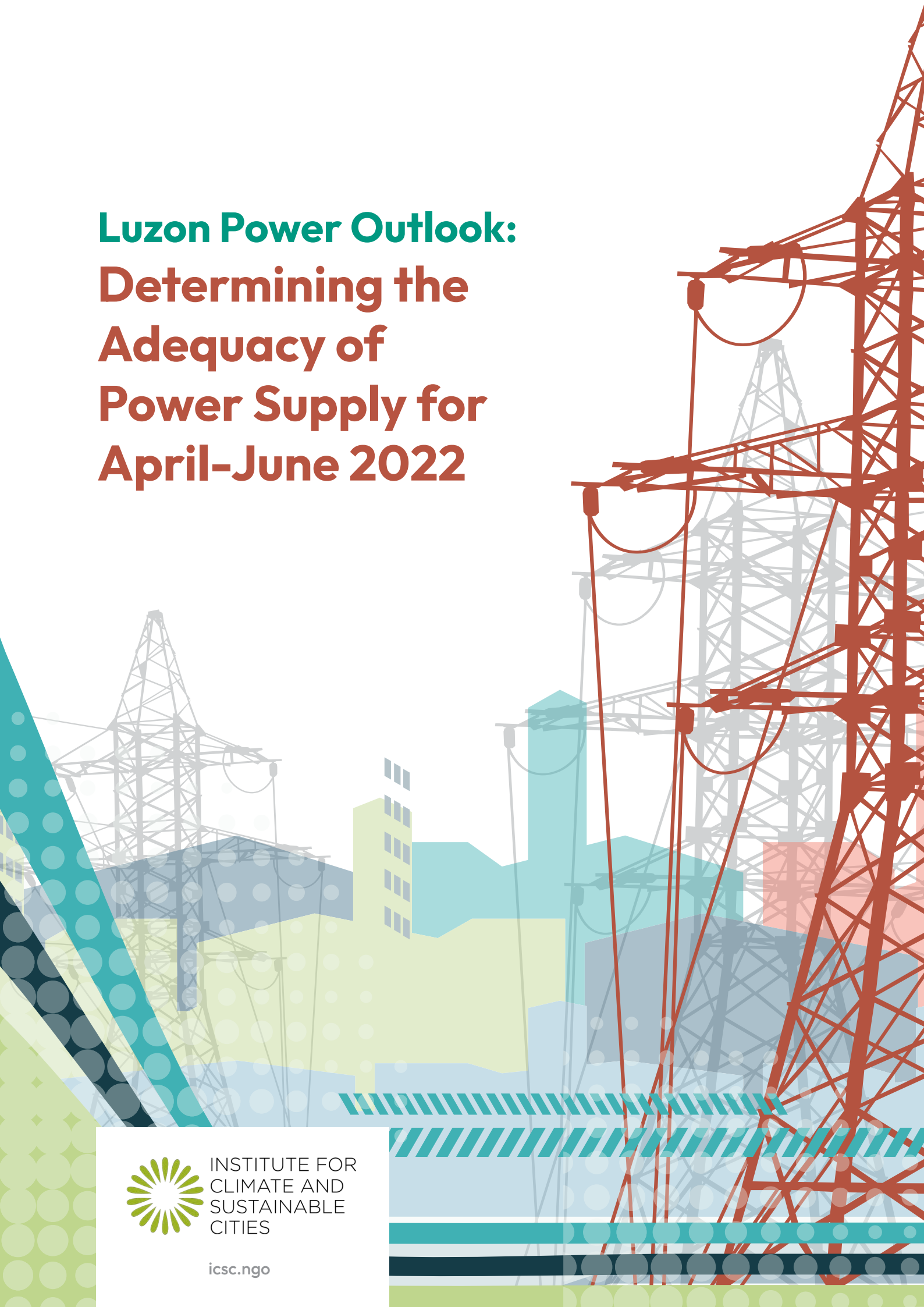
Luzon Power Outlook:
Determining the Adequacy of Power Supply for April–June 2022



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Luzon Power Outlook: Determining the Adequacy of Power Supply for April-June 2022

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Executive Summary

This paper takes a deep dive into National Grid Corporation of the Philippines' (NGCP) Weekly Demand, Supply, and Operating Profile Report for 2022 to assess the adequacy of the power supply for the 2nd Quarter (Q2) of 2022. While it was noted in the NGCP report that there would be sufficient power supply during the said period, the assumptions used were optimistic. There was no consideration of unplanned outages and derated plant capacities that could significantly deplete the power supply of the grid. Moreover, the report observes sufficient but thin reserves before and after the elections period, showing that **NGCP's most optimistic scenario still slides into dangerous territory**.

By applying more conservative assumptions, findings show **that the power supply outlook is very tight for Q2 2022**, with a possibility of red alert status, high electricity costs, and rotating blackouts across the Luzon grid. The yellow alert status last January 11, 2022, supports this finding. Typically, the demand during January is lower due to cooler temperatures. But despite this, the 2,317 MW operating reserves projected by the NGCP depleted to 388 MW (an 83% drop) when several coal plants went on forced outages, showing this factor to be an essential consideration in a power outlook.

Per NGCP power outlook in May 2022, there would be about a 1,200 MW margin of operating reserves before a red alert status. However, several assumptions in the planning outlook might not hold. Namely, (1) the expected commissioning of GN Power Dinginin Unit 2 prior May 2022 and (2) the scheduled capacity of GN Power Unit 1 and Calaca Unit 2, both of which have performed poorly last year and are on unplanned outage as of this report.

