AURORA ENERGY RESEARCH

Mapping, modelling, and modernizing

How to identify system-wide bottlenecks within power systems

Asia Clean Energy Forum

June 2026

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ENERGY RESEARCH

A global power market and grid analytics firm

More precise valuation with long-term nodal price forecast

>$45bn USD worth of bankable transactions with Aurora's forecast to-date globally

Aurora has a strong track record of acting as a lender market advisor in APAC

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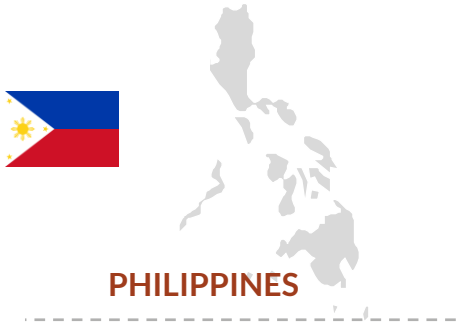
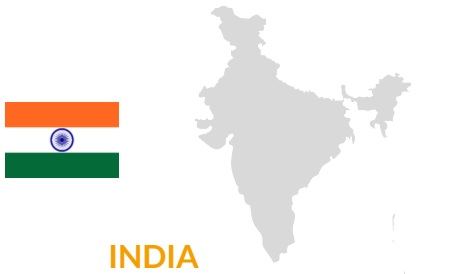
Aurora APAC selected bankability credentials[1]

NON-EXHAUSTIVE

AUSTRALIA



PHILIPPINES



INDIA

1

Commonwealth Bank, EDC (Export Development Canada / Exportation et développement Canada)

Market adviser for Amp Energy on project financing of 339MW solar and 250MW BESS portfolio

2

Societe Generale, ING, MUFG, Mizuho, SMBC, ICBC

$440m debt financing of 209MW onshore wind farm for GIG

3

Societe Generale, Westpac Australia's First Bank, SMBC

Energy market analytics provider for Equis Energy on $260 million project financing of 250MW BESS portfolio

4

Security Bank

Alba Renewables' 65MW ground-mounted solar project ($33m)

5

SMBC, Credit Agricole, standard chartered, BNP Paribas, MUFG, Intesa Sanpaolo, DBS

Vena Energy's 225MW Opus Paoay Solar Farm ($224m)

6

Security Bank

PHESI acquisition of 16MW onshore wind and 7.3MW BESS ($45m)

7

Barclays

Sell side commercial diligence for a 4GW+ renewable platform

8

SMBC, standard chartered

Debt financing of 300MW FDRE project ($600m)

9

SMBC, Rabobank

Debt financing of 100MW FDRE project (₹1,500cr)

1) Non-exhaustive list, including bankability credentials that clients have authorised Aurora to publish.

Sources: Aurora Energy Research

Unique, proprietary, in-house modelling capabilities underpin Aurora's superior analysis

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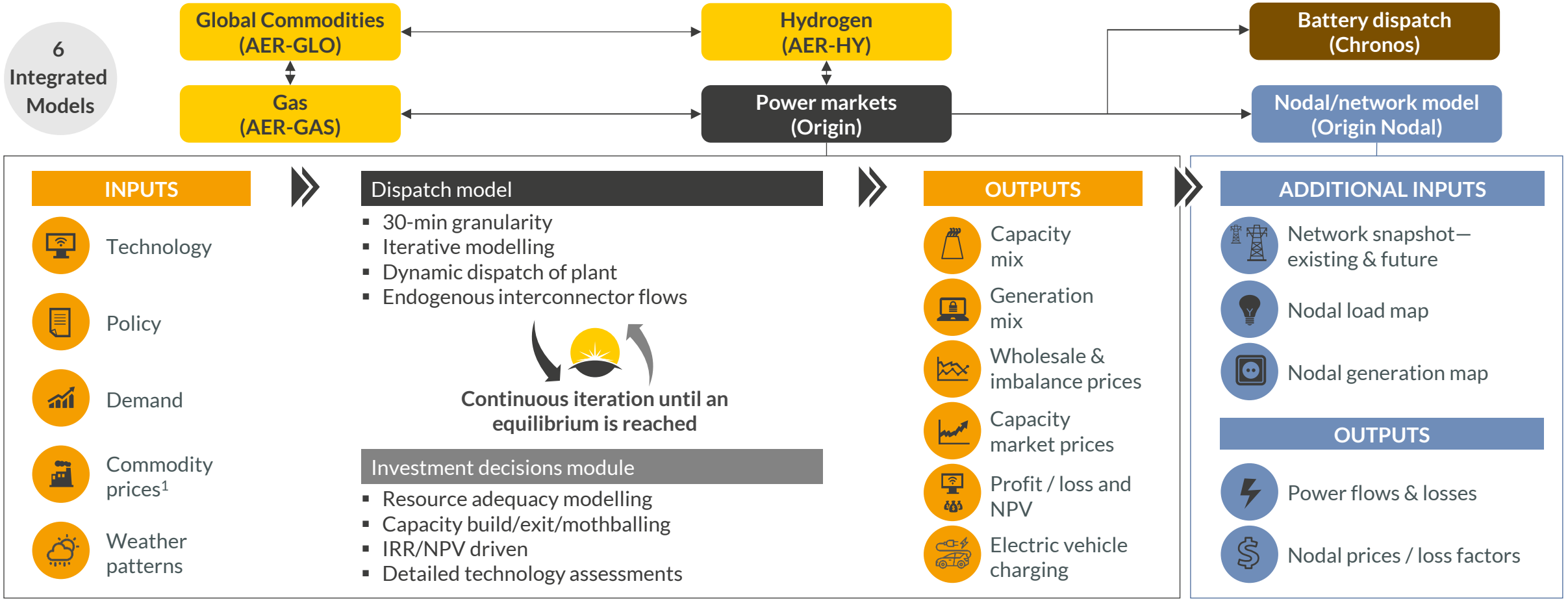

Up to 70
specifications modelled for each plant

c. 100k
investment hours on modelling capabilities

30k
model runs per week

70+
strength of modelling team globally

Half-yearly updates
through subscription research

1) Gas, coal, oil and carbon prices fundamentally modelled in-house with fully integrated commodities and gas market model.

