



Investment Opportunities and Risks in the Philippines and Introduction to WaterRock Energy

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Outline

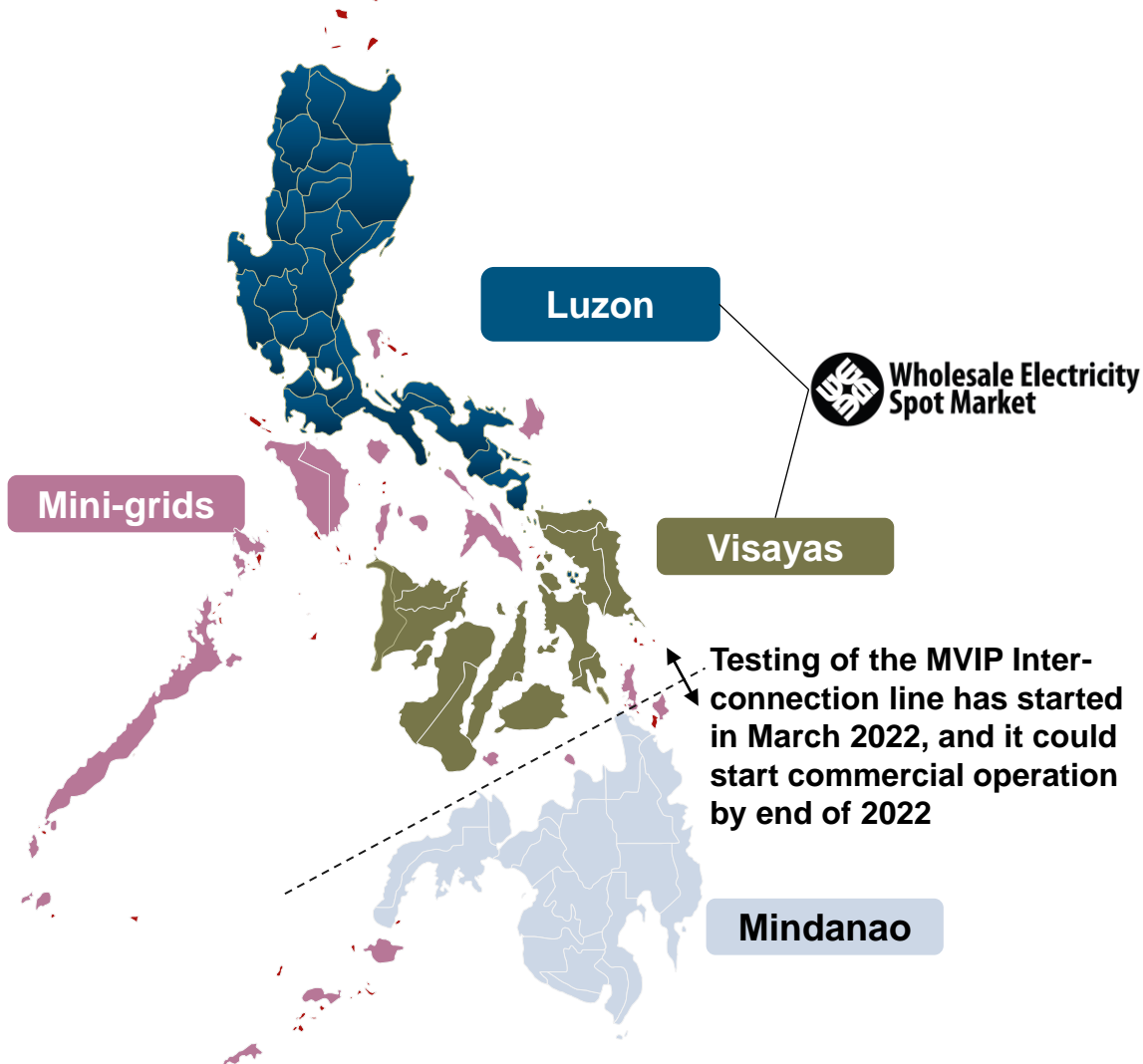
1 Investment Opportunities in the Philippines Power Market