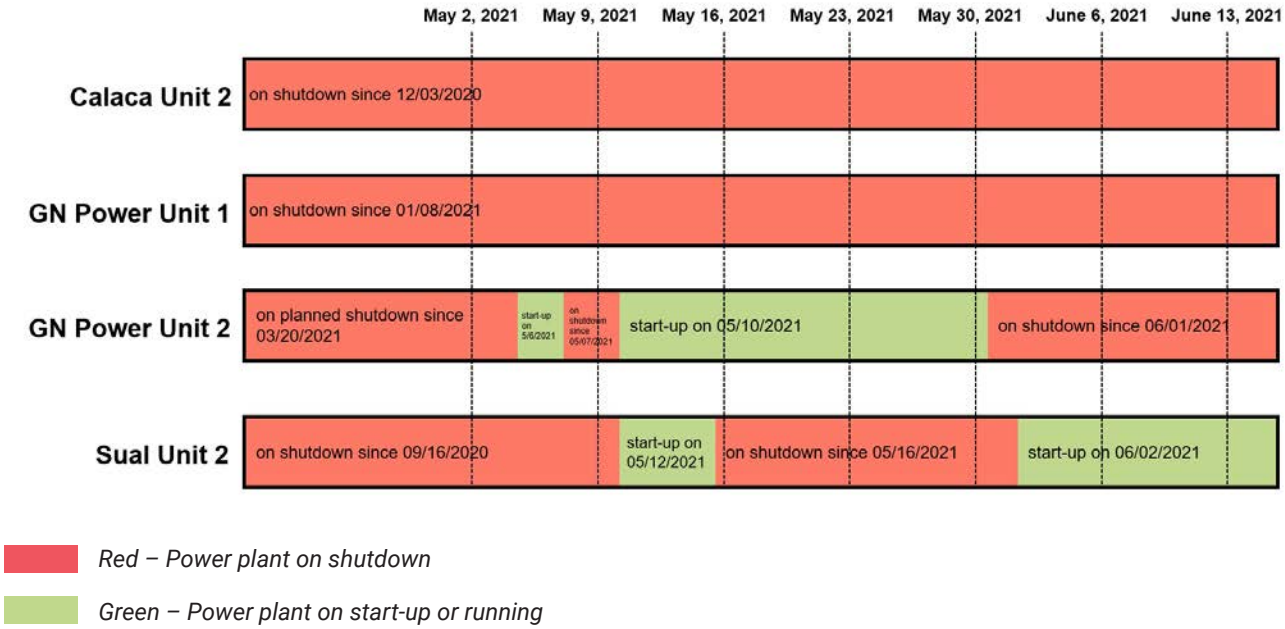
To mitigate the supply deficiency in the second quarter of 2022, the following measures must be implemented:

1. Ensure availability of power plants at their full dependable capacities. Monitor fuel inventories of power plants if they are at sufficient levels.
2. Timely completion of all committed projects that have target commercial operation before May 2022.
3. Manage the activities requiring electrical consumption during peak hours by activating programs with commercial and industrial companies, such as the Interruptible Load Program (ILP) and the Voluntary Load curtailment (VLC).
4. Expedite rooftop solar power installations to increase the supply during peak demand by removing impediments at the utility and LGU levels.
5. For consumers, minimize electricity consumption during peak hours, particularly between 10 am and 2 pm, by shifting activities to off-peak hours

Introduction

Last summer 2021, forced outages hit several of Luzon's baseload power plants[1]. Figure 1 shows Calaca Unit 2, GN Power Unit 1/2, and Sual Unit 2 had recurring forced outages. These incidents resulted in a power deficit even with the dispatch of more expensive power plants. Moreover, data have shown that these forced outages of baseload power plants were not isolated cases, with them frequently happening even before the pandemic hit [1].

Figure 1: Outage Timeline of Four Baseload Coal-Fired Plants in Summer 2021



Red – Power plant on shutdown

Green – Power plant on start-up or running

Most of the time, these unplanned outages go unnoticed because there are enough reserve capacities in the grid. However, this is not what happens during the second quarter of the year (April to June) when peak demand occurs. From historical data, the power requirements were significantly higher due to summer temperatures. This often results in thinner reserve margins when there may not be enough power capacity in the grid that can cost-effectively meet the increased demand.

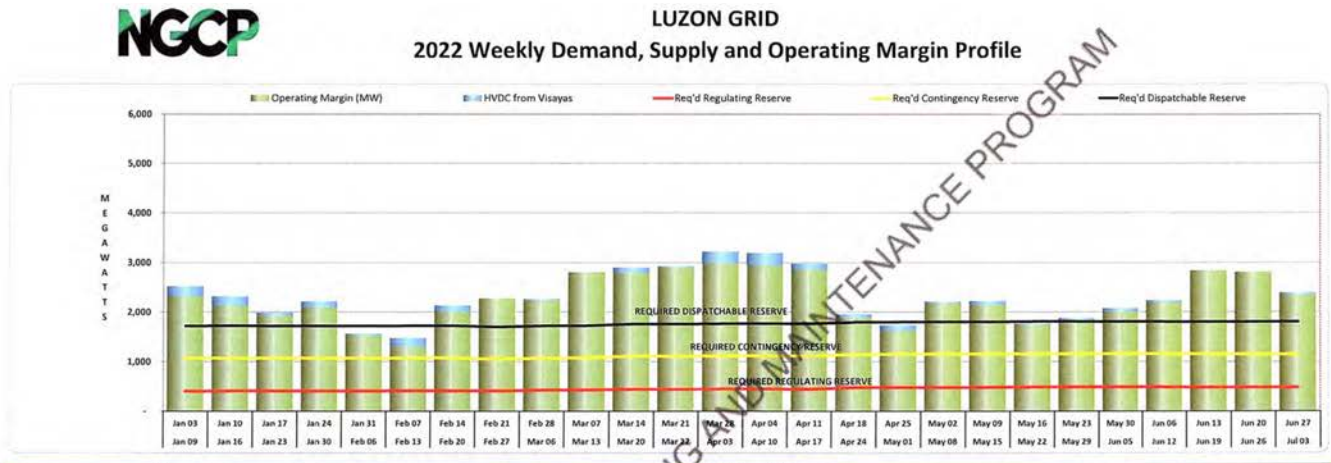
The Luzon grid experienced a Red Alert status from May 31 to June 1, 2021. Unplanned outages of coal plants and derated capacity of natural gas plants further reduced the already thin power supply at the time. Thus, the spot price of electricity[2] skyrocketed to more than 30 PHP/kWh during peak hours. Even with that high price tag, rotating outages were experienced around Luzon.

