Annual Over-riding Constraints Report

26 December 2022 to 25 December 2023

AUGUST 2024

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Philippine Electricity Market Corporation –
Market Assessment Group
and approved by the
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The information contained in this document is based on data that are subject to continuous verification by the Philippine Electricity Market Corporation (PEMC). The same information is subject to change as updated figures come in.

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1. OVER-RIDING CONSTRAINTS MONITORING

This report details the results of the monitoring of over-riding constraints[1] imposed by the System Operator (SO) on generators for the billing year of 2023 (26 December 2022 to 25 December 2023).

1.1. Over-riding Constraints by Region

The 2023 billing year documented a total of 603,511 over-riding constraints[2], wherein commissioning tests[3] and compliance with commercial and regulatory requirements contributed to approximately 80 percent of the total number of impositions.

On the year-on-year comparison, a rise in over-riding constraints by 46.8 percent was observed due to the commercial operations of WESM in Mindanao[4]. Notably, over-riding constraints for Luzon plants also increased significantly during the review period, as new plants entered the market and began commissioning tests. Additionally, the performance testing of natural gas plants in Luzon, as part of their transition to liquefied natural gas (LNG) fuel, contributed to the overall notable increase.

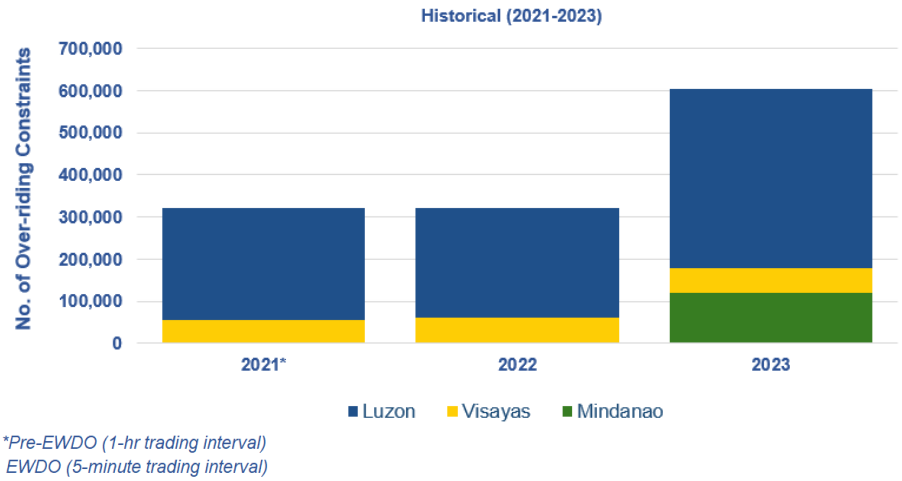


Figure 1. Historical Data of Over-riding Constraints (2017-2023), by Region

[1] WESM Rules Clause 3.5.13.1 states that the SO may require the Market Operator (MO) to impose constraints on the power flow, energy generation of a specific facility in the grid to address system security threat, to mitigate the effects of a system emergency, or to address the need to dispatch generating units to comply with systems, regulatory and commercial tests requirements.

[2] The monitoring of the OC on generators is done on a per generator trading node per trading interval. A constraint imposed on a generator trading node on a particular trading interval is considered as one **OC imposition**. The monitoring of the OC is based on the data and information provided by MO (i.e., real time market results and MMS-input files on security limits) and SO (i.e., SO Data for Market Monitoring).

[3] Department of Energy. Department Circular No. DC2021-06-0013 Section 3 (i) states that commissioning test refers to conduct of procedures to determine and certify that a generating unit was connected to the grid in accordance with the Philippine Grid Code (PGC), Philippine Distribution Code (PDC) and other relevant guidelines and specifications and to determine readiness to deliver energy to the grid or distribution network for the purpose of securing Certificate of Compliance (COC) from the Energy Regulatory Commission (ERC).

[4] Department of Energy. Department Circular No. DC2022-12-0039 Section 1 states that the DOE declares 26 January 2023 as the commencement date of the WESM in Mindanao

A significant portion of these over-riding constraints in 2023, totaling 424,013 (around 70 percent), were applied to Luzon plants. In contrast, Mindanao and Visayas plants were accounted for with 121,101 over-riding constraints (or about 20 percent) and, 58,397 over-riding constraints (or about 10 percent), respectively.

Figure 2 illustrates a steady increase in over-riding constraints from the first quarter to the middle of the second quarter. The rise affected both Luzon and Mindanao regions, with the peak occurrence in May 2023, mainly due to an increase in over-riding constraints in Luzon, driven by a rise in commissioning tests, and in Mindanao, related to Must-Run Unit (MRU) dispatches to address voltage requirements[5]. This was followed by a declining trend until October 2023. Notably, there was an increase of 53 percent from November to December 2023, primarily attributed to Luzon plants as performance test of natural gas plants increased during the fourth quarter as part of commissioning of their new LNG fuel[6].

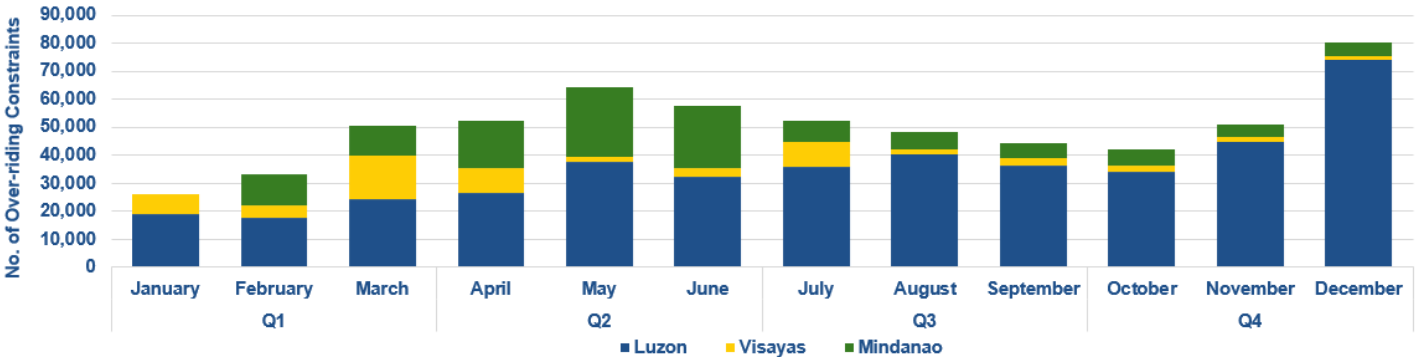
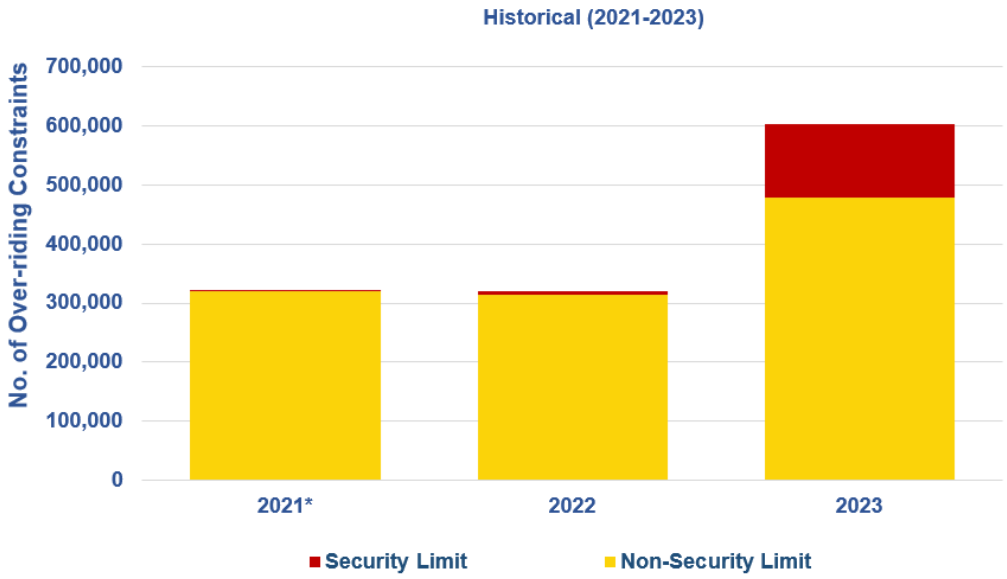


Figure 2. Monthly Comparison of Over-riding Constraints (2023), by Region

1.2. Over-riding Constraints by Category

In terms of over-riding constraints by category, increase in security limit from 2022 to 2023 was observed as WESM in Mindanao commercially operated February 2023 billing period. Security limit in Mindanao, specifically in Zamboanga, contributed to the increase in the overall over-riding constraints in 2023.

[5] Further details of the reason will be discussed in the succeeding section.
[6] Ibid.



*Pre-EWDO (1-hr trading interval)
EWDO (5-minute trading interval)

Figure 3. Historical Data of Over-riding Constraints (2017-2023), by Category

During the period in review, a total of 479,197 over-riding constraints attributable to non-security limits[7] were recorded. These over-riding constraints involved 104 plants in Luzon, 62 plants in Visayas, and 56 plants in Mindanao. Notably, most of the over-riding constraints classified as security limit[8] were imposed on plants located in Mindanao grid. The comparison and movements of over-riding constraints per quarter are further illustrated in Table 1 below.

Table 1. Summary of Over-riding Constraints by Category (2023)

Category	Quarter 1		Quarter 2		Quarter 3		Quarter 4		2023 Total	
	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total
Security Limit	25,809	23.6%	65,670	37.5%	16,191	11.1%	16,644	9.6%	124,314	20.6%
Non-Security Limit	83,648	76.4%	109,589	62.5%	129,090	88.9%	156,870	90.4%	479,197	79.4%
Total	**109,457**	**100.0%**	**175,259**	**100.0%**	**145,281**	**100.0%**	**173,514**	**100.0%**	**603,511**	**100.0%**

[7] WESM Dispatch Protocol Manual Issue 19 Clause 7.6.2 (b) states that non-security limits include testing and commissioning, generating unit limitation, and commercial and regulatory requirement.

