMS
OIL	TPV1 3	5.5	03/07/2024 8:01	03/11/2024 23:00	5	Planned Outage	Annual PMS

## Appendix A. Major Plant Outages

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
<b>Visayas</b>							
OIL	TPVI 2	5.5	03/07/2024 8:01	03/11/2024 23:00	5	Planned Outage	Annual PMS
OIL	TPVI 1	5.5	03/07/2024 8:01	03/12/2024 7:50	5	Planned Outage	Annual PMS
OIL	TPC Carmen 3	10	03/04/2024 0:01			Planned Outage	DOE-APMS as per CY2024-2026 GOMP Rev0
OIL	PDPP3 E	12	03/01/2024 18:19	03/03/2024 18:37	2	Forced Outage	Unable to start due to abnormal sound at lube oil pump motor
OIL	PDPP3 G	13	02/28/2024 20:07	03/02/2024 18:55	3	Forced Outage	Fuel leak at supply pipe
OIL	TPVI 3	5.5	02/22/2024 8:00	02/27/2024 8:00	5	Planned Outage	To conduct APMS as per approved CY 2024-2026 GOMP rev.0
OIL	CENPRI 5	6.7	02/14/2024 9:17			Forced Outage	declared out due to internal water leak.
OIL	PDPP3 E	12	02/09/2024 17:32	02/19/2024 17:51	10	Forced Outage	Abnormal sound at Turbo Charger
OIL	PDPP3 G	13	02/07/2024 18:20	02/09/2024 19:25	2	Forced Outage	excessive HT water leak cyl B4
OIL	PDPP3 C	12	02/05/2024 12:36			Forced Outage	Excessive exhaust gas leak from cylinder A1 to A1
OIL	PDPP3 H	13	01/19/2024 20:30	01/24/2024 21:36	5	Forced Outage	Emergency shutdown due to abnormal sound of turbo charger
OIL	PDPP3 E	12	01/19/2024 17:29	01/23/2024 19:35	4	Forced Outage	Emergency shutdown due to water leak at cylinder A6
OIL	PDPP3 E	12	01/14/2024 14:28			Forced Outage	Gas leak at exhaust manifold
OIL	PDPP3 C	12	01/11/2024 23:15			Forced Outage	HT water leak
OIL	PDPP3 C	12	01/09/2024 19:46			Forced Outage	High exhaust gas leak
OIL	PDPP3 E	12	01/06/2024 18:57	01/10/2024 10:00	4	Forced Outage	engine governor trouble
OIL	PDPP3 H	13	01/03/2024 8:03	01/06/2024 10:38	3	Forced Outage	ASPA
OIL	PB101 Unit 4	6	01/05/2024 4:29			Maintenance Outage	Offline due to hot manifold
OIL	PDPP3 H	13	01/03/2024 8:03			Forced Outage	PDPP-3 U-Excessive vibration at exhaust manifold
OIL	CENPRI 4	6.7	01/02/2024 22:11			Maintenance Outage	Offline due to excessive fuel leaks at main fuel header.
OIL	CENPRI 5	6.7	01/02/2024 22:10			Maintenance Outage	Offline due to excessive fuel leaks at main fuel header.
OIL	PDPP3 E	12	01/02/2024 21:34			Forced Outage	OFF-LINE (Internal Trouble)
OIL	PDPP3 E	12	12/29/2023 14:05			Maintenance Outage	On maintenance [water leak]
OIL	TPC Carmen 2	10	12/27/2023 7:54	01/01/2024 9:10	5	Forced Outage	AUTO-TRIPPED DUE TO HIGH OIL MIST INTENSITY
OIL	TPC Carmen 4	10	12/26/2023 0:00			Planned Outage	Annual PMS
<b>Mindanao</b>							
BIOF	14TACUR	6	03/06/2024 0:00			Planned Outage	PMS (GOMP). ETC March 15 2024.
BIOF	14TACUR	6	03/06/2024 0:00			Maintenance Outage	PMS (Non-GOMP). ETC March 15 2024.
BIOF	14TACUR	6	03/06/2024 0:00			Forced Outage	PMS (Non-GOMP). ETC March 15 2024.
BIOF	LIBPOWR U1	6	02/24/2024 20:18			Forced Outage	Forced Outage. Emergency shutdown due to steam drum leakage.
BIOF	BFI BIOMASS U1	5.7	02/17/2024 20:44	02/23/2024 19:34	6	Forced Outage	Generator trouble
BIOF	BFI BIOMASS U1	5.7	02/11/2024 18:48	02/14/2024 1:28	2	Forced Outage	Affected by tripping of Tacurong-Surallah 69kV Line
BIOF	LSK U1	15	01/14/2024 0:20	01/21/2024 7:05	7	Maintenance Outage	Maintenance outage. ETC 01.21.2024
BIOF	LSK U1	15	01/14/2024 0:20			Forced Outage	Maintenance outage. ETC 01.21.2024
BIOF	14TACUR	6	12/27/2023 16:49	01/02/2024 7:53	6	Forced Outage	Emergency tripped due to leakage in evaporator zone. (Unplanned Outage)
COAL	SMF2 U2	118.5	03/19/2024 23:57	03/23/2024 11:11	3	Forced Outage	Unplanned Outage. Emergency shutdown to facilitate repair of electrostatic precipitator. Implemented gradual unloading thru RTD. ETC 03/23/2024 2359.