2 Introduction to WaterRock Energy Economics

Background

Reform law (EPIRA) in the Philippines has survived four presidential terms and it has provided a sound legislative framework for the power industry since 2001

Different Regions in the Philippines Power Market



Electricity Market Largely Liberalized

- Generation assets and contracted capacity are largely privatized (>70%)
- Retail tariffs are restructured and unbundled with no cross-subsidies since 2005.

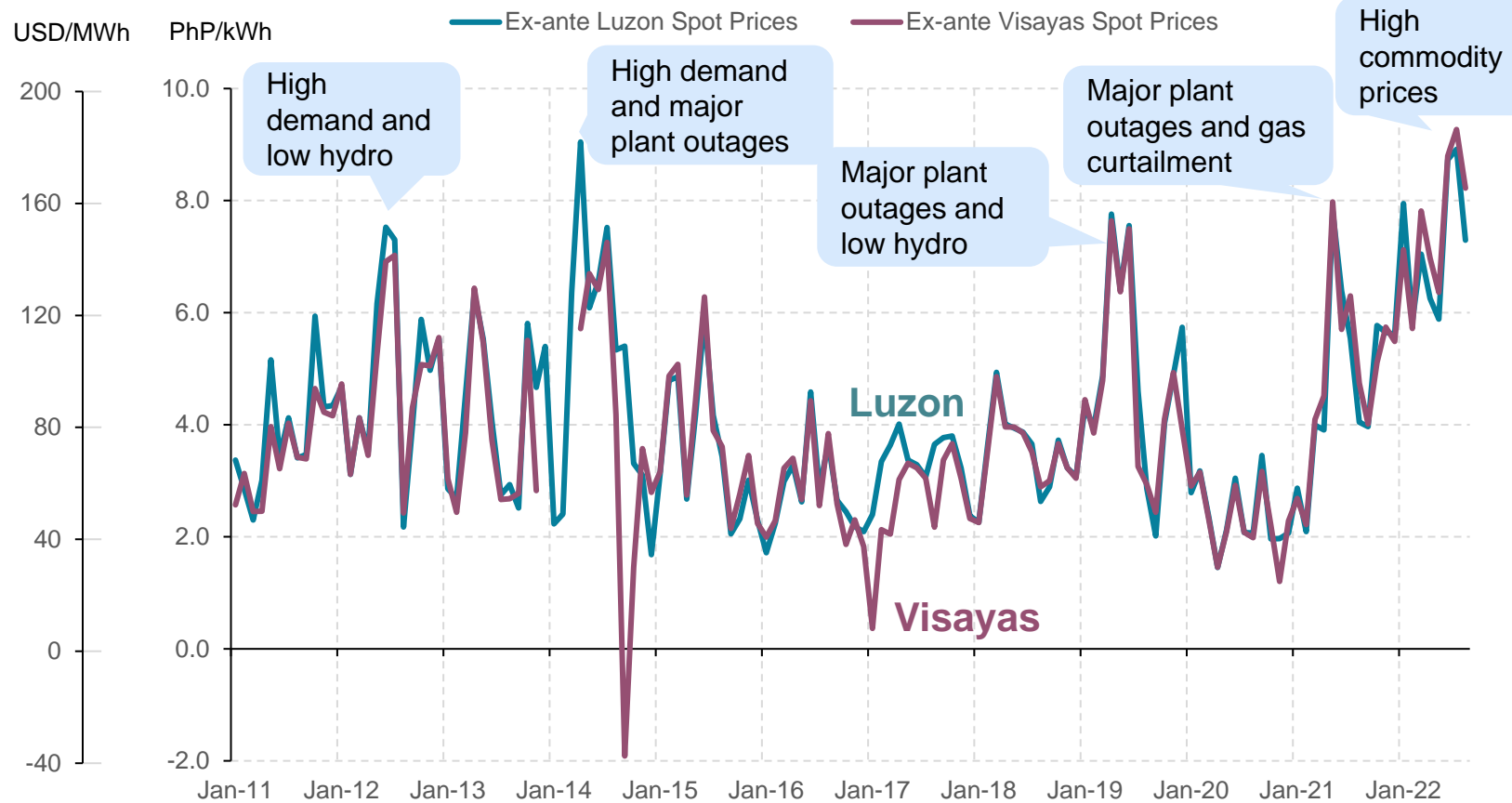
Markets are Functioning OK

- Wholesale Electricity Spot Market (WESM) commenced operation in Dec 2006, and was expanded to Visayas in Dec 2011. The inter-connection between Visayas and Mindanao may happen in the fourth quarter of 2022, which can help to export the surplus power from Mindanao to Visayas and Luzon.
- Retail Competition and Open Access (RCOA) started in 2013 but it has been progressing very slowly
- Under EPIRA, government is restricted to re-enter the generation sector.