Considering the continued power outages and the expected higher demand from the increased economic activity this year, will these blackouts and high cost of electricity plague us again during the Summer of 2022?

The Review of DOE/ NGCP Energy Plans and Forecasts for Q2 2022

The elections will occur on May 9th, and the integrity of the casting and counting of ballots largely depends on the secure supply of electricity. Preparations for the availability of stable electricity for the elections were looked into as early as 2018 when energy secretary Cusi signed a circular creating a task force that would ensure a reliable power supply during the election [2]. Subsequently, the DOE and NGCP have had meetings to discuss the power supply for the second quarter of 2022. These meetings have provided several power outlooks by relevant agencies, the latest of which will be reviewed here.

Figure 2:
Updated 2022 Luzon Grid Weekly Demand, Supply and Reserve Profile published January 19[3]



2022	JANUARY TO JUNE 2022																									
	Jan 03	Jan 10	Jan 17	Jan 24	Jan 31	Feb 07	Feb 14	Feb 21	Feb 28	Mar 07	Mar 14	Mar 21	Mar 28	Apr 04	Apr 11	Apr 18	Apr 25	May 02	May 09	May 16	May 23	May 30	Jun 06	Jun 13	Jun 20	Jun 27
	Jan 09	Jan 16	Jan 23	Jan 30	Feb 06	Feb 13	Feb 20	Feb 27	Mar 06	Mar 13	Mar 20	Mar 27	Apr 03	Apr 10	Apr 17	Apr 24	May 01	May 08	May 15	May 22	May 29	Jun 05	Jun 12	Jun 19	Jun 26	Jul 03
Available Capacity (MW)	12,546	12,534	12,154	12,302	11,635	11,763	12,354	12,446	12,906	13,803	13,970	14,045	14,523	14,517	14,240	13,993	13,926	14,390	14,414	14,133	14,269	14,417	14,566	15,009	14,883	14,454
Thermal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coal	5,104	5,089	5,089	5,563	4,968	5,460	6,423	5,878	6,028	6,644	7,012	7,012	7,472	7,472	7,472	7,472	7,472	8,072	8,072	8,072	8,072	8,072	8,072	8,072	8,072	7,587
Gas Turbine/Diesel	700	653	731	731	731	731	731	778	778	778	778	778	778	778	778	778	778	778	778	778	778	778	778	778	778	778
Combined Cycle/NatGas	3,488	3,398	3,136	3,136	3,136	2,871	2,871	3,133	3,223	3,488	3,222	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,488	3,398
Geothermal	412	412	412	412	373	342	342	381	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	452	368
Wind Farm	120	271	254	76	139	161	40	250	22	138	256	219	226	190	23	47	48	154	124	55	22	14	95	95	34	56
Solar	161	188	148	81	197	177	191	211	192	201	164	111	195	205	161	111	163	175	182	155	208	187	77	125	116	148
Biomass	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
BESS	122	122	122	122	133	127	107	98	116	122	122	105	122	133	133	133	133	133	133	133	133	133	133	133	133	122
Hydro	2,176	2,144	2,140	1,998	1,855	1,850	1,455	1,813	2,005	2,010	1,789	1,787	1,491	1,483	1,547	1,369	1,217	1,037	1,046	918	995	1,159	1,365	1,797	1,740	1,893
System Load (MW)	10,027	10,217	10,165	10,087	10,071	10,285	10,216	10,173	10,641	10,796	11,072	11,119	11,304	11,322	11,258	12,034	12,191	12,177	12,189	12,363	12,387	12,341	12,329	12,171	12,073	12,061
Operating Margin (MW)	2,519	2,317	1,990	2,215	1,564	1,478	2,138	2,273	2,264	2,807	2,898	2,927	3,219	3,195	2,982	1,959	1,735	2,213	2,225	1,770	1,882	2,076	2,236	2,839	2,810	2,393
HVDC from Visayas	193	187	52	113	32	175	125	-	20	-	105	23	229	248	116	74	106	32	70	13	51	64	36	-	-	35
Req'd Regulating Reserve	401	409	407	403	409	411	409	407	426	432	443	445	452	453	450	481	488	487	488	495	495	494	493	487	483	482
Req'd Contingency Reserve	668	668	668	668	668	668	668	647	647	647	668	668	668	668	668	668	668	668	668	668	668	668	668	668	668	668
Req'd Dispatchable Reserve	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647	647

1. Peak Demand Forecast at 12,387 MW to occur in May 2022 based from the DOE Peak Demand Forecast 2020-2040
2. Preventive Maintenance of Power Plants considered.
3. Embedded Generators considered.
4. HVDC Capacity from Visayas was based on the available capacity at the time of occurrence of the peak demand in Luzon

The **green bars** plotted in Figure 2 are the net operating reserves, which is the difference between the available generating capacity and the total forecasted demand on a specific period. This type of data shows the system's adequacy in supplying generating capacities for both the *forecasted demand requirement* and the *reserve requirement*[4]. For this case, no planned outages are expected based on the latest Grid Operating and Maintenance Program (GOMP) [3, 4].