COAL	FMP U2	135	03/01/2024 0:01	03/16/2024 10:40	15	Planned Outage	PMS (GOMP).
COAL	STE U1	116	03/08/2024 0:00	03/14/2024 1:57	6	Forced Outage	PMS (Non-GOMP).
COAL	MCC U3	55	03/12/2024 12:55	03/18/2024 9:44	6	Forced Outage	Forced Outage. Indication Turbine Trip.
COAL	STE U2	116	03/04/2024 0:01	03/12/2024 11:03	8	Forced Outage	PMS (Non-GOMP).
COAL	STE U2	116	03/04/2024 0:01			Maintenance Outage	PMS (Non-GOMP). ETC March 12 2024.
COAL	STE U1	116	03/08/2024 0:00			Forced Outage	PMS (Non-GOMP). ETC March 15 2024.
COAL	STE U2	116	03/04/2024 0:01			Forced Outage	PMS (Non-GOMP). ETC March 11 2024.
COAL	FMP U2	135	03/01/2024 0:01			Planned Outage	PMS (GOMP). ETC March 21 2024.
COAL	FMP U2	135	03/01/2024 0:01			Planned Outage	PMS (GOMP). ETC March 21 2024 2359H.
COAL	FMP U2	135	03/01/2024 0:01			Planned Outage	PMS (GOMP). ETC March 21 2024 2359H.
COAL	MALITA 1	149.9	01/09/2024 8:14	02/19/2024 16:26	41	Forced Outage	PMS (Non-GOMP).
COAL	SMF1 U1	118.5	12/13/2023 20:38	02/20/2024 11:40	69	Forced Outage	Forced outage. Cause Turbine High Vibration. ETC February 21 2024.
COAL	STE U1	116	02/05/2024 16:50	02/09/2024 23:17	4	Forced Outage	Emergency Shutdown due to Boiler Fouling
COAL	STE U1	116	02/05/2024 16:50			Forced Outage	Emergency Shutdown due to Boiler Fouling. ETC Feb 12 2024.
COAL	SMF1 U1	118.5	12/13/2023 20:38			Forced Outage	Forced outage. Cause Turbine High Vibration. ETC February 17 2024.
COAL	STE U1	116	02/05/2024 16:50			Forced Outage	Emergency Shutdown due to Boiler Fouling. No ETC.
COAL	MALITA 1	149.9	01/09/2024 8:14			Forced Outage	PMS (Non-GOMP). ETC February 23 2024.
COAL	MALITA 1	149.9	01/09/2024 8:14			Maintenance Outage	PMS (Non-GOMP). ETC February 23 2024.
COAL	MCC U3	55	01/19/2024 0:02	02/02/2024 0:28	14	Forced Outage	PMS(Non-GOMP). ETC February 8 2024
COAL	MCC U3	55	01/19/2024 0:02			Maintenance Outage	PMS(Non-GOMP). ETC February 8 2024
COAL	MALITA 1	149.9	01/09/2024 8:14			Maintenance Outage	PMS (Non-GOMP). ETC January 23 2024.
COAL	STE U2	116	01/08/2024 14:00	01/13/2024 6:31	5	Forced Outage	Online from FO - Emergency Shutdown due to Boiler Fouling.
COAL	SMF1 U1	118.5	12/13/2023 20:38			Forced Outage	Forced outage. Cause Turbine High Vibration. ETC February 06 2024.
COAL	MALITA 1	149.9	01/09/2024 8:14			Forced Outage	PMS (Non-GOMP). ETC January 23 2024.
COAL	MALITA 1	149.9	01/09/2024 8:14			Forced Outage	Maintenance outage. ETC 01.23.2024
COAL	STE U2	116	01/08/2024 14:00			Forced Outage	Emergency Shutdown due to Boiler Fouling. No ETC yet.
COAL	SMF1 U1	118.5	12/13/2023 20:38			Forced Outage	Forced outage. Tripped with a 30.31MW load. Cause Turbine High Vibration. ETC 02.06.2024
COAL	FMP U1	135	01/01/2024 1:42	01/09/2024 16:39	9	Forced Outage	Emergency shutdown due to tube leak at cyclone A. (Unplanned Outage). Synchronized.
COAL	STE U2	116	01/08/2024 14:00			Forced Outage	Emergency Shutdown due to Boiler Fouling.
COAL	MALITA 2	150	12/30/2023 4:12	01/07/2024 20:02	9	Forced Outage	Synchronized from emergency shutdown due to boiler problem.