[8] WESM Dispatch Protocol Manual Issue No. 19 Clause 7.6.2 (a) states that the SO may impose security limits to override the market offers and address possible threats in system security.

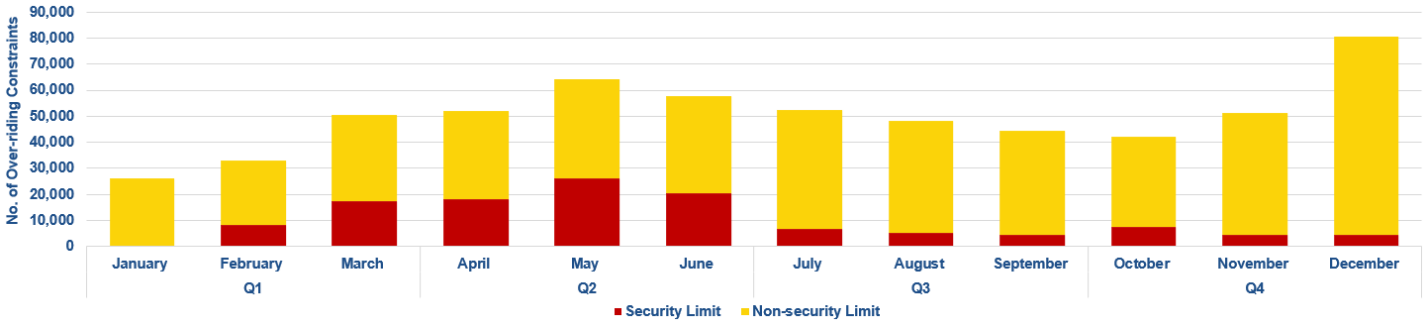


Figure 4. Monthly Comparison of Over-riding Constraints (2023), by Category - System

Observing the trend in Figure 4, a consistent increasing trend was noted from February 2023 to May 2023 attributed to plants scheduled as MRU[9] to address the system voltage requirement in Mindanao, specifically in Zamboanga Area. Furthermore, MRU scheduling during this period also addressed real power balancing and frequency control in Luzon, and thermal limits of transmission lines in Visayas.

Figure 5 further breaks down the impositions on a per region basis which only substantiates the discussions in the preceding paragraphs.

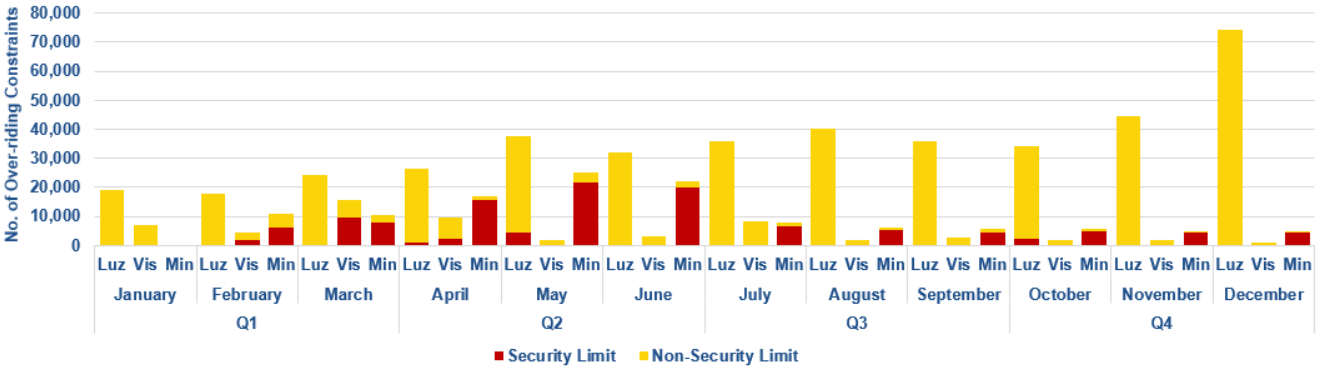
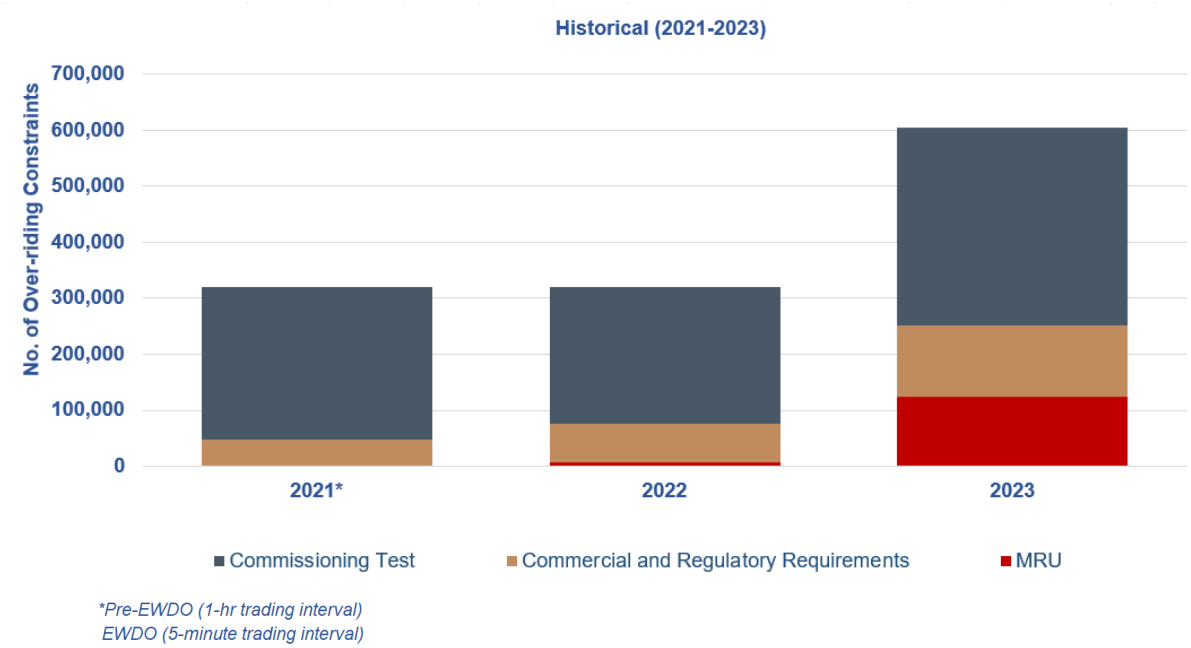


Figure 5. Monthly Comparison of Over-riding Constraints (2023), by Category and per Region

[9] Department of Energy. Department Circular No. DC2021-06-0013 provides that MRUs are generating units identified and instructed by the SO to provide additional energy on a particular trading interval to address System Security requirements but the dispatch of which is said to be Out of Merit.

1.3. Over-riding Constraints by Incident

A 43% increase in commissioning tests was observed from 2022 to 2023 due to new plants conducting their commissioning tests during the reviewed billing period. Additionally, as the commencement of WESM in Mindanao in 2023, the number of plants dispatched as MRU increased significantly primarily to address system voltage requirements in the region.



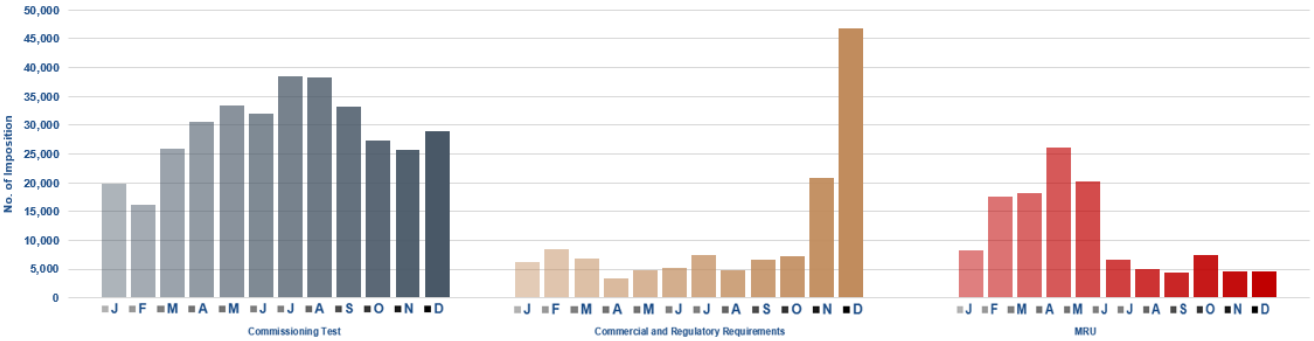
*Pre-EWDO (1-hr trading interval)
EWDO (5-minute trading interval)

Figure 6. Historical Data of Over-riding Constraints (2017-2023), by Incident

Comparing the over-riding constraints on a year-on year basis, it can be observed that most of the over-riding constraints, accounting to 58 percent of the total, were due to conduct of commissioning tests. The remaining over-riding constraints were split between commercial and regulatory requirements and MRU, each accounting for about 21%.