The **green bar** falling below the **black line** *(dispatchable reserves)* during the third week of May 2022 signifies thin reserves. If more outages occur during this time, the **green bar** will fall below the **yellow line** *(contingency reserves)*, and the grid will already enter the Yellow alert status. Blackouts will only start as the Red Alert status approaches, that is, if the **green bar** falls below the **red line** *(regulating reserves)*. This is further expounded on Table 1 describing the purpose of each capacity type.

Table 1: Interpretation of Grid Alert Levels[5]

Capacity	Description	Alert Level	Interruptions?
Dispatchable Reserves	Fast-starting power plants that may replenish the Contingency Reserve below	Thin Reserves	No
Contingency Reserves	Available capacity in synchronized power plants (i.e. operating) that enable them to cover the sudden outage of the largest unit in the grid	Yellow	No
Regulating Reserves	Available capacity in synchronized power plants that enable them to adjust generator output to match momentary variations in power supply and load	Red	Possible brownouts
Forecasted Load	Load every 5-minute interval	Red	Yes

Comparing the maximum scheduled capacity in Figure 2 to the dependable capacities of existing power plants [5], additional coal capacity is already accounted for in the schedule. Specifically, GN Power Dinginin Unit 1 and Unit 2 (GNPD_U01, GNPD_U02) are already considered, bringing the total dependable coal capacity to 8,190 MW. Moreover, the scheduled capacity for natural gas power plants exceeded the total dependable capacity by 200 MW.

Table 2: Comparison between Scheduled Capacity (MW) Vs. Dependable Capacity (MW) of all Power Generating Types

	January 2022: Scheduled Capacity On May 9 to 15, 2022 (Elections) [6]	Total Plant Dependable Capacity [5]	Remarks
Coal	8072	8190.90	Existing Dependable Coal: 6754.9 MW Additional GNPD_U01, GNPD_U02: 1336 MW
Diesel/Gas Turbine	778	1285.9	Existing Dependable Diesel: 667.9 MW Existing Dependable Gas Turbine: 618 MW
Thermal	-	150	Not planned for use during Q2 based on NGCP outlook
Natural Gas	3488	3286.1	Scheduled capacity exceeded the dependable capacity
Geothermal	452	768.7	
HVDC	70	420	
Wind Farm	124	336.9	
Biomass	70	131.1	
Solar	182	362.1	
Hydro	1046	2469.5	
BESS[7]	133	10	Additional BESS: 120 MW

Key findings of the latest official power outlook are:

1. There are thin reserves before and after the elections period, as seen by the operating margin falling below the dispatchable reserve requirement.
2. GNPower Dinginin Unit 2 (GNPD_U02) is assumed to run at the start of May based on the 600 MW increase in capacity.
3. The capacity of coal and natural gas plants during May 2022 are close to their dependable capacities, indicating no planned or unplanned outages during this time.
4. Diesel and gas turbine plants are scheduled at only half their dependable capacity.
5. HVDC[8] line available capacity is dependent on the "time of occurrence of the peak demand." Projected capacity during peak demand in May will be around 80 MW only.

The outcome of this projection is that the Luzon grid relies on GNPD_U02 to operate on time to avoid thin reserves during the election period leading to 2,225 MW of operating reserves. Unplanned or forced outages have also not been considered in this outlook. A power shortage could occur if the same outage scenario discussed previously happens again come summer 2022. These signify that the assumptions made are optimistic, and even then, in the most optimistic scenario, NGCP's power outlook still slides into dangerous territory, as indicated by the thin operating reserves before and after elections.

Review of Assumptions

The latest power outlook shows about a 1,200 MW operating margin between the operating reserves and the red alert status during the elections. An operating margin is the allotted room for forced outages in the grid. However, this 1,200 MW operating margin could quickly deplete when the actual conditions do not meet the optimistic assumptions. Some of the considerations that could affect the likelihood of these assumptions are:

1. **The newly constructed GN Power Dinginin Units 1 and 2 may not be fully operational in time for May 2022 (1336 MW).**

   Recent data shows that Unit 1 was on outage on January 11, 2022, making it one of the causes of the Yellow Alert. This outage is not included in the approved outage schedules in the GOMP. As of January 26, it is now operating at full capacity (668 MW), after taking 10 months for commissioning. Meanwhile, Unit 2 has not started its commissioning activities[9]. The unavailability of either of these two units, now the largest power plant in the grid, would mean a deficiency in the power supply this Summer 2022.

2. **Calaca Unit 2 and GN Power Unit 1 may not provide their full dependable capacity during May 2022 (616 MW).**

   Last year, both power plants experienced extended unplanned shutdowns, unable to provide their power supply commitment for approximately 10 months each, Dec 2020 to Sept 2021 (Calaca Unit 2) and Jan 2021 to Nov 2021 (GN Power Unit 1).

   As of January 2022, both power plants are again on unplanned shutdown. Calaca and GN Power each had run for two months before breaking down again in Nov 2021 and Jan 2022, respectively. Note that the approved GOMP of the grid did not consider both forced outages [3]. With no oversight and close coordination on whether these plants can operate in time, it is very optimistic to include their capacities in the power supply this May 2022.

   Besides these two plants, several other coal power plants that experience the same outage issues. Thus, it should be a practice to remove these plants from the generating capacity equation of power forecasts if there is no definite schedule on when they can provide consistent power. Keeping these plants will only mask the power supply deficiency problem.