COAL	STE U1	116	12/28/2023 12:00	01/03/2024 13:48	6	Forced Outage	STEAG Unit 1 on emergency shutdown. Cause Boiler fouling. (Unplanned Outage)
COAL	FMP U1	135	01/01/2024 1:42			Forced Outage	Emergency shutdown due to tube leak at cyclone A. (Unplanned Outage).
COAL	FMP U1	135	01/01/2024 1:42			Forced Outage	Emergency shutdown to inspect possible tube leak at cyclone A (Unplanned Outage).
COAL	STE U1	116	12/28/2023 12:00			Forced Outage	STEAG Unit on emergency shutdown. Cause: Boiler fouling. (Unplanned Outage)
COAL	SMF1 U1	118.5	12/13/2023 20:38			Forced Outage	Forced outage. Tripped with a 30.31MW load. Cause: Turbine High Vibration.
COAL	MALITA 2	150	12/30/2023 4:12			Forced Outage	SMC Unit 2 on emergency shutdown due to boiler problem. Unplanned Outage.
COAL	STE U1	116	12/28/2023 12:00			Forced Outage	STEAG Unit on emergency shutdown. Cause Boiler fouling. (Unplanned Outage)
COAL	SMF1 U1	118.5	12/13/2023 20:38			Forced Outage	Forced outage. Tripped with a 30.31MW load. Cause Turbine High Vibration.
HYD	AG4 U3	52.7	03/21/2024 14:26			Forced Outage	Emergency shutdown. OMC - insufficient water supply. (Unplanned Outage)
HYD	AG7 U2	25.3	03/20/2024 12:42			Forced Outage	Shutdown due to insufficient water supply. (Unplanned Outage)
HYD	AG2 U2	60	03/14/2024 8:15	03/25/2024 23:59	12	Planned Outage	PMS(GOMP). ETC March 26 2024
HYD	SBL B U1	14	03/12/2024 0:13	03/22/2024 12:04	10	Planned Outage	PMS (GOMP). ETC March 25 2024 at 2359H.
HYD	SBL B U2	14	03/12/2024 0:08	03/22/2024 12:27	11	Planned Outage	PMS (GOMP). ETC March 25 2024 at 2359H.
HYD	PG4 U1	75	03/09/2024 20:16	03/13/2024 7:59	3	Forced Outage	OMC Outage. Due to low Water inflow (H2O Elev. Already at minimum level).
HYD	TU2 U1	8.1	03/06/2024 16:27			Forced Outage	Plant Tripped due to High Vibration DE(Drive End) Axial and High Vibration DE Radial 2
HYD	PG4 U2	75	03/05/2024 7:02	03/09/2024 14:52	4	Planned Outage	PMS (Non-GOMP). ETC March 10 2024.
HYD	TU2 U1	8.1	02/25/2024 16:06	03/05/2024 9:14	9	Forced Outage	Forced Outage. Indication Trip (Temperature Generator radial bearing DE too high).
HYD	TU2 U1	8.1	02/25/2024 16:06	03/05/2024 9:14	9	Forced Outage	Forced Outage. Indication Trip (Temperature Generator radial bearing DE too high). ETC on March 04 2024.
HYD	TU2 U1	8.1	02/25/2024 16:06			Forced Outage	Forced Outage. Indication Trip(Temperature Generator radial bearing DE too high). ETC on Mar. 04 2024.
HYD	SBL A U1	8.75	02/27/2024 0:25	03/01/2024 17:44	4	Planned Outage	PMS (GOMP).
HYD	TU2 U1	8.1	02/25/2024 16:06			Forced Outage	Forced Outage. Indication Trip(Temperature Generator radial bearing DE too high)
HYD	SBL A U2	8.75	02/27/2024 0:25	03/05/2024 19:38	8	Planned Outage	PMS (GOMP). ETC March 05 2024.
HYD	SBL A U1	8.75	02/27/2024 0:25			Planned Outage	PMS (GOMP). ETC March 05 2024.
HYD	TU2 U1	8.1	02/25/2024 16:06			Forced Outage	Trip(Temperature Generator radial bearing DE too high)
HYD	TU2 U1	8.1	02/23/2024 7:56			Forced Outage	Forced outage due to temp. generator radial bearing too high.
HYD	TU1 U1	6.7	02/14/2024 0:07	02/18/2024 20:46	5	Planned Outage	PMS(GOMP). ETC Feb 21 2024
HYD	AG4 U3	52.7	02/10/2024 8:01			Forced Outage	Shutdown for PMS (Non-GOMP). ETC 02/14/2024 800
HYD	PG4 U3	75	02/01/2024 22:49	02/06/2024 18:10	5	Forced Outage	On line from forced Outage. Indication Back-up Protection Electrical Emergency Shutdown.
HYD	AG6 U1	31.5	01/31/2024 0:00	02/06/2024 21:41	7	Forced Outage	Extended outage from original GOMP schedule (January 16-30 2024).
HYD	PG4 U3	75	02/01/2024 22:49			Forced Outage	Forced Outage. Indication Back-up Protection Electrical Emergency Shutdown.