Table 2. Summary of Over-riding Constraints by Incident (2023)

Incident	Quarter 1		Quarter 2		Quarter 3		Quarter 4		2023 Total	
	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total
Commissioning Test	62,111	56.7%	96,132	54.9%	111,105	76.5%	81,983	47.2%	351,331	58.2%
Commercial and Regulatory Requirements	21,537	19.7%	13,457	7.7%	17,985	12.4%	74,887	43.2%	127,866	21.2%
Must Run Units	25,809	23.6%	65,670	37.5%	16,191	11.1%	16,644	9.6%	124,314	20.6%
Total	**109,457**	**100.0%**	**175,259**	**100.0%**	**145,281**	**100.0%**	**173,514**	**100.0%**	**603,511**	**100.0%**



Note: The legend refers to the opacity of the color in the chart

Figure 7. Monthly Comparison of Over-riding Constraints (2023), by Incident

Upon closer examination of over-riding constraints per incident, over-riding constraints related to commissioning test continued to increase from January 2023 to August 2023 then decreased for the remainder of the year. The decrease was due to the completion of commissioning tests and expiration of Provisional Certificates of Approval to Connect (PCATC)[10] for several plants.

Over-riding constraints due to commercial and regulatory requirements remained consistent throughout the reviewed period, with a significant increase in November and December 2023 due to performance test of natural gas plants transitioning to liquefied natural gas (LNG) fuel.

Regarding MRUs, most over-riding constraints occurred in the first half of the year, primarily addressing real power balancing and frequency control in Luzon, thermal limits of transmission lines in Visayas, and system voltage requirements in Mindanao.

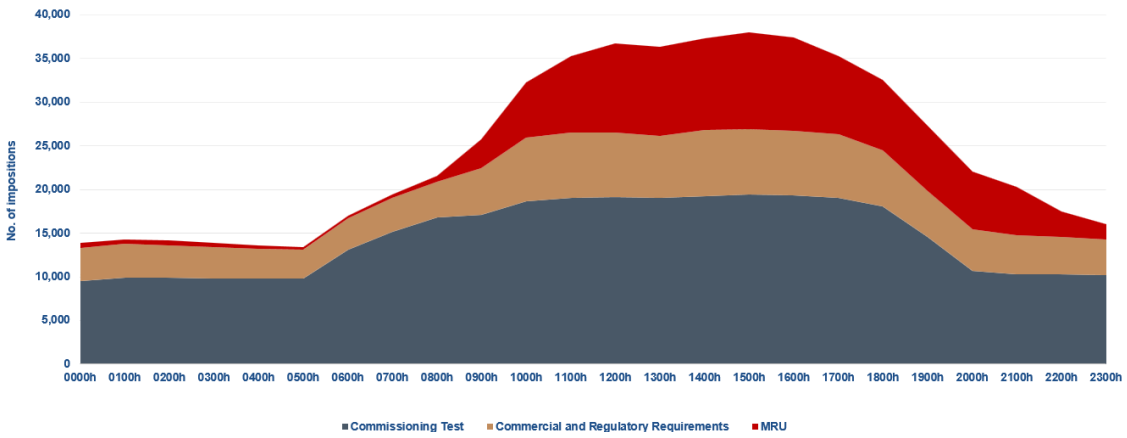


Figure 8. Hourly Profile of Over-riding per Incident (2023)

Figure 8 illustrates the trend of over-riding constraints imposition throughout the day. It is evident that most of over-riding constraints occur during the day until early

[10] Department of Energy. Department Circular No. DC2021-06-0013. PCATC is a certification issued by the TNP or DU to a Generation Company, allowing the conduct of Test and Commissioning with respect to its Generation Facility/ies

evening, specifically between 0500h and 2000h. This was mainly on account of the conduct of commissioning tests of solar plants, and most plants scheduled as MRUs are dispatched during peak hours (0900h to 2100h).

1.4. Over-riding Constraints by Plant Type

On a year-on-year comparison, several notable observations emerged regarding over-riding constraints. Biomass plants experienced a significant decline in over-riding constraints compared to previous years. It is only conducted in Q4 of 2023, 2021 and 2022 as plants conducting commissioning tests in 2021 commenced its commercial operation in 2022. Conversely, coal plants saw an increase due to conduct of commissioning and emission tests. Natural gas plants likewise experienced more impositions due to performance tests related to their new LNG fuel. Meanwhile, the increase for oil-based plants was primarily driven by MRU designations addressing voltage requirements in Mindanao's Zamboanga area. Furthermore, both solar and wind plants experienced increased over-riding constraints as new plants entered commissioning phases, following a decrease in 2022.

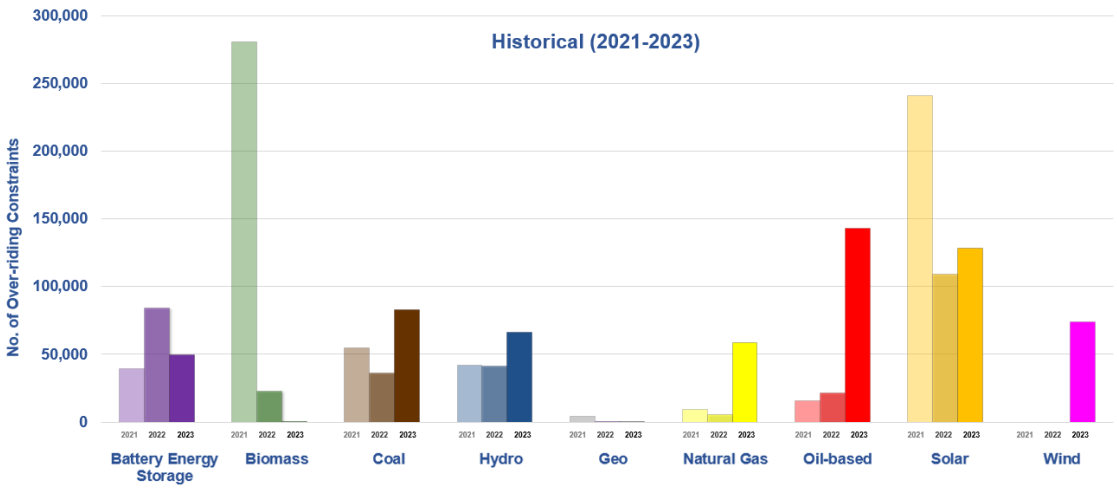


Figure 9. Historical Data of Over-riding Constraints (2021-2023), by plant type

Throughout 2023, oil-based plants had the highest number of over-riding constraints among the resource types due to plants dispatched as MRU, conduct of ancillary service and emission tests, accounting for 23.7 percent of the total impositions. They were closely followed by solar plants at 21.3 percent, coal plants at 13.7 percent, wind plants at 12.2 percent, and hydro plants at 11 percent. Natural gas plants accounted for 9.7 percent of over-riding constraints, while BESS contributed 8.2 percent. Biomass and geothermal plants had a small share, each accounting for 0.1 percent.

Table 3. Summary of Over-riding by Plant Type (2023)

Plant Type	Quarter 1		Quarter 2		Quarter 3		Quarter 4		2023 Total	
	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total	No. of Over-riding Constraints	% of Total
Battery Energy Storage	20,461	18.7%	10,158	5.8%	15,201	10.5%	3,807	2.2%	49,627	8.2%
Biomass		0.0%	-	0.0%	-	0.0%	347	0.2%	347	0.1%
Coal	8,324	7.6%	16,456	9.4%	27,612	19.0%	30,488	17.6%	82,880	13.7%
Geothermal		0.0%	453	0.3%	30	0.0%	120	0.1%	603	0.1%
Hydro	16,172	14.8%	11,686	6.7%	30,368	20.9%	7,867	4.5%	66,093	11.0%
Natural Gas	3,117	2.8%	1,409	0.8%	3,163	2.2%	50,980	29.4%	58,669	9.7%
Oil-based	28,447	26.0%	69,452	39.6%	24,546	16.9%	20,558	11.8%	143,003	23.7%
Solar	26,894	24.6%	43,138	24.6%	25,209	17.4%	33,190	19.1%	128,431	21.3%
Wind	6,042	5.5%	22,507	12.8%	19,152	13.2%	26,157	15.1%	73,858	12.2%
Total	**109,457**	**100.0%**	**175,259**	**100.0%**	**145,281**	**100.0%**	**173,514**	**100.0%**	**603,511**	**100.0%**

Observing the trend of over-riding constraints per plant type, a significant quarterly increase was noted for coal plants due to the commissioning of a new plant and ongoing emission tests throughout the year. Wind plants likewise experienced an increase as a new plant entered the market and began its commissioning tests in March 2023. The significant rise in the fourth quarter was attributed to performance tests conducted by San Gabriel Avion NGPP and Sta. Rita NGPP on their new LNG fuel.

Notable changes were observed on other plant types. Despite having the majority of over-riding constraints, oil-based plants saw a significant decline starting at the third quarter of 2023 and continuing into the fourth quarter caused by decrease in dispatches as MRU in Mindanao. Furthermore, the increase in hydro plant over-riding constraints during the third quarter was due to the commencement of commissioning tests for Tibag HPP. Conversely, the decrease in solar plant impositions during the third quarter resulted from the completion of commissioning tests for Pinugay SPP and Currimao 2 SPP. Additionally, BESS experienced a substantial decline in over-riding constraints, from 15,201 in Q3 to 3,807 in Q4 2023, due to the completion and expiration of commissioning tests for Magat BESS, Ubay BESS, and Concepcion BESS.