Sources: Aurora Energy Research

Agenda

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I. Stage 1 Data Intelligence: Power Market Model

II. Stage 2 Data Intelligence: Power Market Model + Grid Model

III. Stage 3 Data Intelligence: AI-enabled Data Platform

Following a period of high prices during the hot-dry season in 2024, wholesale prices decreased in 2025 with wetter and cooler weather

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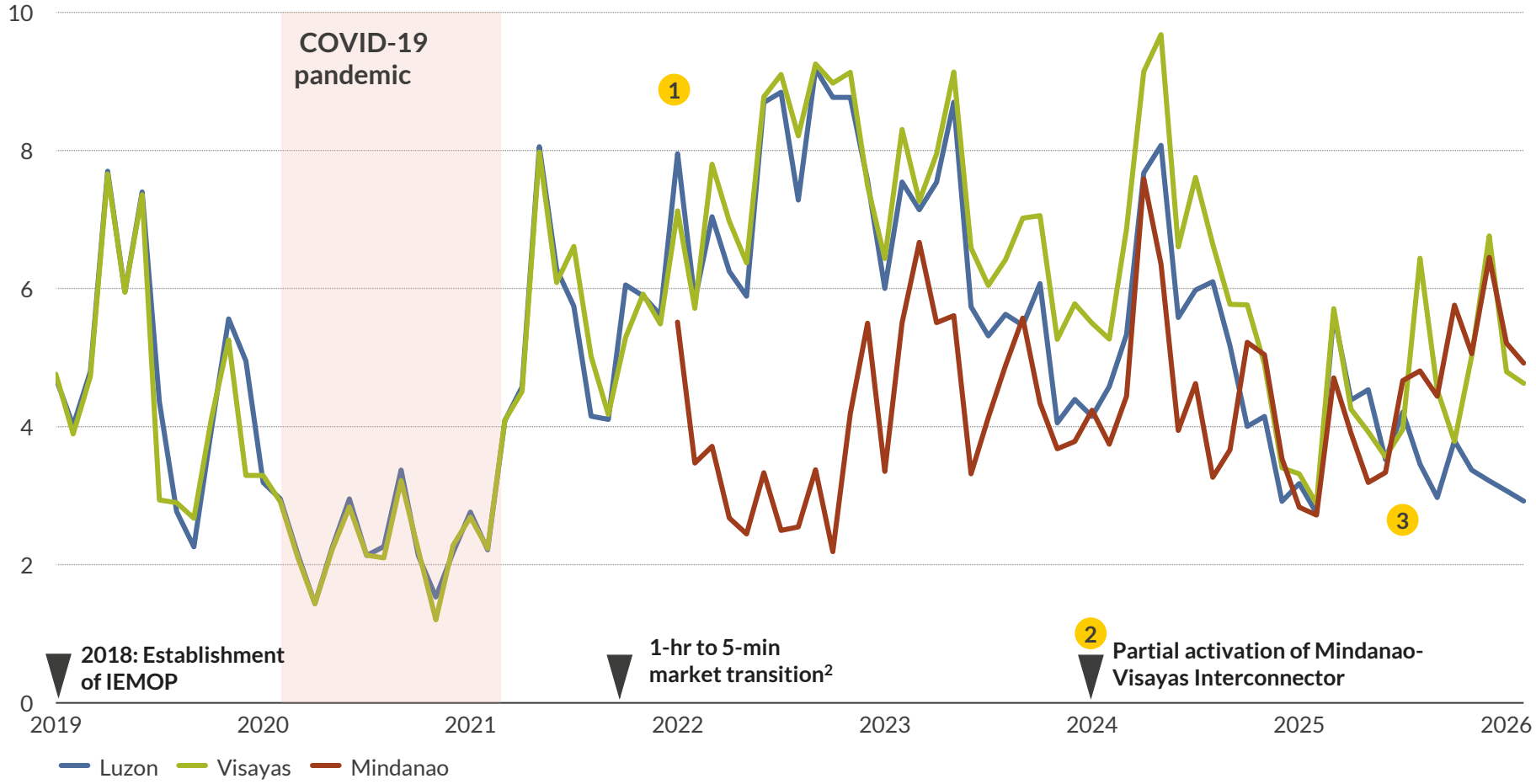
Monthly average LWAP[1]

Thousand ₱/MWh, nominal



1) Load weighted average price; 2) IEMOP published data taken as hourly data prior 26th June 2021 and in 5-minutes intervals after;

Source: Aurora Energy Research, IEMOP

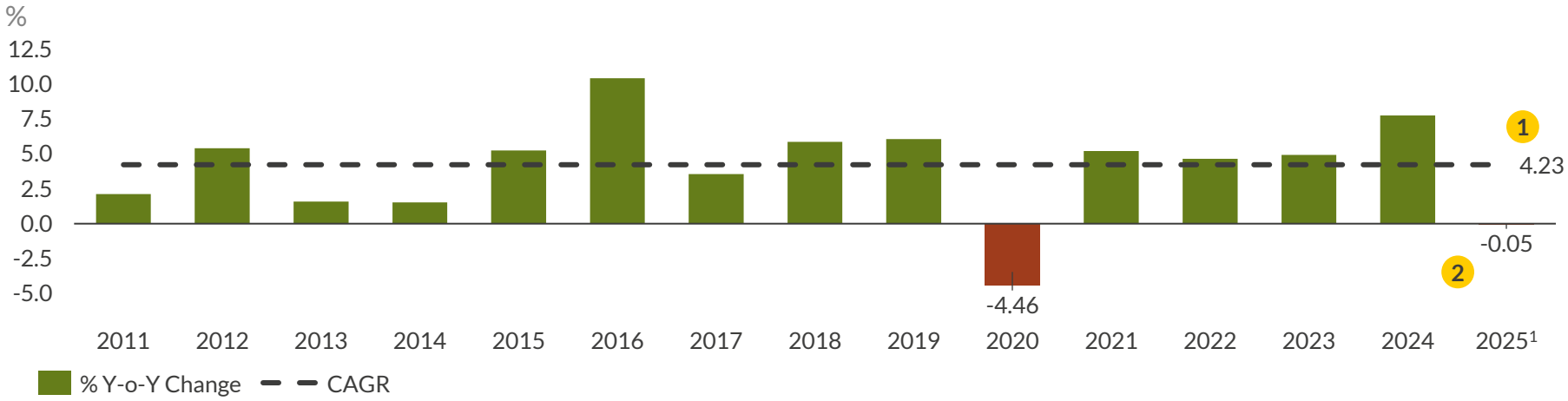
Brief history and key milestones

With EPIRA enacted in 2001, the WESM began commercial operations in Luzon and Visayas in 2006 and 2010 respectively, and finally Mindanao in 2023.