3. **Plant Derating due to Malampaya supply gas restrictions and Indonesian Coal Ban (~1000 MW).**

   Last year, Malampaya gas supply was restricted by 40% during the brownouts from May 31 to June 1. The depletion of the gas field continues [6]. Meanwhile, Indonesia has lifted the export ban but its occurrence shows a new fuel supply risk factor that can affect 97% of the imported coal supply in the country [7]. With these constraints, the assumption of all natural gas and coal plants (which account for a majority of the grid's capacity) being able to provide their full dependable capacities is unlikely.

Methodology

This analysis will focus on the effects of the main three assumptions done by the DOE/NGCP projections, such as the timely commissioning of GNPD_U02, no unplanned outages, and no deratings. To account for the contingencies, this report built on the projections made by the DOE/NGCP and progressively added more conservative assumptions. Peak demand values are used on the demand side to determine the adequacy of the power supply to meet the highest possible loading requirement. This analysis only determines IF a power supply deficit will occur based on the peak demand requirements of the grid in 2022. This will NOT focus on WHEN a power supply deficit will occur.

The operational availability of the various plants to meet the demand and reserve requirements during summer 2022 was analyzed. This was done together with other grid measures (all types of energy supplies, HVDC line imports, etc.) to determine the power supply adequacy during this period. This was done through the following steps:

1. From the 2022 forecasted load demand, determine the reserve capacity requirements needed to support the demand. These include the 4% regulating reserve, 668 MW contingency reserves[10], and 647 MW dispatchable *reserves*[11].
2. Determine the power supply capacity of the different power supply types. These include:
    a. *Existing Baseload plants*
    The power supply capacity of each baseload coal and natural gas power plants will be either based on their:
        i. installed capacity
        ii. derating operation shape – computed as the average actual MW output from Q2 in the 2019 to 2021 peak hours.

    These two shape configurations will be used depending on the scenarios.

    b. *New baseload plants*
    For new plants that are in the commissioning and testing stage (GNPD_U01 and GNPD_U02), they have no previous year operational data. It was assumed that these plants will deliver their full dependable capacity.

    c. *Existing RE plants*
    The power supply capacity of RE plants will be based on their average actual MW output from the same period in 2019 to 2021. This was done to consider the variability and seasonality of these power plants.

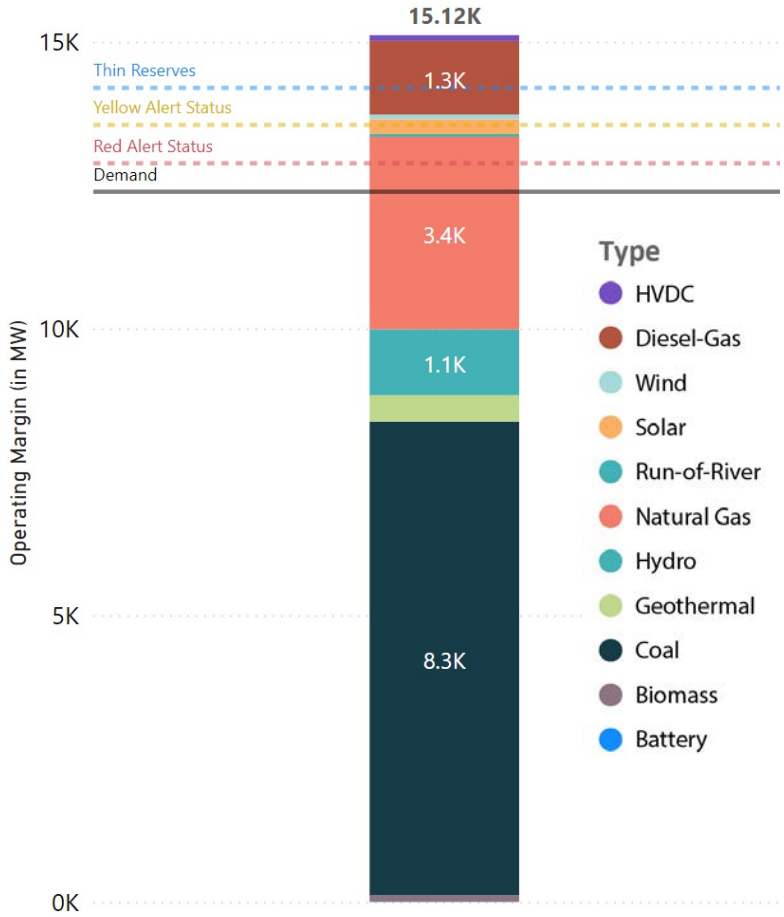
    d. *Diesel and Gas Turbine power plant*
    The power supply capacity of the Diesel and Gas Turbine power plants will be based on their full dependable capacity. This is because these plants can be operated on-demand and should be flexible enough to be operated whenever the need arises.

    e. *HVDC from Visayas*
    The power supply capacity of the HVDC transmission line will be based on the average of the forecasted weekly capacity NGCP Power Outlook. The HVDC link will be assumed to provide 100 MW capacity for the peak demand period.
3. After establishing the power supply capacity of the power plants, these values will be added or stacked together to determine the total available power supply during that period. The stacked power supply capacity will be superimposed over the forecasted demand and reserve side requirements to determine the adequacy of the power supply capacity.

Analysis of Scenarios

SCENARIO 1:
Best Case Scenario, Full Compliance to GOMP

DESCRIPTION:
This scenario mimics the DOE/NGCP projections by utilizing the full dependable capacity of all baseload power plants currently on the grid. On paper, this scenario is possible but would rely on each power plant to strictly commit to scheduled capacities declared on the GOMP and not experience any forced outage.



The lines indicate the demand (black), and reserve statuses. The stacked bar represents the computed power supply (in MW) for this period given the assumptions of this scenario.