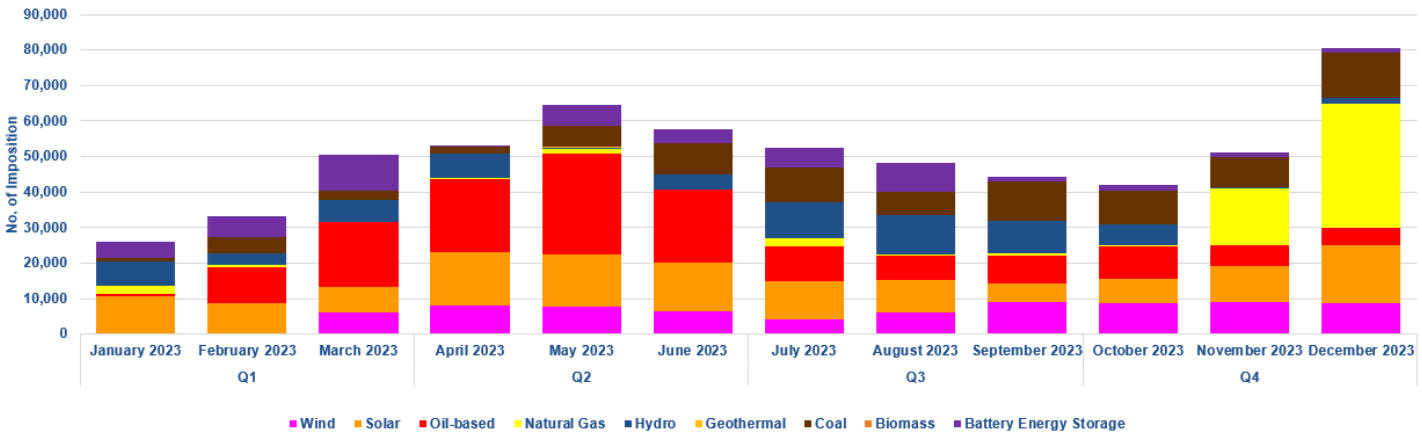


Figure 10. Monthly Comparison of Over-riding Constraints (2023), by Plant Type

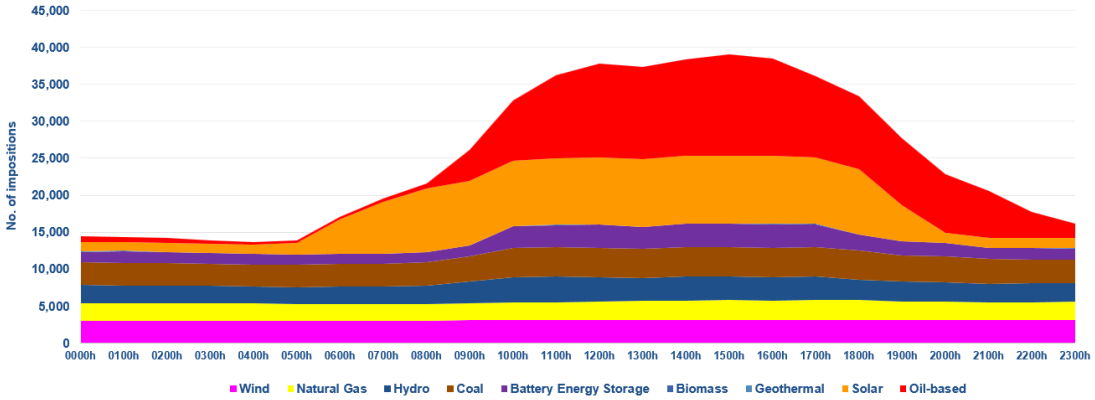


Figure 11. Hourly Profile of Over-riding Constraints (2023), by Plant Type

Analysis of the hourly profile of over-riding constraint per plant type reveals that over-riding constraints during daytime were mainly due to solar plant commissioning tests. Additionally, oil-based and battery plants experience over-riding constraints during peak hours of the day. In contrast, wind, hydro, coal, and natural gas plants exhibited relatively consistent over-riding constraints throughout the 24-hour period.

To further analyze the trend of over-riding constraints and their MW scheduling, a month-on-month comparison per quarter was conducted. Generally, plants undergoing regulatory requirement testing have had higher MW schedules, as conventional plants like coal and natural gas facilities, which regularly undergo such testing for compliance, have higher capacities than renewable energy plants like solar and wind.

Typically, commercial and regulatory requirement testing decreases during peak hours, suggesting that plants conduct these tests during off-peak hours to maximize available capacity when system demand is highest.

The charts also reveal that most oil-based and solar plants' over-riding constraints occur during peak hours. Additionally, the SO utilizes MRUs to address potential system security threats, often occurring during peak hours, as evident in the over-riding constraints of oil-based plants from February 2023 to June 2023.

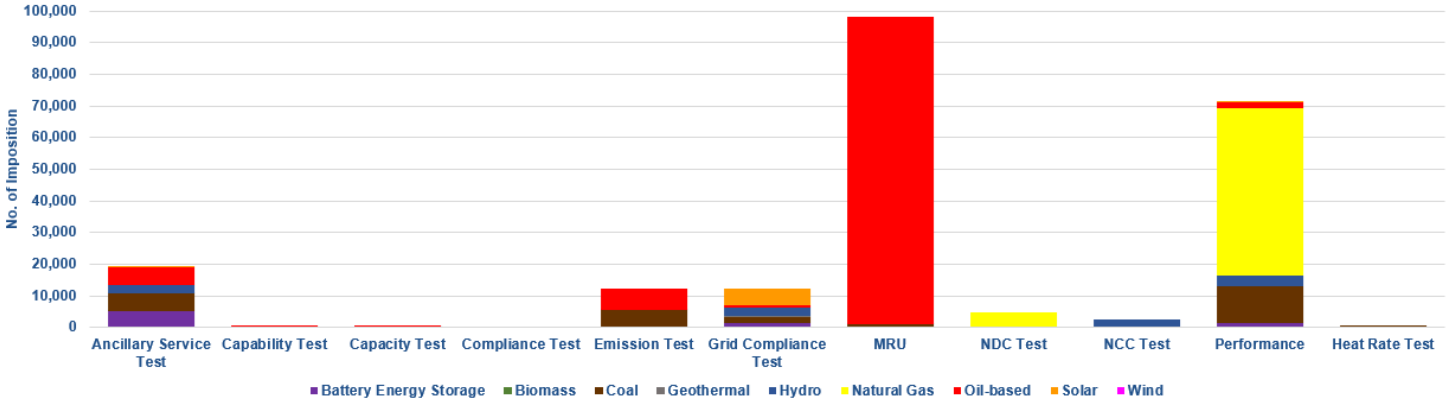


Figure 12. Number of Over-riding Constraints of Incidents (2023), by Plant Type (excluding Commissioning Test)

Excluding plants undergoing commissioning tests, the majority of over-riding constraints were attributed to MRU dispatches of oil-based plants, specifically WMPC DPP, to address system voltage requirements in Zamboanga area in Mindanao. This was

followed by over-riding constraints due to performance tests of natural gas plants, namely San Gabriel Avion NGFPP and Sta. Rita NGPP, as part of their commissioning process for new liquefied natural gas fuel.

2. PLANTS UNDER COMMISSIONING TEST

A year-on-year comparison reveals an overall increase in both the number of over-riding constraints and the number of plants undergoing commissioning tests from 2022 to 2023. This increase is attributed to new plants entering the market and commencing their commissioning tests. However, a decrease was observed in the first quarter of 2023, as biomass plants completed their commissioning test period in the second quarter of 2022.

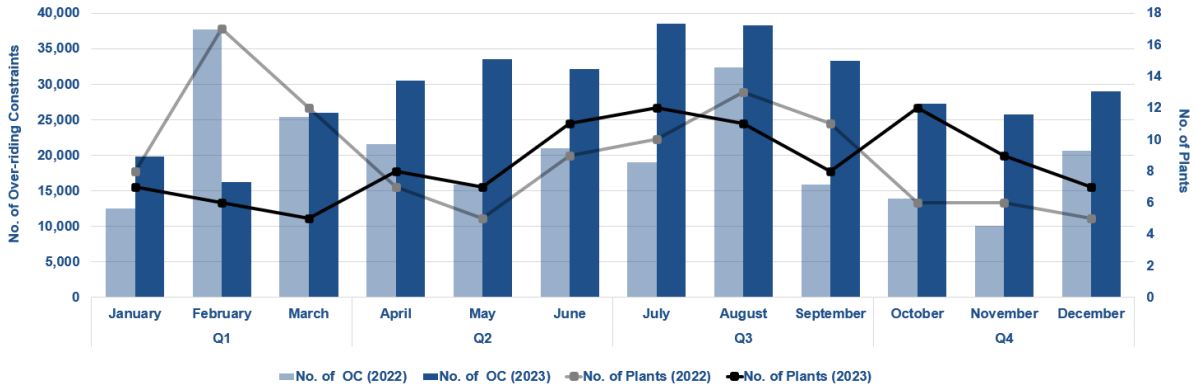


Figure 13. Historical Data of Over-riding Constraints (2022-2023), commissioning test

As part of its mandate to monitor trading participants' over-riding constraints[11] including those plants under commissioning tests, the MSC regularly conducts a monitoring of the reasons for extended tests, and if the same is aligned with the procedures set forth in the Market Rules and Manuals and other relevant issuances.

Throughout the covered period, an increasing trend was observed for both the number of imposition and the number of plants under commissioning tests. Consistent increases were noted from March to August 2023, reaching a maximum of 38,432 over-riding constraints in July 2023 imposed to 12 plants.

The majority of plants undergoing commissioning tests were renewable energy plants, with the exception of MPGC CFTPP, a coal plant that entered the market in May 2023 and underwent its commissioning test period.

The following notable plants that conducted its commissioning test during the reviewed billing period is listed in annex c. Most of the commissioning tests of solar plants occurred in the second quarter. Hydro plant commissioning tests were noted primarily during the third quarter. The wind plant entered the market in March 2023, and continued its commissioning tests throughout the remainder of the year.

[11] Market Surveillance Manual Issue 1.0 Section 5.5

As for energy storage systems, nine (9) BESS were observed to conduct commissioning tests during 2023 billing year, eight (8) of which are now in commercial operations.

The fourth quarter of 2023 saw a notable decline in over-riding constraints due to the completion of commissioning tests for eight (7) plants. These plants received their respective Final Certificate of Approval to Connect (FCATC)[12] allowing them to submit nominations or offers through their Market Participant Interface (MPI). Additionally, the expiration of the commissioning test period for Concepcion BESS contributed to the decrease in BESS over-riding constraints.