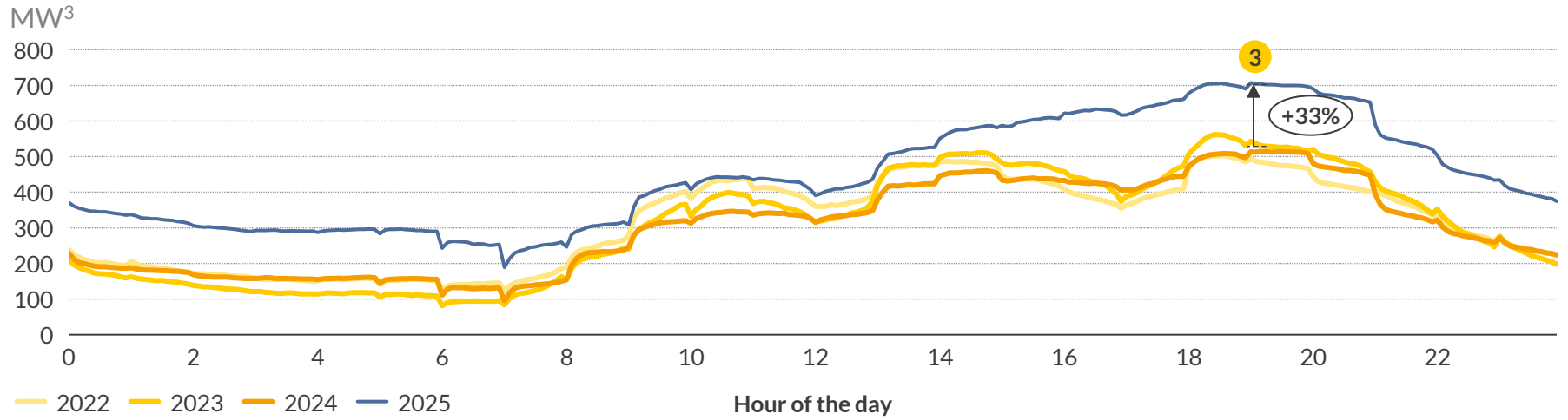
1. Prices shift with movements in the commodities markets, notably in 2021 and 2022 with coal prices reaching record high levels. The Secondary Price Cap was triggered about 23% of the time in 2022.
2. Commercial operation of WESM Mindanao in Jan 2023. Mindanao sees price separation from Luzon-Visayas region. Mindanao-Visayas Interconnection was activated partially in May 2023, with the full 450MW capacity energizing on 28th January 2024.
3. Lower prices in 2025 can be partially explained by lower or negative monthly demand growth (year-on-year) together with abundant hydro generation. The cooler and wetter than normal weather is attributable to El Nino Southern Oscillation (ENSO[3]), a cyclically recurring weather pattern but not structural change in power demand.

Bearish prices observed in 2025 were partly due to weather patterns, resulting in lower demand growth and increased hydro inflows

Annual national demand in the Philippines - year-on-year change



Average intraday scheduled generation of impounding hydro plants in Luzon



1) Year-on-year change in demand from calculated based on NGCP data from 2011 to 2024 and IEMOP data for 2025 data.; 2) GDP grew 4.4% in 2025, which was the slowest annual growth in 5 years and below the government's targets for 2025.; 3) Aurora's forecasted demand includes demand as seen by the grid, losses, as well as demand met by behind-the-meter generation.
Source: Aurora Energy Research, NGCP, IEMOP

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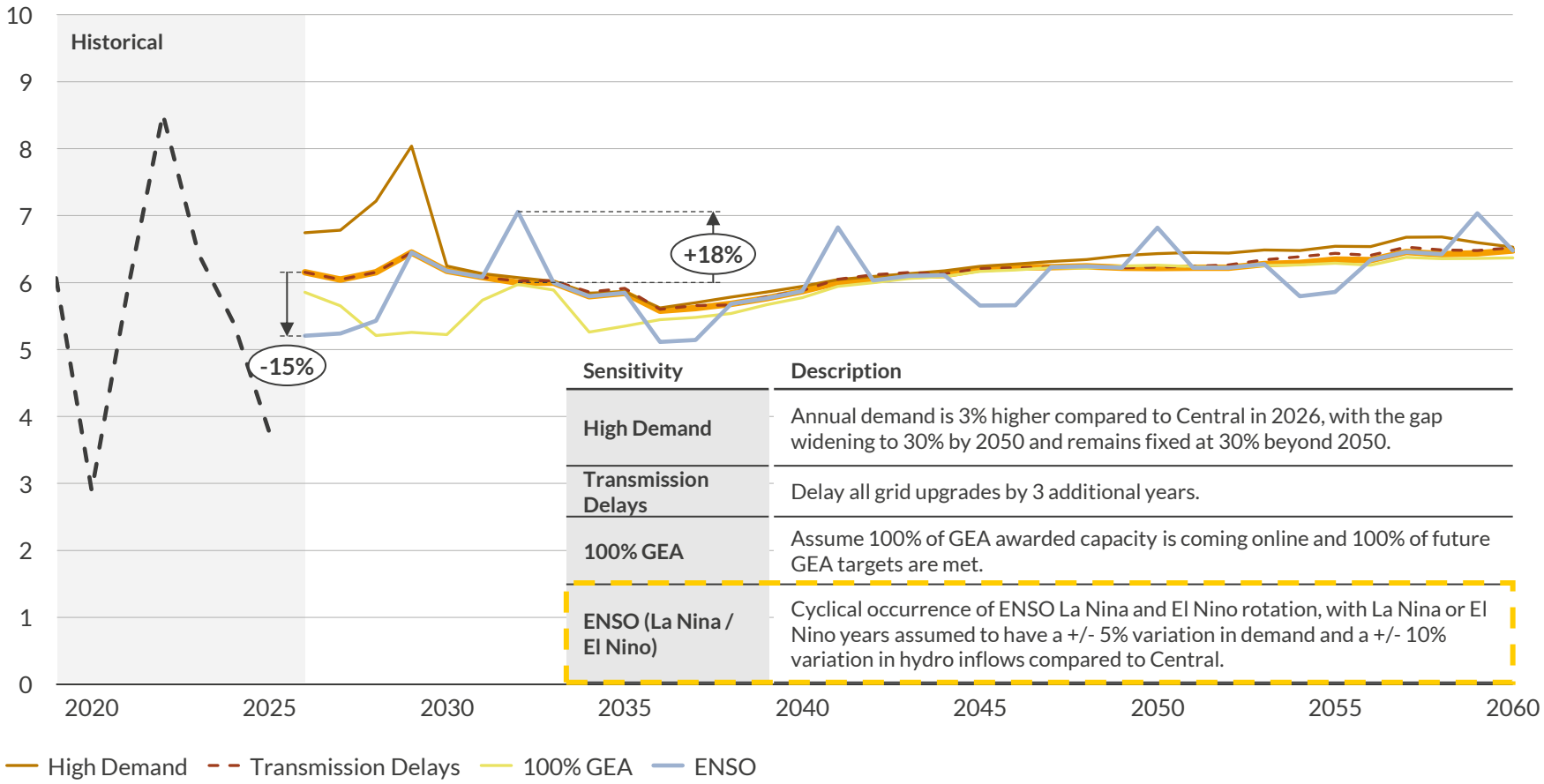
Brief history and key insights

1. From 2011 to 2024, the Philippines historically experienced demand growth at a CAGR of 4.23%.
2. Aside from the reduction in demand driven by the COVID-19 pandemic in 2020, the Philippines also experienced negative year-on-year demand growth of -0.05% in 2025, driven by factors attributable to El Nino Southern Oscillation (ENSO) and slower economic growth[2].
3. With the 2025 La Nina event, the weather was cooler and wetter, leading to higher hydro inflows. For example, impounding hydro plants had up to 33% higher generation in the evening compared to earlier years. Impounding hydro plants are more flexible in their dispatch due to their ability to shift output to maximise dispatch in the evening with higher WESM prices. This resulted in significantly softened price spikes and as these plants exerted outsized influence on reducing average prices in 2025.