ASSUMPTIONS

- All **baseload** plants operate at their **full dependable Capacity**
- All **RE plants** operate like their **average operation of Q2 of 2019 to 2021**
- All **Diesel/Gas turbine** plants can operate at their **full dependable capacity**
- Assume GNPD_U02 will be commissioned before May 2022
- **No forced outages** considered

OUTCOME

- **Sufficient Power** for Q2 2022 with a large operating margin.
- **~2,600 MW Operating Margin**
- **No expected blackouts**
- **No grid alert status**
- Use of **expensive generators** will be **minimal** since there should be sufficient plants operating during peak hours

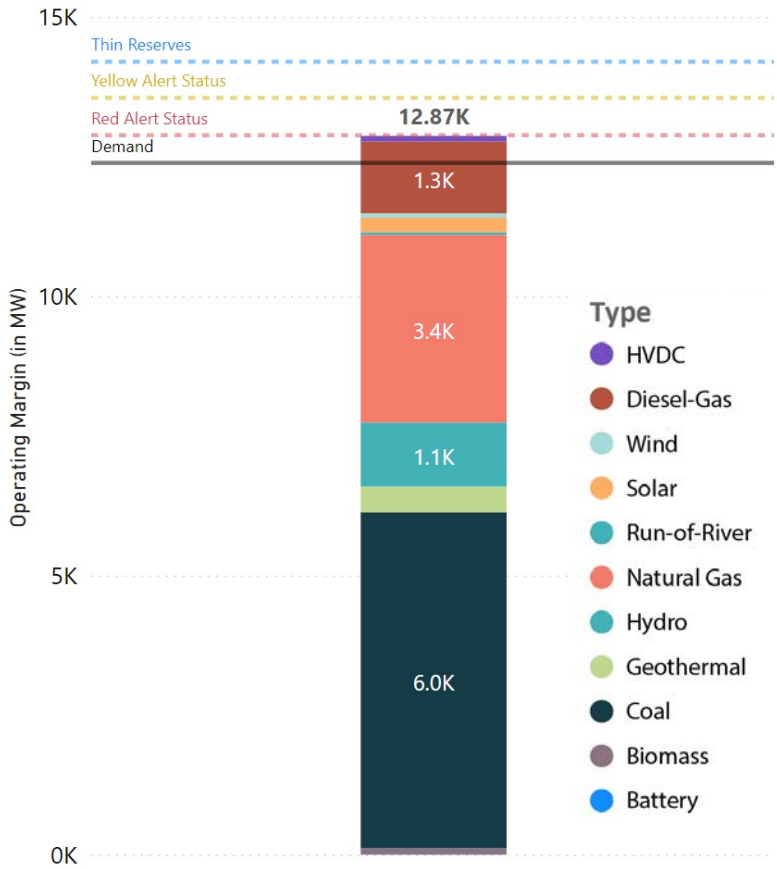
REMARKS

- It is **optimistic that GNPD_U02 will be commissioned before May 2022**. Its twin unit, GNPD_U01, started commissioning on February 2021 and just recently completed on January 2022 (10 months). Commissioning of GNPD_U02 has yet to commence.
- It is **optimistic no plants will be experiencing shutdown** in Q2 2022. Based on historical data, unplanned outages are common for baseload coal plants. Additionally, trends in January 2022 show the same scenario where unplanned outages frequently occur.
- It is **optimistic that all baseload plants will provide their full dependable capacity** during said period. There have been multiple times that plants were unable to provide full capacity due to operational limitations.
- It is **optimistic that the full dependable capacity of fossil fuel plants** (diesel, gas turbine) **can dispatch**.

SCENARIO 2:
Semi-Compliance to GOMP, with some forced outages; outages based on 5/31 to 6/1/2021

DESCRIPTION:

This scenario is when most baseload power plants commit to their scheduled capacity as declared in the GOMP, except for a few. The forced outages for this scenario were patterned from the forced outages from May 31 to June 1, 2021, to determine the effects of unplanned outages on the GOMP. Moreover, GN Power Dinginin Unit 2 will not commercially operate before May 2022.



The lines indicate the demand (black), and reserve statuses. The stacked bar represents the computed power supply (in MW) for this period given the assumptions of this scenario.

ASSUMPTIONS

- All **baseload** plants operate at their **full dependable Capacity**
- All **RE plants** operate like their **average operation of Q2 of 2019 to 2021**
- All **Diesel/Gas turbine** plants can operate at their **full dependable capacity**
- Assume **GNPD_U02 will NOT be commissioned** before May 2022 (668MW)
- Assume the **plant outages that occurred on May 31 to June 1, 2021 occurred again.** Plant outages include Calaca Unit 2, GN Power Unit 1, GN Power Unit 2, and Sual Unit 2 (~1500 MW).

OUTCOME

- **Insufficient Power for Q2 2022**
- **Red Alert Status**
- **~1,335 MW Deficit** (from dispatchable reserves)
- **Possible limited blackouts** because of the lack of regulating power generators during peak hours.
- **Maximum use of expensive diesel/gas turbine generators** to ensure that there should be sufficient plants operating during peak hours