The decrease in over-riding constraints during the fourth quarter was primarily due to the completion of commissioning tests for Currimao 2 SPP, leading to a decrease in solar plant over-riding constraints from October 2023 onwards. The decline observed for Mariveles CTPP Unit 1 was also related to commissioning tests, as its PCATC expired in August 2023. Additionally, seven (7) plants received their FCATCs during the fourth quarter allowing them to submit nominations through the MPI. Of these, two (2) have commenced commercial operation, and four (4) are actively submitting nominations to the MPI. However, one (1) plant, despite having received FCATC and being allowed to submit nominations, has opted not to do so until it obtains either a Certificate of Compliance (COC) or Provisional Authority to Operate (PAO).

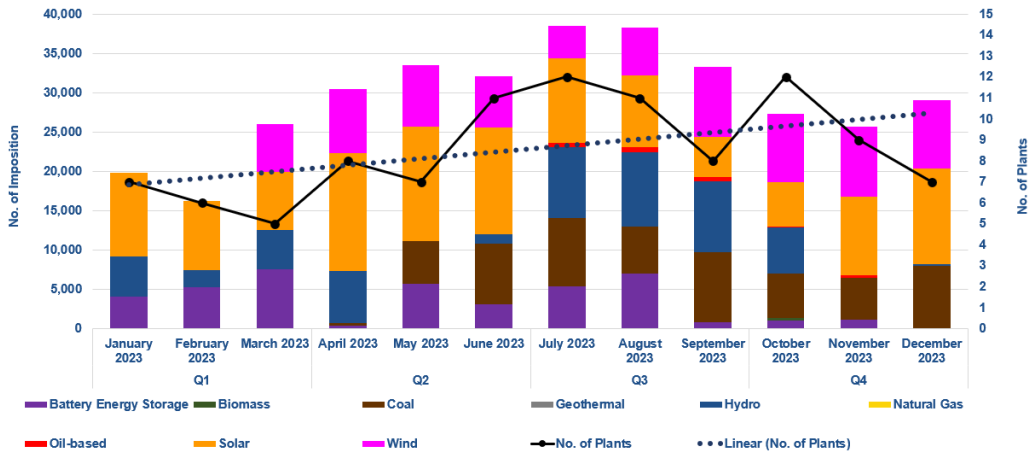


Figure 14. Monthly Comparison of the Over-riding Constraints due to Commissioning Test (2023), by Plant Type and Number of Plants

[12] Department of Energy. Department Circular No. DC2021-06-0013. FCATC is a certification issued by the TNP or DU to a Generation Company attesting that its Generation Facility/ies is ready to deliver energy to Grid or distribution network in accordance with the Philippine Grid Code (PGC)

APPENDIX A. LIST OF GENERATING PLANTS WITH OVER-RIDING CONSTRAINTS IMPOSITION

Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
LUZON		
Ambuklao Hydroelectric Power Plant Unit 1	Hydro	37.5
Ambuklao Hydroelectric Power Plant Unit 2	Hydro	37.5
Ambuklao Hydroelectric Power Plant Unit 3	Hydro	37.5
Angat Hydroelectric Power Plant Unit A	Hydro	19.6
Arayat-Mexico Solar Power Plant Project Phase 2	Solar	30.8
Bakun Hydro Electric Power Plant	Hydro	74
Balaoi and Caunayan Wind Power Project Phase 1	Wind	80
Bauang Diesel Power Plant GS1	Oil-Based	70
Bauang Diesel Power Plant GS2	Oil-Based	70
Bauang Diesel Power Plant GS3	Oil-Based	70
Binga Hydroelectric Power Plant - Unit 1	Hydro	35
Binga Hydroelectric Power Plant - Unit 2	Hydro	35
Binga Hydroelectric Power Plant - Unit 3	Hydro	35
Binga Hydroelectric Power Plant - Unit 4	Hydro	35
0.531 MW/1.400 MWh Energy Storage System (ESS)	Battery	0.5
Cagayan North Solar Power Plant	Solar	115
Casecnan Hydro Electric Power Plant	Hydro	165
Cayanga-Bugallon Solar Power Plant	Solar	75.1
Bunker C-Fired Diesel Power Plant	Oil-Based	20
Concepcion Battery Energy Storage System	Battery	60
Currimao 2 Solar Power Plant	Solar	68.7
GNPower Dinginin Coal Plant - Unit 1	Coal	668
GNPower Dinginin Coal Plant - Unit 2	Coal	668
Lamao Battery Energy Storage System	Battery	50
Bataan Battery Energy Storage System	Battery	40
Bataan Combined Cycle Power Plant Unit 1	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 2	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 3	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 5	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 6	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 7	Oil-Based	60
Bataan Combined Cycle Power Plant Unit 8	Oil-Based	90
Magapit Battery Energy Storage System	Battery	40
Magat Battery Energy Storage System	Battery	24
Magat Hydroelectric Power Plant Unit 1	Hydro	97

[13] As of 27 May 2024

Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
Magat Hydroelectric Power Plant Unit 2	Hydro	97
Magat Hydroelectric Power Plant Unit 3	Hydro	97
Magat Hydroelectric Power Plant Unit 4	Hydro	97
Maris Canal HEPP Unit 1	Hydro	4.25
Maris Canal HEPP Unit 2	Hydro	4.25
Mariveles Solar Power Plant	Solar	16
Mariveles Coal Fired Thermal Power Plant Unit 1	Coal	316
Mariveles Coal Fired Thermal Power Plant Unit 2	Coal	316
Mariveles Coal-fired Thermal Power Plant- Phase 1	Coal	150
Mariveles Coal-fired Thermal Power Plant Unit 2	Coal	150
Masinloc Battery Energy Storage System	Battery	10
Masinloc Coal-Fired Thermal Power Plant Unit 1	Coal	344
Masinloc Coal-Fired Thermal Power Plant Unit 2	Coal	344
Masinloc Coal-Fired Thermal Power Plant Unit 3	Coal	335
NIA Baligatan Hydro Electric Power Plant	Hydro	6
Pasuquin Solar Power Plant	Solar	92.4
Orion Solar Power Plant	Solar	16.2
Refinery Solid Fuel-Fired Boiler Power Plant	Coal	140
Pantabangan Hydro Electric Power Plant Unit 1	Hydro	60
Pantabangan Hydro Electric Power Plant Unit 2	Hydro	60
RASLAG III Solar PV Plant	Solar	13.4
Bunker-C Fired Thermal Power Plant (BCFDPP)	Oil-Based	110
San Marcelino Solar Power Project	Solar	326.4
San Roque Hydro Electric Power Plant Unit 2	Hydro	145
San Roque Hydro Electric Power Plant Unit 3	Hydro	145
Sual Coal-Fired Power Plant 1	Coal	647
Sual Coal-Fired Power Plant 2	Coal	647
PPGC Diesel Power Plant	Oil-Based	50
Trust Solar Power Plant	Solar	15.4
Pinugay Solar Power Plant	Solar	71.6
Navotas Bunker C-Fired Diesel Power Plant Power Barge 1 / Mobile 3	Oil-Based	63.8
Navotas Bunker C-Fired Diesel Power Plant Power Barge 2 Mobile 4	Oil-Based	51.5
Navotas Bunker C-Fired Diesel Power Plant Power Barge 3 / Mobile 5	Oil-Based	55.2
Navotas Bunker C-Fired Diesel Power Plant Power Barge 4 / Mobile 6	Oil-Based	52
Subplant 2 Alaminos Battery Energy Storage System	Battery	20
San Gabriel Avion Natural Gas-Fired Power Plant Unit 1	Natural Gas	47.2
San Gabriel Avion Natural Gas-Fired Power Plant Unit 2	Natural Gas	45.8
Bacman Geothermal Power Plant Unit 1	Geothermal	60
Bacman Geothermal Power Plant Unit 3	Geothermal	20