While the timing of ENSO is unknown, we estimate cyclical multi-year patterns, with wholesale prices varying up to 18% relative to Central

Wholesale electricity price in Luzon – Aurora Central vs Sensitivity drivers

Thousand ₱/MWh, real 2025



Sensitivity	Description
High Demand	Annual demand is 3% higher compared to Central in 2026, with the gap widening to 30% by 2050 and remains fixed at 30% beyond 2050.
Transmission Delays	Delay all grid upgrades by 3 additional years.
100% GEA	Assume 100% of GEA awarded capacity is coming online and 100% of future GEA targets are met.
ENSO (La Nina / El Nino)	Cyclical occurrence of ENSO La Nina and El Nino rotation, with La Nina or El Nino years assumed to have a +/- 5% variation in demand and a +/- 10% variation in hydro inflows compared to Central.

Source: Aurora Energy Research, IEMOP

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Key insights

- The ENSO La Nina El Nino sensitivity shows the significant impact of weather patterns on market outcomes.
- Informed by historic observations, demand and hydro inflows are altered in the magnitude of 5% and 10% respectively, assuming a repetitive cyclical pattern. However, the timing is purely deterministic and shall not be interpreted as a weather forecast.
- La Nina creates bearish fundamentals, while El Nino creates the opposite bullish fundamentals.
- Based on these inputs, the impact on WESM is forecasted to reduce ~1,000 ₱/MWh or ~15% lower with cooler and wetter weather, while an increase in prices of the same magnitude can also be expected with hotter and drier weather.

Low demand and high renewable output over the Easter holidays have seen increased negative prices, particularly on Good Friday

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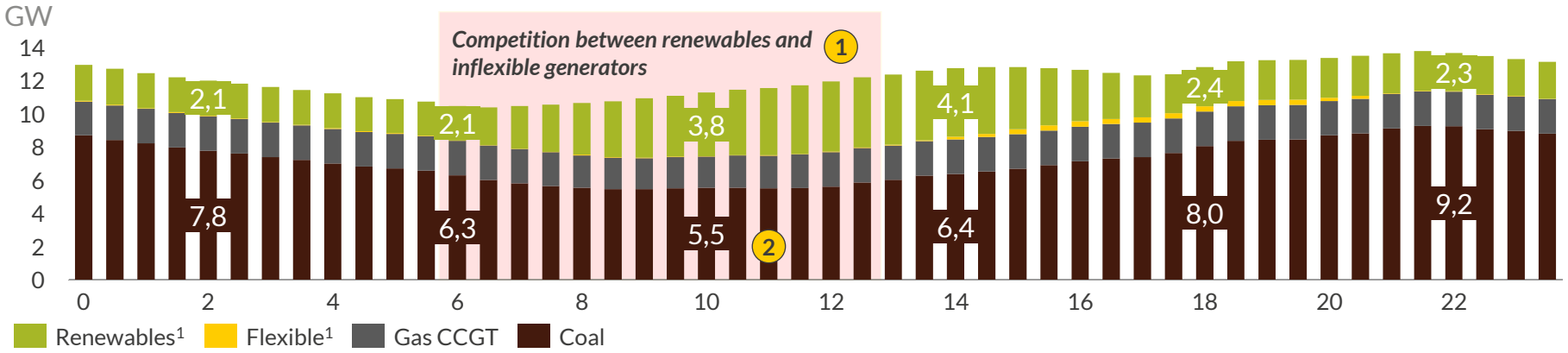
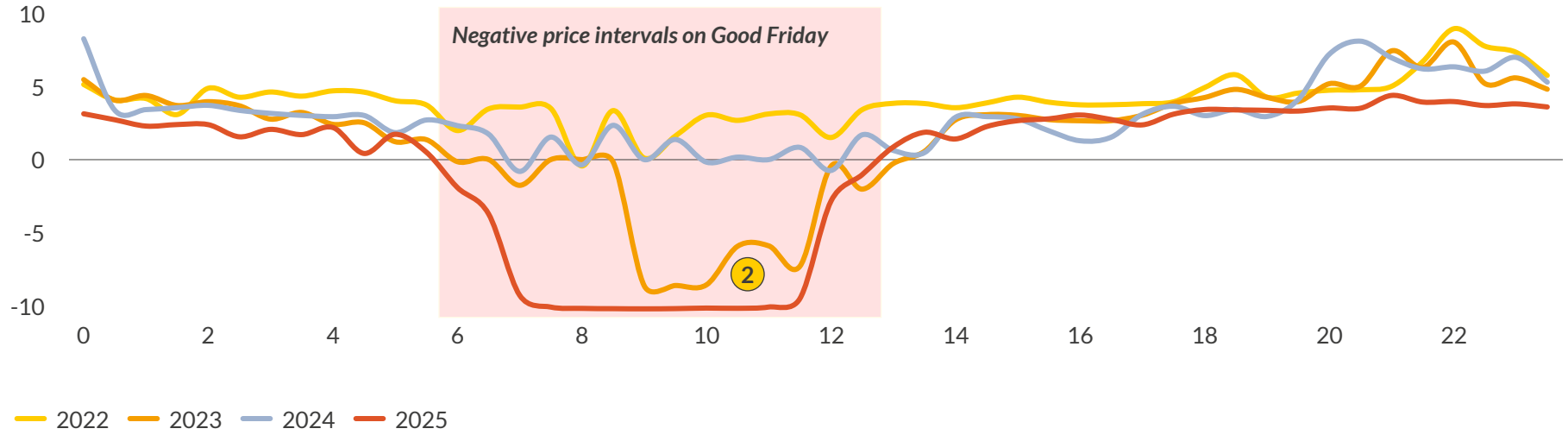
Hourly generation on Good Friday 2025



WESM prices over Good Friday from 2022 to 2025



1) While pumped hydro assets are considered renewable energy sources in the Philippines, it is classified as pumped-storage units instead of must dispatch or priority dispatch generating units like other renewables, based on WESM Rules as of 27 Jan 2023.

Source: Aurora Energy Research

Key insights

- The prevalence of negative prices around holidays like Good Friday is based on relatively low demand affecting residual load.

1 Renewables

- Renewables generation (e.g., solar), which are must dispatch and priority dispatch generating units, increased up to ~4.1GW over the course of the day.

2 Residual load

- Scheduled coal generation decreased to ~5.5GW at intervals in the morning due to low demand and influx of renewables generation.
- Baseload power plants, which are scheduled generating units, are inflexible and would prefer to consistently operate above their stable export level.
- Many baseload generators bid negative, down to the price floor of −10,000 ₱/MWh to increase likelihood of dispatch and those negative bids are increasingly setting the price.

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III. Stage 3 Data Intelligence: AI-enabled Data Platform

Curtailment in the Philippines follows a defined dispatch hierarchy, with renewables designated as "must-dispatch" or "priority dispatch"

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1 What is curtailment?

In the Philippines, curtailment is the instructed **reduction in generator output** due to **thermal grid constraints** or **excess generation supply**, even if the plant is available to produce.

2 Who manages curtailment?

Independent Electricity Market Operator of Philippines (IEMOP)

As the independent market operator (IMO) of the WESM, IEMOP **determines the dispatch schedule**. IEMOP takes charge in dealing with generation oversupply.