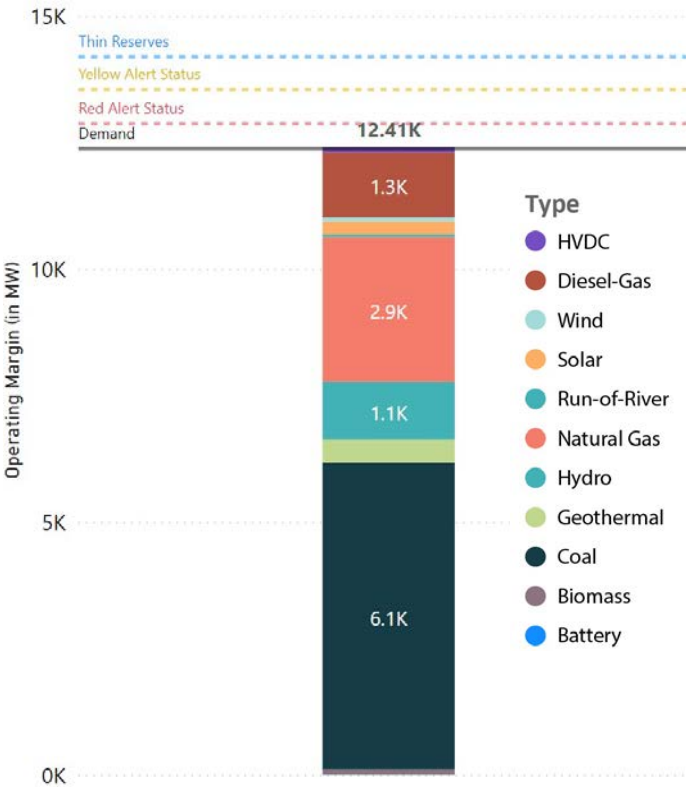
REMARKS

- **Considering the outages, this is a conservative case** due to being based on Q2 2021, when multiple plants simultaneously experienced an outage.
- It is **optimistic that all baseload plants will provide their full dependable capacity** during said period. There have been multiple times that plants were unable to provide full capacity due to operational limitations.
- It is **optimistic that the full dependable capacity of fossil fuel plants** (diesel, gas turbine) **can dispatch**.

SCENARIO 3:
Forced Outages and Derated Capacity based on Historical Operating Data

DESCRIPTION

This scenario is when most baseload power plants operated based on their average historical operation during 2nd Quarter peak hours from the past three years. Plants that fall below the 65% availability threshold over the past three years will be assumed to be performing poorly and could potentially experience an outage during Q2 2022. Moreover, GN Power Dinginin Unit 2 will not commercially operate before May 2022.



The lines indicate the demand (black), and reserve statuses. The stacked bar represents the computed power supply (in MW) for this period given the assumptions of this scenario.

ASSUMPTIONS

- All **baseload** plants operate like their **average operation of Q2 of 2019 to 2021 peak hours**
- All **RE plants** operate like their **average operation of Q2 of 2019 to 2021**
- All **Diesel/Gas turbine** plants can operate at their **full dependable capacity**
- Assume **GNPD_U02 will NOT be commissioned** before May 2022 (668MW)
- Assume the **plant having average availability below 65% from 2019 to 2021 is on forced outage.** These include Calaca Unit 2 at 49.59%, Calaca Unit 1 at 60.69%, and GN Power Unit 1 at 63.14% (~850 MW)

OUTCOME

- **Insufficient Power for Q2 2022**
- **Red Alert Status**
- **~1,795 MW Deficit** (from dispatchable reserves)
- **Definite extensive brownouts** because of the lack of power generators during peak hours.
- **Maximum use of expensive diesel/gas turbine generators** to ensure that there should be sufficient plants operating during peak hours

REMARKS

- **Considering the outages and derating, this is the pessimistic scenario** since it would signify that most baseload power plants will not comply with their scheduled capacity in the GOMP. However, since historical operations show frequent deratings, it can also be anticipated in the future.
- It is still **optimistic that the full dependable capacity of fossil fuel plants** (diesel, gas turbine) **can dispatch.**

Summary of scenarios are shown below:

SCENARIO 1
Full Compliance to GOMP

SCENARIO 2
Semi-Compliance to GOMP

SCENARIO 3
Historical Operation

	SCENARIOS		
DESCRIPTION	**1**	**2**	**3**
	Optimistic Scenario	**Conservative Scenario**	**Pessimistic Scenario**
	Full Compliance to GOMP	**Semi-Compliance to GOMP, with some forced outages**	**Historical Operation**
ASSUMPTIONS			
Baseload plants	full dependable capacity	full dependable capacity	Average actual operation from 2019-2021 Q2 (derating)
GNPD_U02 commissioned on-time	Yes	No	No
Outages	None	Same outages and natural gas deratings that occurred on May 31 to June 1, 2021.	All plants that fall below 65% availability rate will be assumed on outage.
RE plants	Average actual operation of 2019-2021 Q2		
OUTCOMES			
Grid Alert Status	Normal	**Red**	**Red**
Diesel/Gas Turbine generators	Minimal	**Max needed**	**Max needed**
Margin (or Deficit)	2,600 MW Margin	**1,335 MW Deficit**	**1,795 MW Deficit**
Blackouts	None	**Possible Limited Blackouts**	**Definite Extensive Blackouts**
Power Costs	Normal	**Expensive**	**More expensive**

Conclusion

When more conservative assumptions are factored in, **the power supply during Q2 2022 is very tight; specifically, a red alert status is highly probable.** Even with the compliance of most power plants in the Grid Operating and Maintenance Program (GOMP), if unplanned outages occurred the same as in the previous years, rotating blackouts would occur while still resulting in high electricity costs. High electricity cost is foreseeable since the full dispatch of expensive generators such as diesel/ gas turbine power plants will be required to augment the power supply during Q2 2022, as exhibited in Scenarios 2 and 3.

The yellow alert last January 11, 2022, was a glimpse of what could happen during Q2 following the unplanned outages of several coal-fired power plants. This is unusual since January's power demand is low. Looking at NGCP's projections for that week (Figure 2), the operating reserves should have been 2,317 MW. However, the operating reserves were depleted due to the simultaneously forced outages, dropping the reserve margin to 388 MW [4]. This should serve as an eye-opener that no consideration of unplanned outages is an impractical assumption, more so because the coal plants in the grid experience frequent unplanned outages.