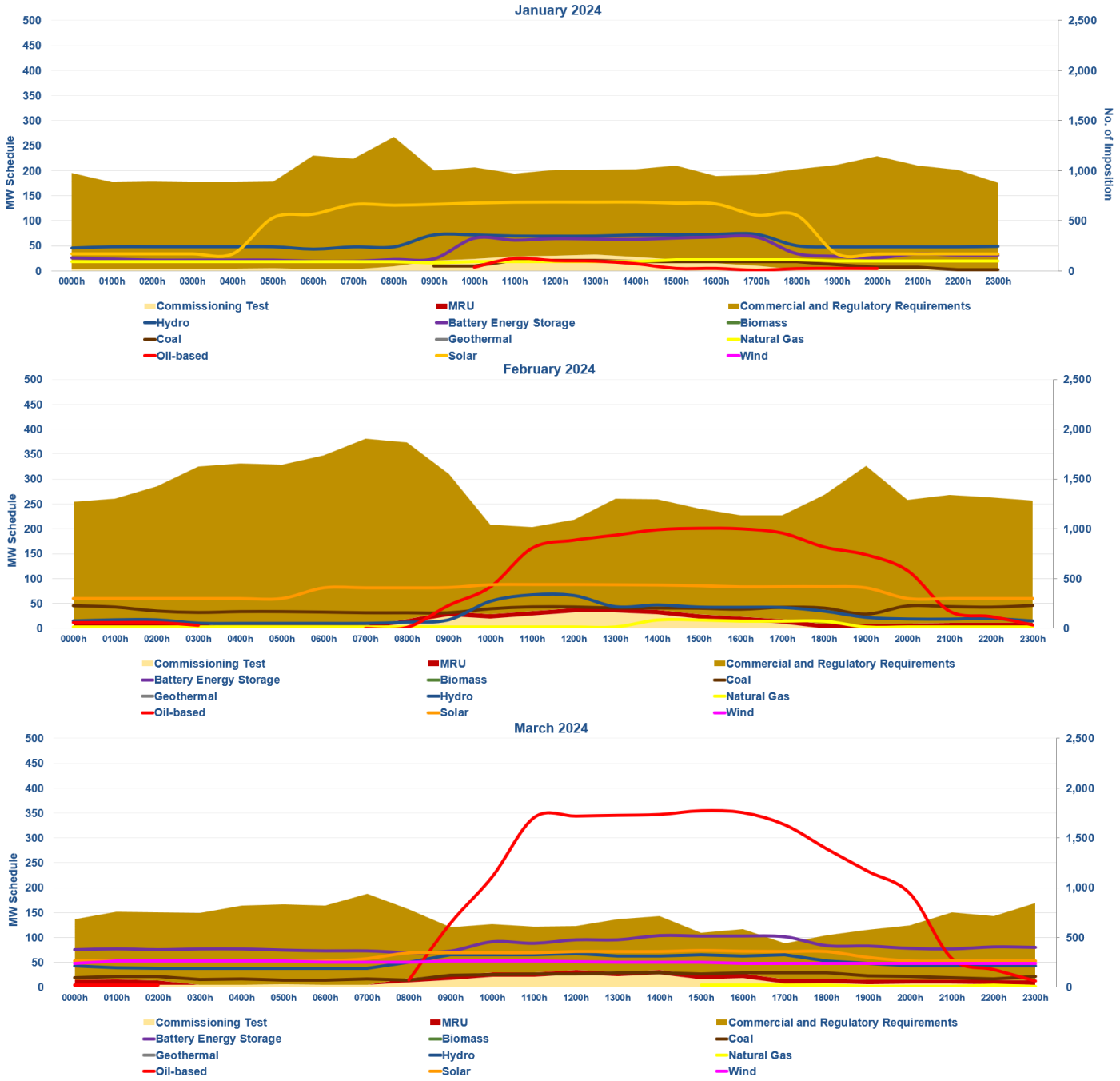
Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
Botocan Hydro Electric Power Plant	Hydro	20.8
Caliraya Hydro Electric Power Plant	Hydro	28
Pililla Diesel Power Plant Sector 1	Oil-Based	28
Pililla Diesel Power Plant Sector 2	Oil-Based	22
Pililla Diesel Power Plant Sector 3	Oil-Based	22
Pililla Diesel Power Plant Sector 4	Oil-Based	28
Pililla Diesel Power Plant Sector 5	Oil-Based	22
Pililla Diesel Power Plant Sector 6	Oil-Based	28
Kalayaan Hydro Electric Power Plant 1	Hydro	183
Kalayaan Hydro Electric Power Plant 2	Hydro	183
Kalayaan Hydro Electric Power Plant 3	Hydro	184.6
Kalayaan Hydro Electric Power Plant 4	Hydro	185
Lower Labayat Hydroelectric Power Plant	Hydro	1.5
Malaya Thermal Power Plant Unit 2	Oil-Based	130
Majestics Energy Solar PV Plant	Solar	32.9
Makban-Binary 1 Geothermal Power Plant	Geothermal	6
Pagbilao Coal-Fired Power Plant 1	Coal	382
Pagbilao Coal-Fired Power Plant 2	Coal	382
Pagbilao 3 Power Plant	Coal	420
QPPL Coal-Fired Power Plant	Coal	460
Batangas Diesel Power Plant Unit 1	Oil-Based	5.5
Batangas Diesel Power Plant Unit 2	Oil-Based	5.5
SBPL Coal Fired Power Plant	Coal	455
SLPGC Circulating Fluidized Bed (CFB) Coal-Fired Power Plant 2	Coal	149.6
San Gabriel Power Plant	Natural Gas	420
Sta. Rita Natural Gas Power Plant 1	Natural Gas	257.3
Sta. Rita Natural Gas Power Plant 2	Natural Gas	255.7
Sta. Rita Natural Gas Power Plant 3	Natural Gas	265.5
Sta. Rita Natural Gas Power Plant 4	Natural Gas	264
San Lorenzo Combined-Cycle Gas Turbine Power Plant Unit 50	Natural Gas	265
San Lorenzo Combined-Cycle Gas Turbine Power Plant Unit 60 (San Lorenzo CCGTPP)	Natural Gas	265
VISAYAS		
Calbayog Bunker C-Fired Diesel Power Plant	Oil-Based	11.2
Isabel Modular Diesel Power Plant Sector 1	Oil-Based	10
Isabel Modular Diesel Power Plant Sector 2	Oil-Based	10.1
Isabel Modular Diesel Power Plant Sector 3	Oil-Based	15.1
Isabel Modular Diesel Power Plant Sector 4	Oil-Based	10.2
Isabel Modular Diesel Power Plant Sector 5	Oil-Based	15.1
Isabel Modular Diesel Power Plant Sector 6	Oil-Based	10.2

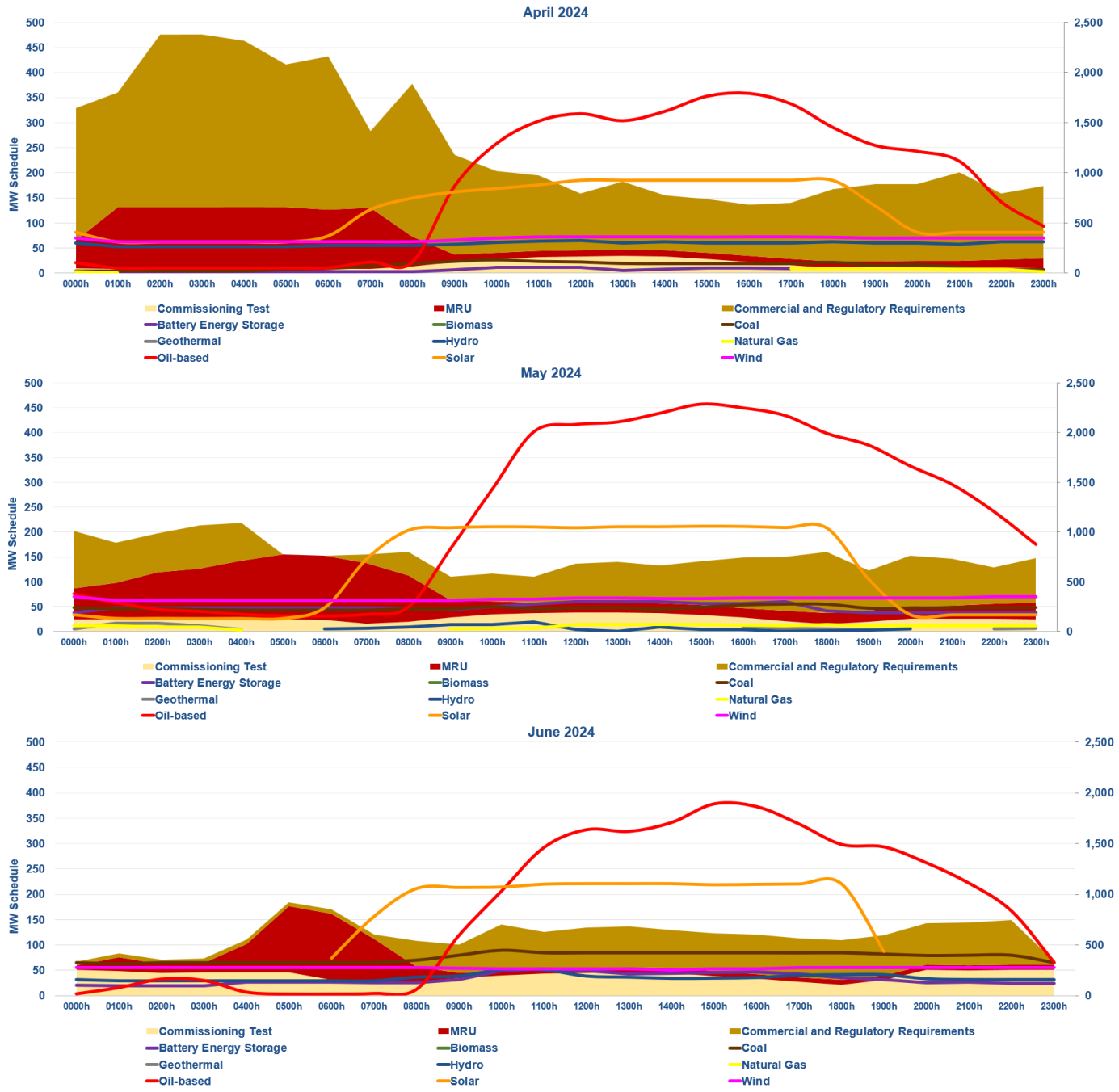
Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
Ormoc Battery Energy Storage System	Battery	40
Tubig Hydroelectric Power Plant	Hydro	15.2
CEDC Coal-Fired Thermal Power Plant Unit 1	Coal	82
CEDC Coal-Fired Thermal Power Plant Unit 2	Coal	82
CEDC Coal-Fired Thermal Power Plant Unit 3	Coal	82
CPPC Bunker C-Fired Diesel Power Plant Unit 1	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 2	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 3	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 4	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 5	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 6	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 7	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 8	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 9	Oil-Based	6.5
CPPC Bunker C-Fired Diesel Power Plant Unit 10	Oil-Based	6.5
EAUC Bunker C-Fired Power Plant Unit 1	Oil-Based	11.5
EAUC Bunker C-Fired Power Plant Unit 2	Oil-Based	11
EAUC Bunker C-Fired Power Plant Unit 3	Oil-Based	11.5
EAUC Bunker C-Fired Power Plant Unit 4	Oil-Based	11.5
Cebu Coal-Fired Thermal Power Plant (Cebu CFTPP) Unit 1	Coal	103
Cebu Coal-Fired Thermal Power Plant (Cebu CFTPP) Unit 2	Coal	103
Toledo Battery Energy Storage System	Battery	20
Sangi Coal Fired Power Plant	Coal	83.6
Sangi Coal Fired Power Plant	Coal	83.6
Naga Oil-Fired Power Plant Unit 1	Oil-Based	5.5
Naga Oil-Fired Power Plant Unit 2	Oil-Based	5.5
Naga Oil-Fired Power Plant Unit 3	Oil-Based	5.5
Naga Oil-Fired Power Plant Unit 4	Oil-Based	5.5
Naga Oil-Fired Power Plant Unit 5	Oil-Based	5.5
Naga Oil-Fired Power Plant Unit 6	Oil-Based	5.5
Unit 1 Calumangan Bunker C-Fired Diesel Power Plant	Oil-Based	4.5
Unit 2 Calumangan Bunker C-Fired Diesel Power Plant	Oil-Based	4.5
Unit 3 Calumangan Bunker C-Fired Diesel Power Plant	Oil-Based	4.5
Unit 4 Calumangan Bunker C-Fired Diesel Power Plant	Oil-Based	6.7
Unit 5 Calumangan Diesel Power Plant	Oil-Based	6.7
Kabankalan Battery Energy Storage System	Battery	20
Nasulo Geothermal Power Plant	Geothermal	47.5
Palinpinon Geothermal Power Plant II Unit 1	Geothermal	20
Palinpinon Geothermal Power Plant II Unit 2	Geothermal	20
Palinpinon Geothermal Power Plant II Unit 3	Geothermal	19.5
Kabankalan Bagasse-Fired Biomass Power Plant	Biomass	20
Bohol Diesel Power Plant Unit 1	Oil-Based	4
Bohol Diesel Power Plant Unit 2	Oil-Based	4