National Grid Corporation of the Philippines (NGCP)

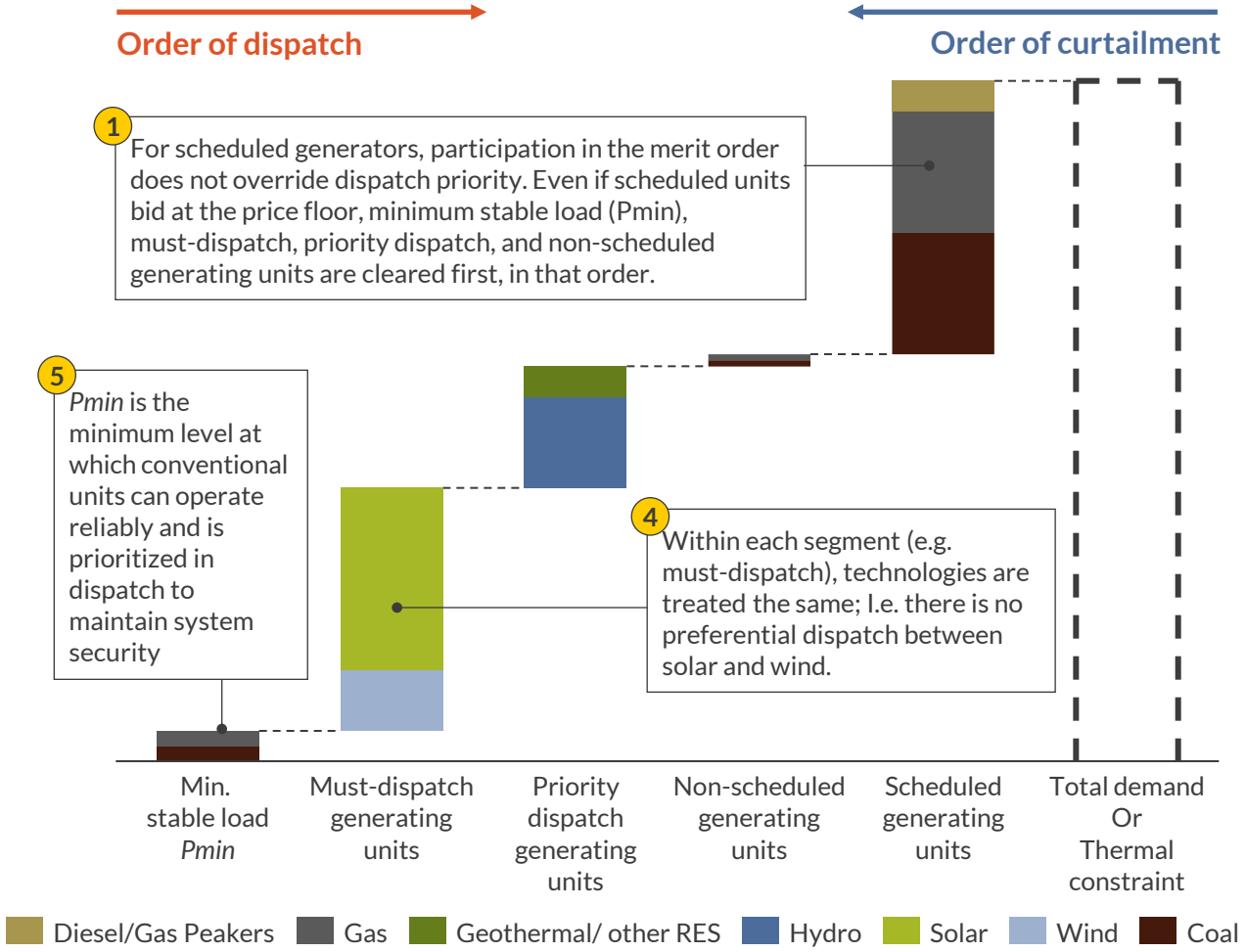
NGCP is the system operator (SO), which **implements the dispatch schedule** and may **constrain units in real time** to maintain system security. NGCP takes charge in dealing with thermal grid constraints.

3 What is the curtailment order?

When restricting dispatch targets under WESM Rules Clause 3.6.1.7, the market dispatch considers the following order when a combination of the groups are to be restricted:

1. Scheduled generating units
2. Non-scheduled generating units (generating units with capacity below regional thresholds[2])
3. Priority dispatch generating units (including geothermal, biomass, impounding hydro)
4. Must-dispatch generating units (including solar, wind, run-of-river hydro, ocean[3])
5. Minimum stable load (*Pmin*) of conventional generating units

Illustrative dispatch & curtailment order



1) Referenced from the Price Determination Methodology issue 4.0 manual published by PEMC. 2) The thresholds are 10MW for Luzon, 5MW for Visayas and 5MW for Mindanao. 3) Renewable energy harnessed from the ocean e.g. tidal energy

Sources: Aurora Energy Research

Aurora's network model utilizes detailed market and transmission data to forecast potential curtailment for the Castillejos Solar Power Project

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Modelling methodology and key assumptions for Aurora Central

How Aurora models load flow in the network

1 Load / Demand

- Demand growth on a system level considers population growth and increased consumption per capita.
- Nodal model considers proximity to load – residential, commercial, or industrial – to solve for power flow.

2 Generation

- **Near term**[1]: Aurora models DOE's Existing & Committed projects
- **Long term**: From 2028, the model forecasts additional capacity based on demand, commodities, build costs etc.
- The model also factors in proximity & changes to local generation mix

3 Network

- Network topology, transmission asset parameters and connectivity are incorporated.
- Nodal model considers relevant transmission line upgrades to support changing load and generation patterns.[2]

4 Co-optimised nodal and market constraints

- Generator specific behavior (ramp rates)
- Network flow constraints
- Least-cost optimization outputs include asset-specific curtailment and network congestion

Curtailment calculation methodology

- The calculation considers the area demand, total generation injected into the grid and available transmission capacity around the asset.
- In the absence of specific DOE or NGCP rules on curtailment of renewables, Aurora's model distributes curtailment on a pro-rated basis based on plant capacity across all preferential dispatch plants connected to the same connection point in the transmission grid.

1) Near term refers to the next 5 years until 2030 (unless there are Committed plants with a COD beyond 2030); 2) Aurora Central's base assumptions considers both the timelines from TDP 2025 and ERC's approval timelines.