Per NGCP power outlook, the operating reserves for May 2022 would be about 2,000 MW, similar to the value last January. But this time, it would have a higher demand this summer due to higher temperatures and consumption due to economic recovery from the pandemic. The higher demand and tight supply put the grid at a higher risk. Unless these plants have ensured to commit their dependable capacities during the second quarter, the power outlook will remain very tight with any forced outage or derating causing rotating blackouts for Q2 2022.

Recommendations

To improve on these scenarios and ensure that there would be enough power supply during Q2 2022, the following are recommended:

What can be done by the DOE:

1. **Restore power plants to their full dependable capacity during Q2 2022.**

   Ensure that there will be no forced outages that can deplete the operating reserves of the grid. Many power plants have exceeded ERC's total allowable outage days in 2021 and have incurred penalties. However, the penalties imposed on these plants do not reflect the socio-economic impacts of the rotating blackouts it has caused. Stricter implementation of the ERC mandate and heavier penalties are recommended.

   Some of the constraints that might hinder plants in providing their full dependable capacity are the recent Indonesian coal export ban and the natural gas supply restriction from Malampaya. Measures have to be in place to ensure the continued supply of plant fuels which can be done by monitoring fuel inventories for all power plants.

   Additionally, during the critical period, close coordination by the System Operator with the individual plants ensures the availability of the power supply capacity needed for the load demand and reserve requirements.

2. **Timely completion of all committed projects that have target commercial operation before May 2022.**

   According to the October 2021 list of committed projects, 636 MW capacity is expected for commercial operation before May 2022. Sources include Oil, Hydro, Biomass, and Solar plants. Note that committed capacity for coal-fired power plants is no longer included in this table since this was already considered in the DOE/NGCP projections. Expediting the market registration for newly constructed plants can also ensure that they participate in the spot market trades in Q2.

	Committed Capacity (in MW) with Target Commercial operation before May 2022 [8]	Number of Projects
Oil	179.82	1; AC Energy
Hydro	22.82	7
Biomass	20.6	4
Solar	412.67	9, most notable are: • Jobin-Sqm Inc; • Energy Logics Philippines, Inc. • Solarace1 Energy Corporation • Terasu Energy Inc.
TOTAL	**635.91**	

3. **Manage the activities requiring electrical consumption during peak hours by activating programs with commercial and industrial companies**

   From the demand-side perspective, activation of programs and measures at the commercial and industrial levels can help reduce the power demand during peak hours. This includes the Interruptible Load Program (ILP) where commercial and industrial facilities utilize their self-generation capacities to supplement grid power capacity. Distribution utilities (DU) and electric cooperatives (EC) can also partake in Voluntary Load Curtailment (VLC). Moreover, in the long term, Energy Efficiency and Conservation (EEC) measures can be implemented to reduce power consumption during peak hours.

4. **Augment power supply by encouraging operations of privately-owned power generation facilities during peak demand periods.**

   Expedite rooftop solar power installations to increase the power supply during peak demand by removing impediments at the utility and LGU levels. The power supply deficiency happens during peak hours (10 AM to 2 PM). Solar rooftops can provide additional supply during this peak demand, especially during summer.

   However, unless prioritized and installed within the next few months, there would be insufficient rooftop installations to augment supply due to long lead time to secure building permit and lack of support from DUs and ECs.

What can be done by the Consumers:

Manage the activities requiring electrical consumption during peak hours by practicing energy efficiency and conservation (EEC) measures in the residential sector

Electric consumers in the residential sector can minimize their electricity consumption during peak hours (10 am to 2 pm) to reduce the load demand during these critical hours. A change in lifestyle or shifting the schedule of electricity-intensive activities from peak hours to off-peak hours can do this. The use of more energy-efficient appliances will also help reduce the demand during peak hours.

These measures have huge potential in affecting the power outlook since, in 2020, the household and the residential sector had the highest share (31%) in Total Energy Consumption. This share had a drastic increase from its previous year's share because of the Work from Home (WFH) arrangements that shifted electricity consumption to this sector.

End notes

[1]Baseload power is an energy resource that provides the minimum amount of electric power required by the demand to remain operational 24/7. The plants designed to function as baseload plants are rated to provide the minimum needed power and are expected to run 24/7 to run the grid.

[2]When electricity is bought and sold in the Wholesale Electricity Spot Market, the price of electricity from each trading interval will vary based on the changing supply and demand. The spot price is the electricity price for a certain interval.

[3]Typos have been corrected in the analysis (e.g. mismatch between Solar ↔ Biomass, BESS ↔ Hydro)

[4]Reserve requirement includes: regulating reserves (covers the inter- and intra-hour variations in demand and variations from generation schedules and hourly forecasts); contingency reserves (covers the loss or failure of a generating unit); and the dispatchable reserve (replenishes the contingency reserve service)

[5]When interpreting Grid alert levels, understand that the capacities in table 1 are consumed from bottom to top. When the operator dispatches the forecasted load to be consumed, it is followed by regulating reserves to regulate any forecasting errors and variations. When there is a large loss of supply, contingency reserves and dispatchable reserves are used for additional supply capacity.

[6]Typos have been corrected (e.g. mismatch between Solar ↔ Biomass, BESS ↔ Hydro)

[7]Battery Energy Storage System

[8]HVDC line refers to the high-voltage direct current transmission link connecting Leyte to Luzon. This allows excess power supply from the Visayas grid to be used in the Luzon grid when circumstances allow.

[9]New baseload plants undergo a commissioning or testing stage before they can commercially operate. This initial period does not provide consistent power; thus, the grid cannot utilize its capacity reliably.

[10]based from GNPD, the largest operating unit

[11]based from Sual, the second largest operating unit

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