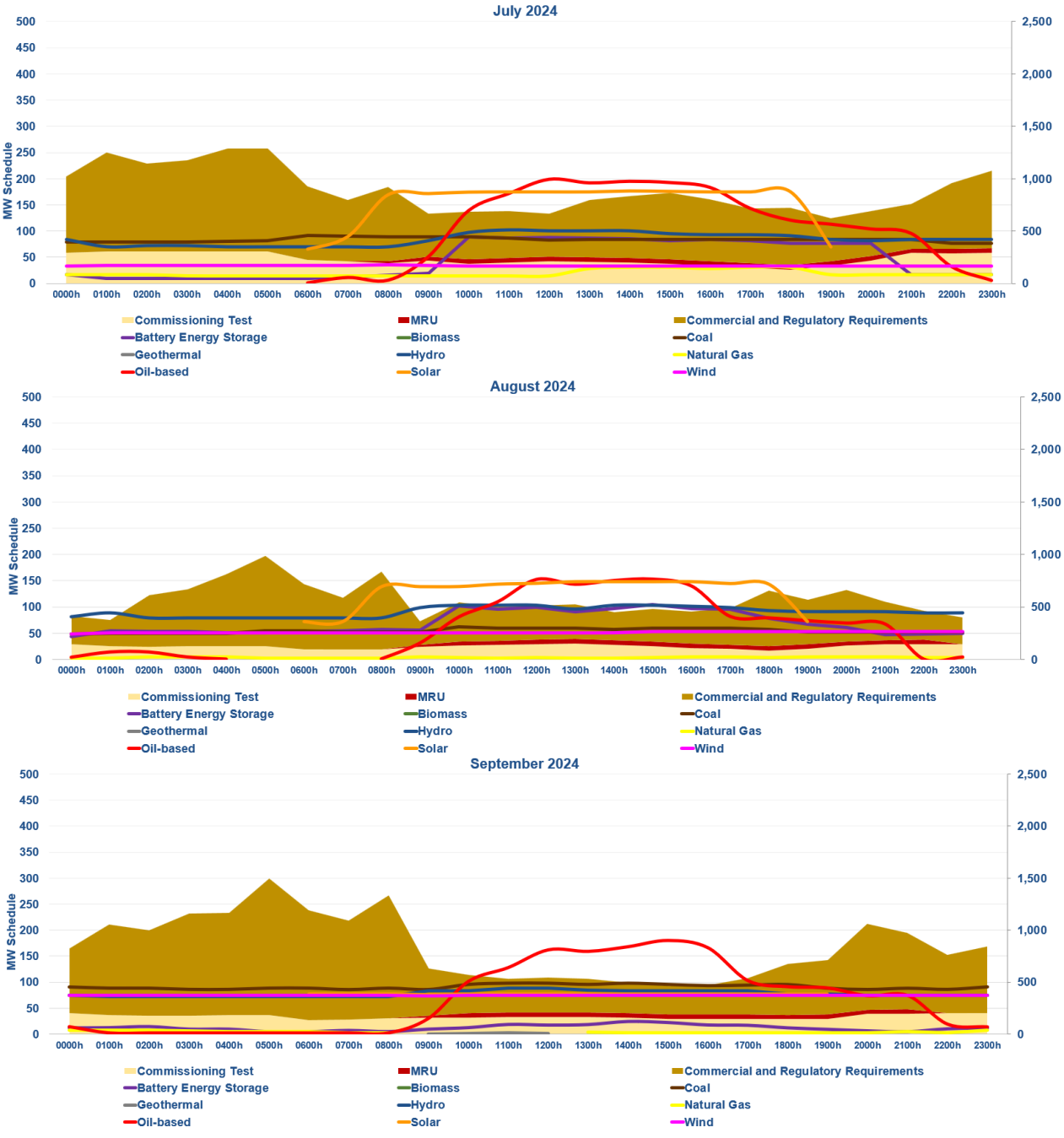
Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
Bohol Diesel Power Plant Unit 3	Oil-Based	4.2
Bohol Diesel Power Plant Unit 4	Oil-Based	4
Power Barge 104 Unit 1	Oil-Based	7
Power Barge 104 Unit 2	Oil-Based	7
Power Barge 104 Unit 3	Oil-Based	7
Power Barge 104 Unit 4	Oil-Based	8
Ubay Battery Energy Storage System (BESS)	Battery	20
Circulating Fluidized Bed (CFB) Coal-Fired Power Plant (CFPP)	Coal	135
Panay Diesel Power Plant 1 (Unit 2)	Oil-Based	5
Panay Diesel Power Plant 1 (Unit 3)	Oil-Based	5
Panay Diesel Power Plant 1 (Unit 5)	Oil-Based	5
Panay Diesel Power Plant 3 (Unit Charlie)	Oil-Based	12
Panay Diesel Power Plant 3 (Unit Echo)	Oil-Based	12
Panay Diesel Power Plant 3 (Unit Golf)	Oil-Based	13
Panay Diesel Power Plant 3 (Unit Hotel)	Oil-Based	13
PEDC Coal-Fired Thermal Power Plant Unit 1	Coal	83.7
PEDC Coal-Fired Thermal Power Plant Unit 2	Coal	83.7
PEDC Unit 3 Circulating Fluidized Bed Power Plant	Coal	150
Power Barge 101- Unit 1	Oil-Based	6
Power Barge 101- Unit 2	Oil-Based	6
Power Barge 101- Unit 3	Oil-Based	6
Power Barge 101- Unit 4	Oil-Based	6
Timbaban Hydro Power Plant	Hydro	18.9
MINDANAO		
Biomass Power Plant	Biomass	6
Misamis Occidental Bunker C-Fired Power Plant 2 Unit 1	Oil-Based	7.8
Misamis Occidental Bunker C-Fired Power Plant 2 Unit 2	Oil-Based	7.8
Bunker-C Fired Diesel Power Plant Unit 1	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 2	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 3	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 4	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 5	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 6	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 7	Oil-Based	10
Bunker-C Fired Diesel Power Plant Unit 8	Oil-Based	10.1
Bunker-C Fired Diesel Power Plant Unit 9	Oil-Based	10.2
Bunker-C Fired Diesel Power Plant Unit 10	Oil-Based	10.2
Agus I Hydroelectric Power Plant Unit 1	Hydro	35
Agus I Hydroelectric Power Plant Unit 2	Hydro	35
Agus II Hydroelectric Power Plant Unit 2	Hydro	60
Agus IV Hydroelectric Power Plant Unit 1	Hydro	52.7