Sources: Aurora Energy Research, NGCP

Outages of large generators and grid management have a significant influence on price separation for some nodes

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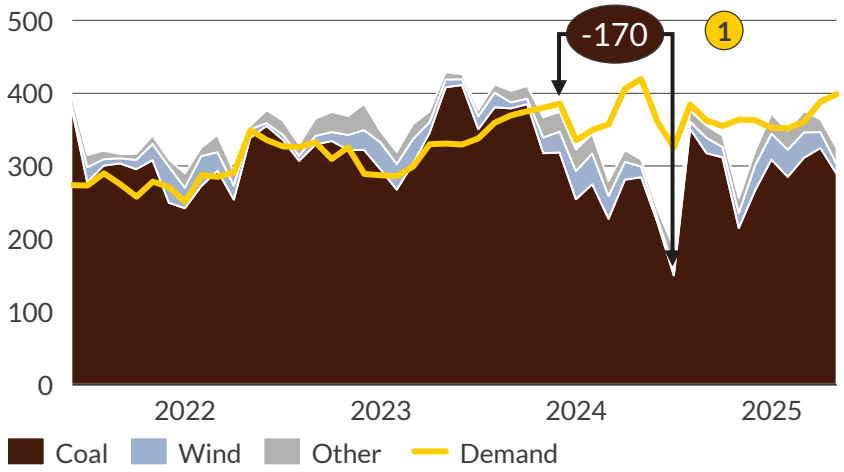
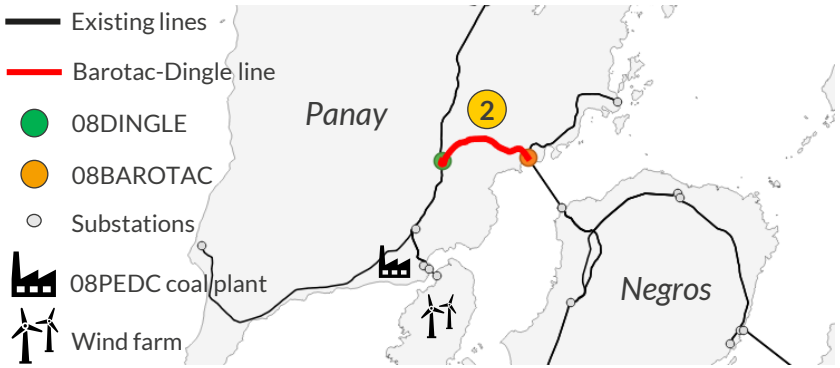
Generation and demand in Panay– Historical

MW

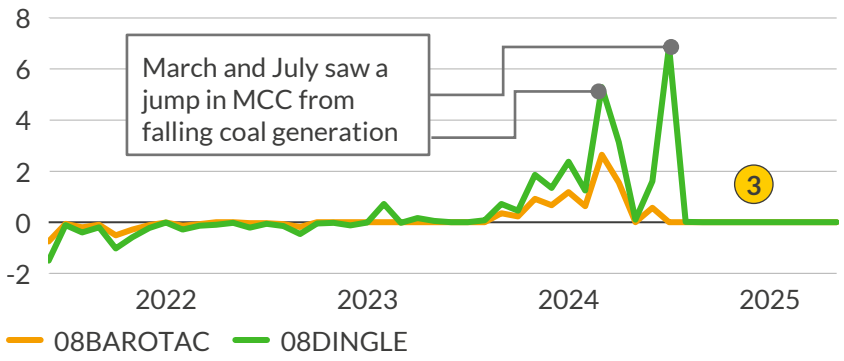


Panay–Negros transmission network



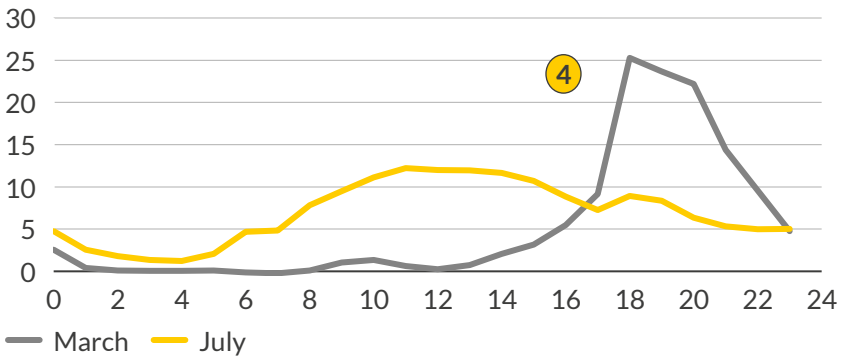
Monthly average MCC– Historical

Thousand ₱/MWh, nominal



Intraday MCC at 08DINGLE (2024)– Historical

Thousand ₱/MWh, nominal



Key Insights

1. The 08PEDC coal plant underwent maintenance and reduced output by ~170MW in early 2024. Reduced generation in Panay with sustained demand required increased imports from Negros.
2. As a result, the 138kV Barotac-Dingle lines were constrained for 42% of intervals in July[1], causing significant price separation between 08BAROTAC, 08DINGLE, and the larger Panay region.
3. Subsequently, the N-1 contingency for the Barotac-Dingle lines were removed on 9 Sept 2024, alleviating the line constraint. Energisation of a third line on 4 April 2025 further alleviated this grid constraint.[1] With a less constrained grid, prices normalised.
4. Intraday data shows the March MCC peak was concentrated in the evening when gas peakers become price setting. The July spike followed a typical intraday demand curve, showing congestion hampering imports of cheap solar dispatch from Negros.