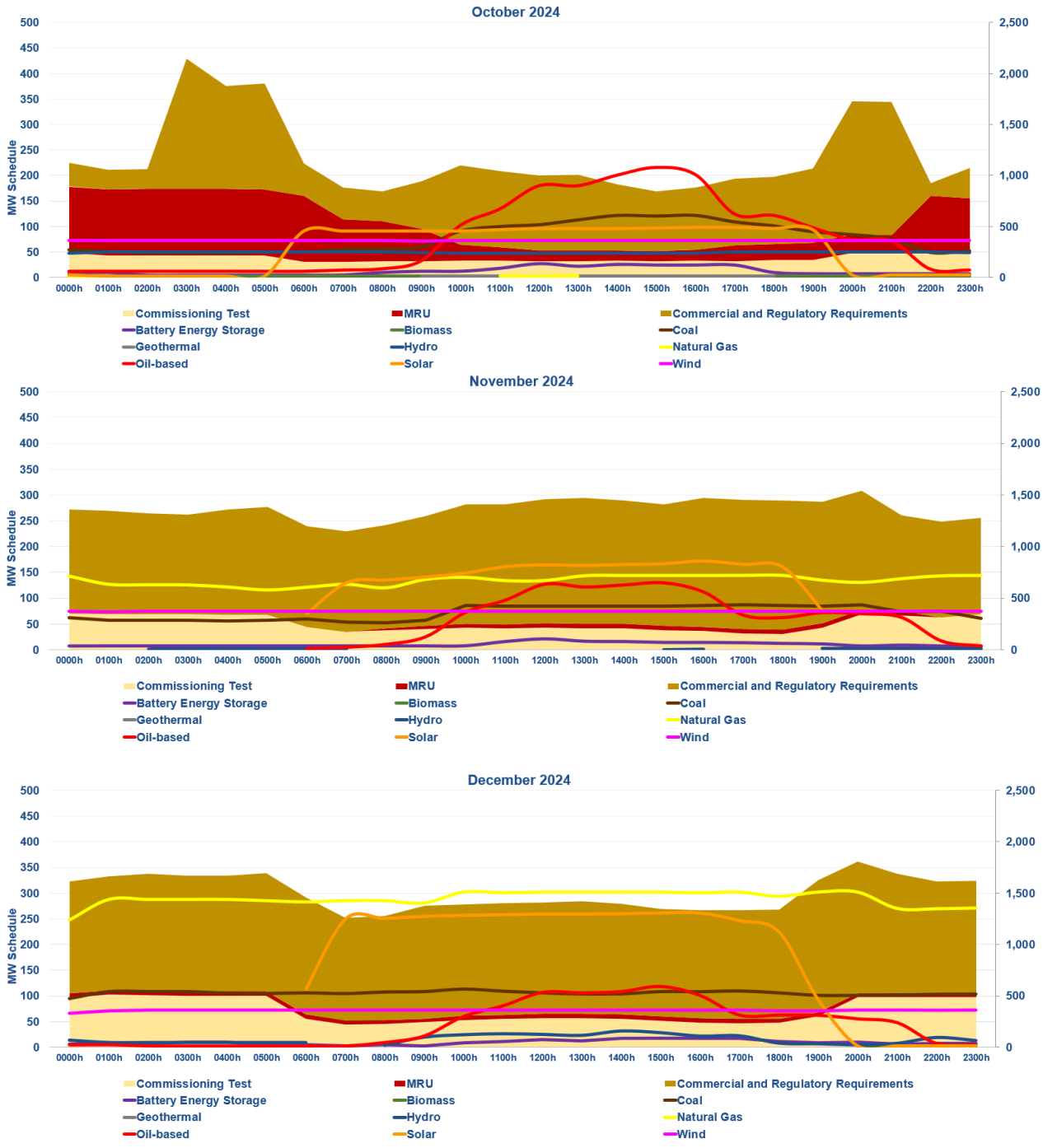
Plant/Unit Name	Plant Type	Registered Capacity (MW)[13]
Agus IV Hydroelectric Power Plant Unit 2	Hydro	52.7
Agus IV Hydroelectric Power Plant Unit 3	Hydro	52.7
Agus V Hydroelectric Power Plant Unit 1	Hydro	27.5
Agus V Hydroelectric Power Plant Unit 2	Hydro	27.5
Agus VI Hydroelectric Power Plant (HEPP) Unit 1	Hydro	31.5
Agus VI Hydroelectric Power Plant Unit 2	Hydro	31.1
Agus VI Hydroelectric Power Plant Unit 3	Hydro	50
Agus VI Hydroelectric Power Plant Unit 4	Hydro	25
Agus VI Hydroelectric Power Plant Unit 5	Hydro	43.8
Agus VII Hydroelectric Power Plant Unit 1	Hydro	26.1
Agus VII Hydroelectric Power Plant Unit 2	Hydro	25.3
GNPK's Coal Fired Power Plant Unit 1	Coal	151.9
GNPK's Coal Fired Power Plant Unit 2	Coal	151
Iligan Diesel Power Plant (Units 1-19)	Oil-Based	102
FDCMPC Circulating Fluidized Bed (CFB) Coal Thermal Power Plant (CTPP) Unit 1	Coal	135
Jasaan Battery Energy Storage System	Battery	20
Bukidnon Bunker C-Fired Diesel Power Plant 2	Oil-Based	7.5
NBPC 6.20 MW Bunker C Fired Diesel Power Plant	Oil-Based	5
Bunker C. Fired Diesel Power Plant	Oil-Based	10.4
Pulangi IV Hydroelectric Power Plant Unit 1	Hydro	75
Pulangi IV Hydroelectric Power Plant Unit 2	Hydro	75
Pulangi IV Hydroelectric Power Plant Unit 3	Hydro	75
Villanueva Battery Energy Storage System	Battery	20
Surigao Del Sur Power Plant	Oil-Based	7.8
Lake Mainit Hydroelectric Power Plant	Hydro	24.8
Diesel Power Plant	Oil-Based	10.7
Mobile 2 Bunker C-Fired Power Plant Unit 1	Oil-Based	50
Mobile 2 Bunker C-Fired Power Plant Unit 2	Oil-Based	50
Maco Battery Energy Storage System (BESS)	Battery	20
Bunker C-Fired Diesel Power Plant	Oil-Based	13
Malita Battery Energy Storage System (BESS)	Battery	20
Digos Modular Diesel Power Plant (Units 1-16)	Oil-Based	16.9
Mobile 1 Bunker C-Fired Power Plant Unit 1	Oil-Based	49
Mobile 1 Bunker C-Fired Power Plant Unit 2	Oil-Based	50
Mindanao I Geothermal Power Plant	Geothermal	51.4
Mindanao II Geothermal Power Plant	Geothermal	50
Phase1 118.501 MW Coal - Fired Power Plant	Coal	118.5
118.50 MW Phase 2 Coal-Fired Power Plant	Coal	118.5

APPENDIX B. HOURLY PROFILE OF OVER-RIDING CONSTRAINTS (2023) PER INCIDENT VS. MW SCHEDULE PER PLANT TYPE, MONTHLY




April 2024
MW Schedule
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
May 2024
MW Schedule
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
June 2024
MW Schedule
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind


July 2024
MW Schedule
0000h 0100h 0200h 0300h 0400h 0500h 0600h 0700h 0800h 0900h 1000h 1100h 1200h 1300h 1400h 1500h 1600h 1700h 1800h 1900h 2000h 2100h 2200h 2300h
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
August 2024
MW Schedule
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
September 2024
MW Schedule
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind


October 2024
MW Schedule
500
450
400
350
300
250
200
150
100
50
0
2,500
2,000
1,500
1,000
500
0
0000h 0100h 0200h 0300h 0400h 0500h 0600h 0700h 0800h 0900h 1000h 1100h 1200h 1300h 1400h 1500h 1600h 1700h 1800h 1900h 2000h 2100h 2200h 2300h
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
November 2024
MW Schedule
500
450
400
350
300
250
200
150
100
50
0
2,500
2,000
1,500
1,000
500
0
0000h 0100h 0200h 0300h 0400h 0500h 0600h 0700h 0800h 0900h 1000h 1100h 1200h 1300h 1400h 1500h 1600h 1700h 1800h 1900h 2000h 2100h 2200h 2300h
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind
December 2024
MW Schedule
500
450
400
350
300
250
200
150
100
50
0
2,500
2,000
1,500
1,000
500
0
0000h 0100h 0200h 0300h 0400h 0500h 0600h 0700h 0800h 0900h 1000h 1100h 1200h 1300h 1400h 1500h 1600h 1700h 1800h 1900h 2000h 2100h 2200h 2300h
Commissioning Test
MRU
Commercial and Regulatory Requirements
Battery Energy Storage
Biomass
Coal
Geothermal
Hydro
Natural Gas
Oil-based
Solar
Wind

APPENDIX C. PLANTS UNDER COMMISSIONING TEST, 2023

Plant Type	Facility Name	Registered Capacity
Battery Energy Storage System	Bataan Battery Energy Storage System	40 MW
	Concepcion Battery Energy Storage System	60 MW
	Lamao Battery Energy Storage System	50 MW
	Magapit Battery Energy Storage System	40 MW
	Magat Battery Energy Storage System	24 MW
	Masinloc Battery Energy Storage System	10 MW
	Subplant 2 Alaminos Battery Energy Storage System	20 MW
	Ormoc Battery Energy Storage System	40 MW
	Toledo Battery Energy Storage System	20 MW
	Kabankalan Battery Energy Storage System	20 MW
	Ubay Battery Energy Storage System (BESS)	20 MW
	Jasaan Battery Energy Storage System	20 MW
	Villanueva Battery Energy Storage System	20 MW
	Malita Battery Energy Storage System (BESS)	20 MW
Biomass	6 MW Biomass Power Plant	6 MW
Coal	Mariveles Coal-fired Thermal Power Plant- Phase 1	150 MW
	Mariveles Coal-fired Thermal Power Plant Unit 2	150 MW
Hydro	Lower Labayat Hydroelectric Power Plant	1.5 MW
	Tibag Hydroelectric Power Plant	5.8 MW
	Timbaban Hydro Power Plant	18.9 MW
	Lake Mainit Hydroelectric Power Plant	24.8 MW
Solar	Arayat-Mexico Solar Power Plant Project Phase 2	30.8 MW
	Cagayan North Solar Power Plant	115 MW
	Cayanga-Bugallon Solar Power Plant	75.1 MW
	Currimao 2 Solar Power Plant	68.7 MW
	Mariveles Solar Power Plant	16 MW
	Pasuquin Solar Power Plant	92.4 MW
	Orion Solar Power Plant	16.2 MW
	RASLAG III Solar PV Plant	13.4 MW
	San Marcelino Solar Power Project	326.4 MW
	Trust Solar Power Plant	15.4 MW
	Pinugay Solar Power Plant	71.6 MW
Hydro	Lower Labayat Hydroelectric Power Plant	1.5 MW
	Tibag Hydroelectric Power Plant	5.8 MW
	Timbaban Hydro Power Plant	18.9 MW
	Lake Mainit Hydroelectric Power Plant	24.8 MW
Oil-based	Calbayog Bunker C-Fired Diesel Power Plant	11.2 MW
Wind	Balaoi and Caunayan Wind Power Project Phase 1	80 MW