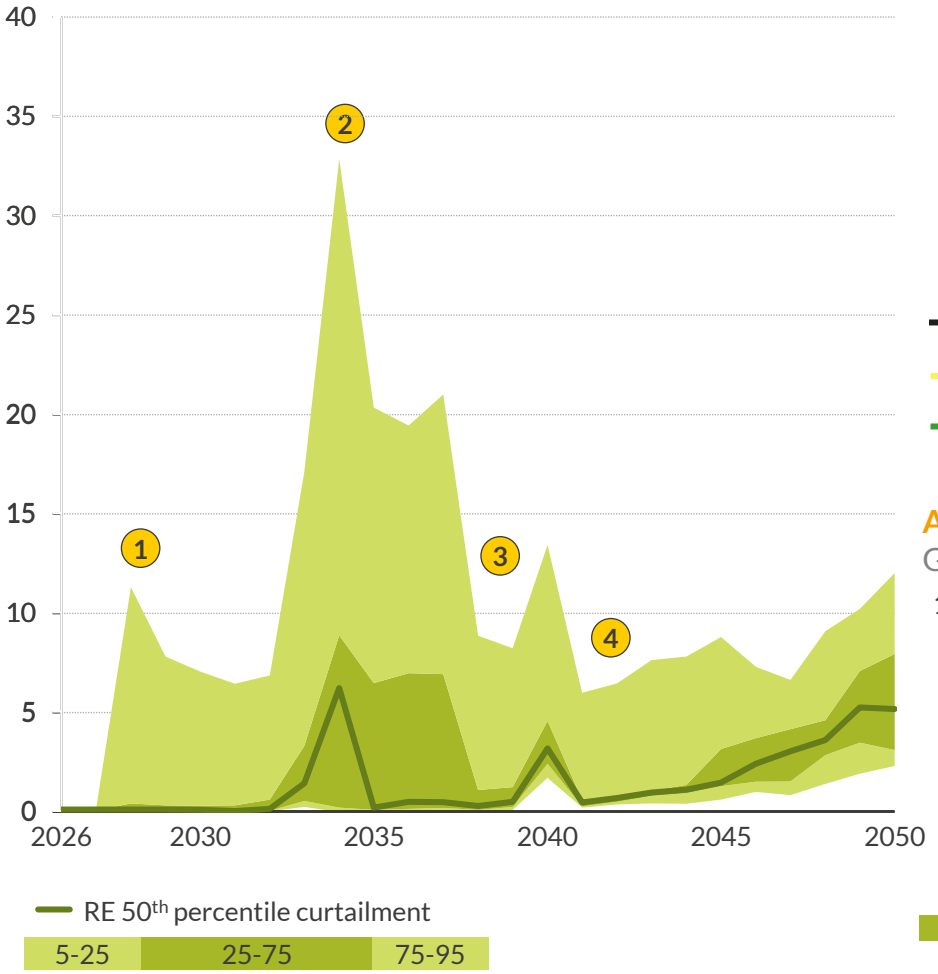
1) IEMOP Market Operations Highlights

Sources: IEMOP

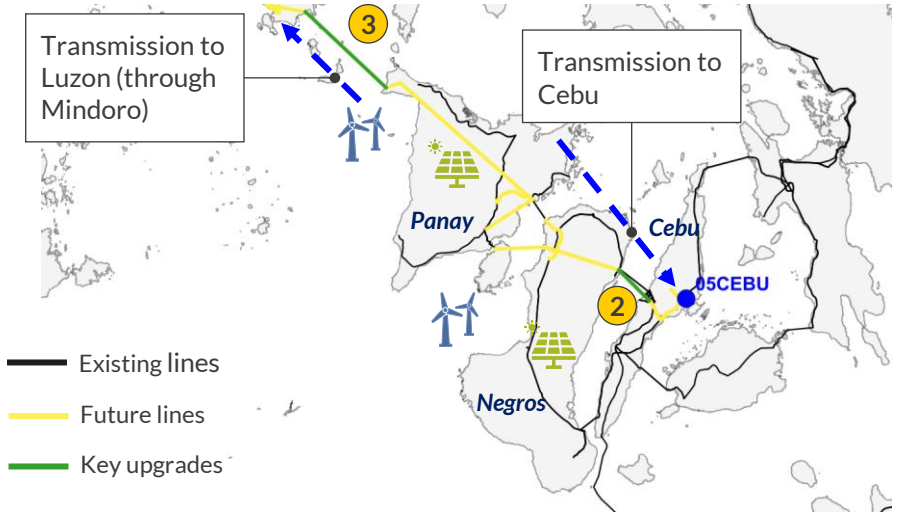
Most connection sites in Negros and Panay forecasted to experience less than 5% curtailment, though some locations see higher risk

Aurora Central – Renewables[2] curtailment in Panay, Negros

% volume

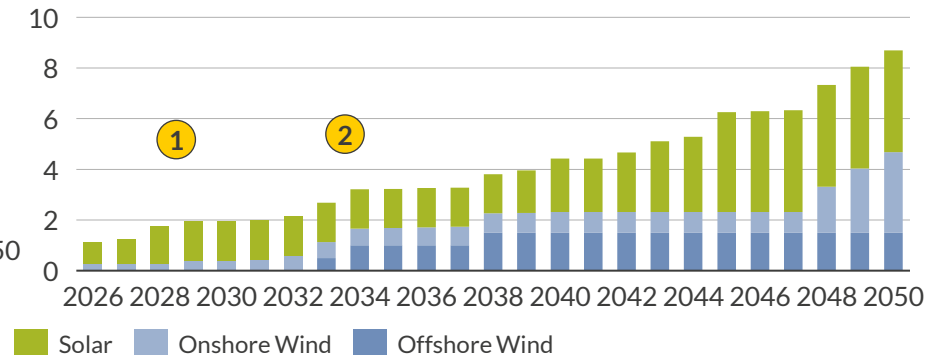


Negros, Panay transmission network



Aurora Central – Capacity outlook in Panay, Negros

GW



1) Total curtailment is the sum of grid and economic curtailment; 2) Renewable assets included here are solar, onshore wind, and offshore wind.

Sources: Aurora Energy Research

Key insights

- Under the Aurora Central scenario, curtailment outcomes for most renewables sites are forecasted to vary within 40% in Panay and Negros, with most connection sites experiencing around 3% curtailment risk[1] across the forecast horizon.

1. Curtailment risk is expected to increase as more GEA capacity is commissioned in the region increasing congestion of transmission corridors to Cebu.
2. Offshore wind capacity from GEA-5 is expected to further increase the curtailment risk of some renewable projects in Visayas including existing capacity in the region.
3. The commissioning of the 230kV Panay-Guimaras-Negros in 2035 and Cebu-Negros Lines 3 and 4 in 2038 will provide additional pathways for renewable generation from this region leading to reduced curtailment risk for renewables.
4. In 2041, the 230kV Bulalacao-Buruanga interconnection will alleviate curtailment for projects in Panay and Negros by providing additional transmission corridors towards Luzon through Mindoro.

Agenda

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Engaging Aurora's insights with EOS AI

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- Power Markets
- Commodities & Hydrogen
- Reports Browser
- EOS AI

Data Dashboards

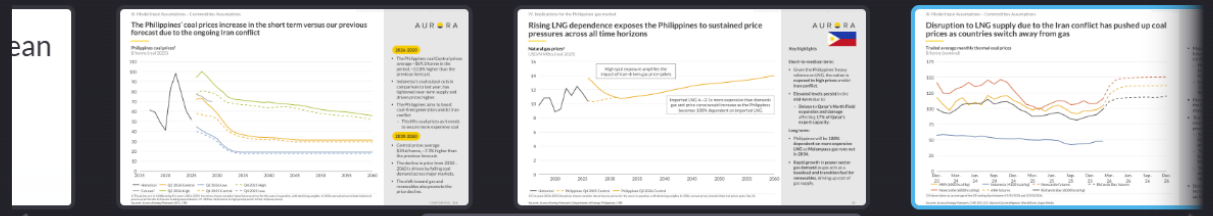
- Historical Market Data
- Scenario Explorer
- Flexplorer
- Nodal Explorer: Dashboard
- Nodal Explorer: Maps
  Aurora Maps

Software Applications

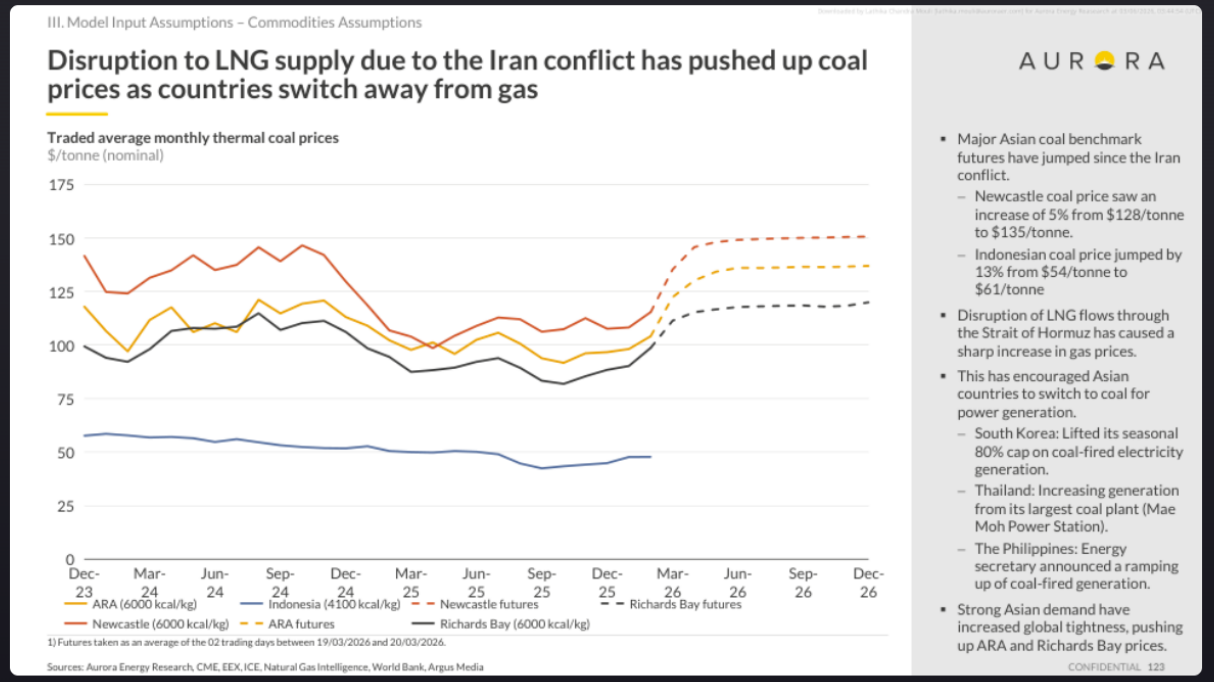
- Origin

Switch Agent

Apr 2026 | Apr 2026 | Apr 2026



Philippine Power & Renewables Market Forecast Q2 2026 - Page 123 Open in SharePoint



How did the Iran War affect Philippines wholesale market?

Based on the available sources, here is a detailed overview of how the Iran War affected the Philippines wholesale electricity market:

Impact of the Iran War on the Philippines Wholesale Electricity Market

Timeline of Key Events

- **28 Feb 2026**: The US and Israel launched "Operation Epic Fury,"

How will

2014 - 2026

Enable project pre-screening or siting optimization with Nodal Maps and Nodal Explorer

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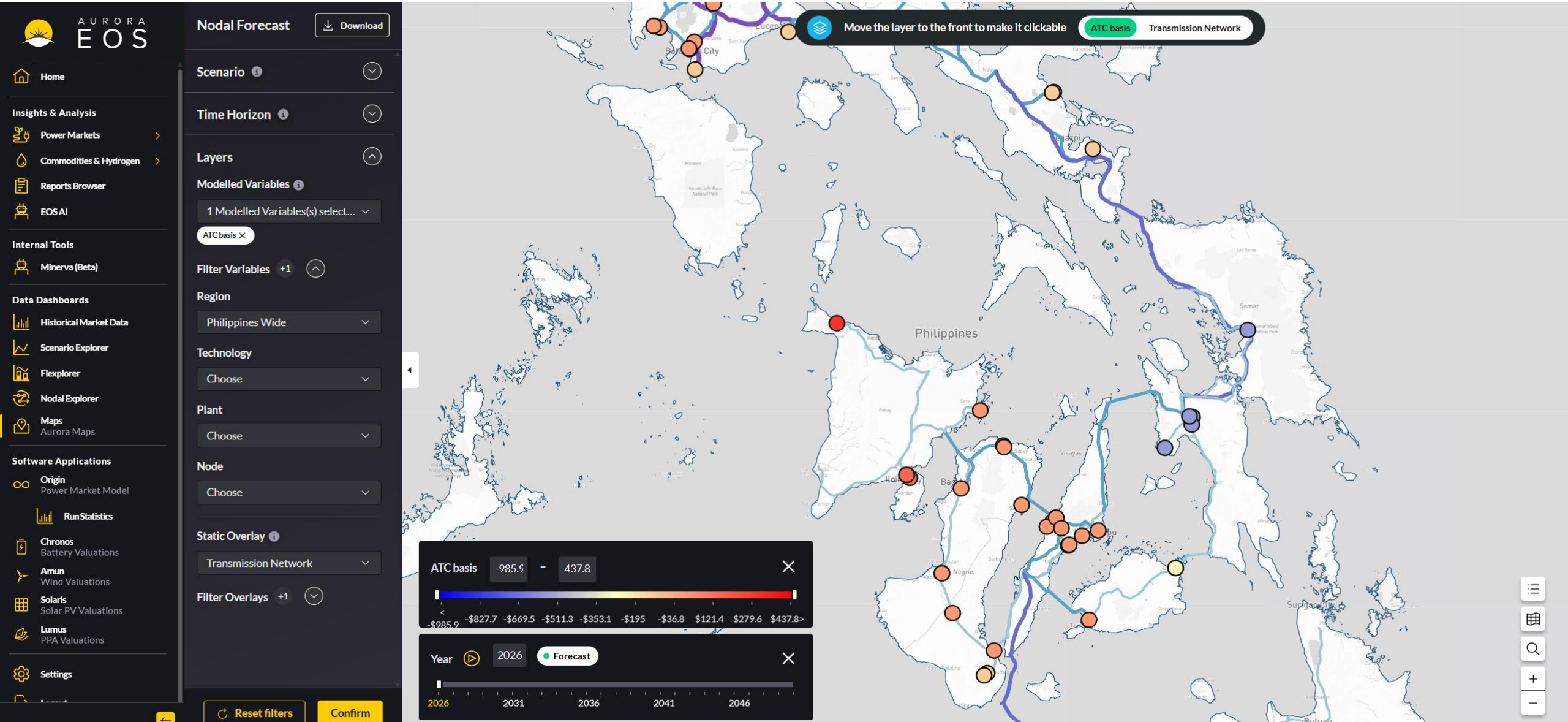

Keep track on latest market movements with Historical Market Data dashboard and Monthly Market Summaries

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Critical power market intelligence for the Philippines power market is being regularly updated for Aurora's subscribers

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  Power & Renewable Market Forecast
- **Renewable energy capture prices**
  Power & Renewable Market Forecast
- **Energy arbitrate potential for batteries**
  Power & Renewable Market Forecast
- **Forecasted capacity & generation mix**
  Power & Renewable Market Forecast
- **RES market & PPA price benchmarks**
  Research note[1]

Subscription analytics

Unique data packages from Aurora only

- **Long-term nodal price forecast**
  Nodal add-on
- **Regional economic & grid curtailment trend**
  Research note[1]
- **Reserve spot market price forecasts**
  Flex-lite add-on
- **Access to historical price dashboard**
  Power & Renewable Market Forecast
- **Access to Aurora's Research support**
  Power & Renewable Market Forecast

1) Research note is published on need basis to reflect latest market development; No fixed publication cycle for Research Note.

Sources: Aurora Energy Research

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