Historical WESM Price

WESM spot prices have been volatile and event-driven; average price has increased to 7.6 peso/kWh in 2022 due to high fuel input prices

Average WESM Price in Luzon

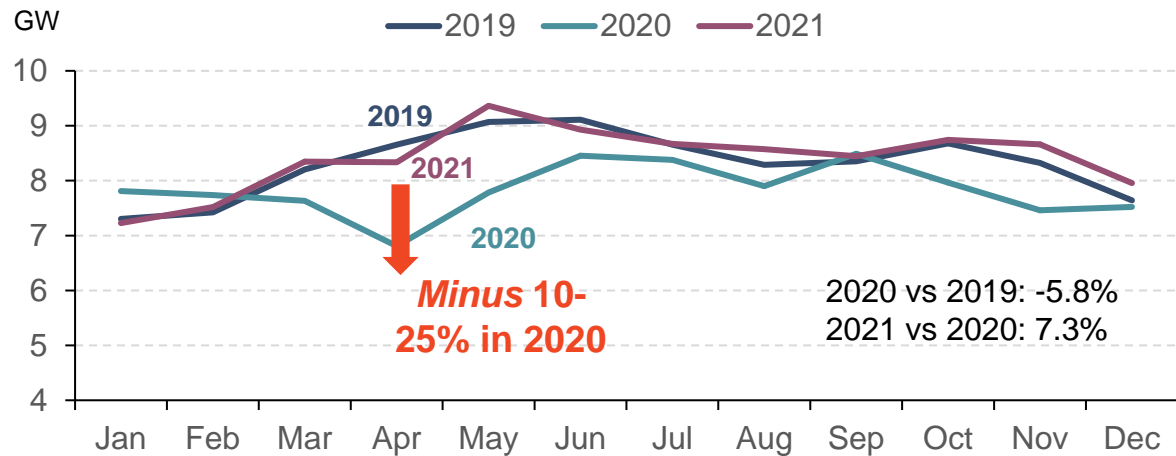


- Volatile WESM price, trading at a range of 2.0-8.5 peso/kWh. Price spike could be driven by:
 - **Weather events.** Price could be higher in dry and hot years due to low hydro generation but high peak demand.
 - **Forced outages.** Coal plants built in the 1990s (3.5 GW) could have higher forced outage rates, which leads to occasional price spike.
 - **Gas curtailment** due to maintenance or forced outage of the Malampaya gas field
 - **Geopolitical events**, such as the Ukraine-Russia conflict and the Indonesia coal ban, which increase coal input prices for the coal plants.
- Time-weighted average WESM price for Luzon and Visayas is 4.8 peso/kWh in 2021 and has increased to 7.6 peso/kWh in Jan-Sept 2022.

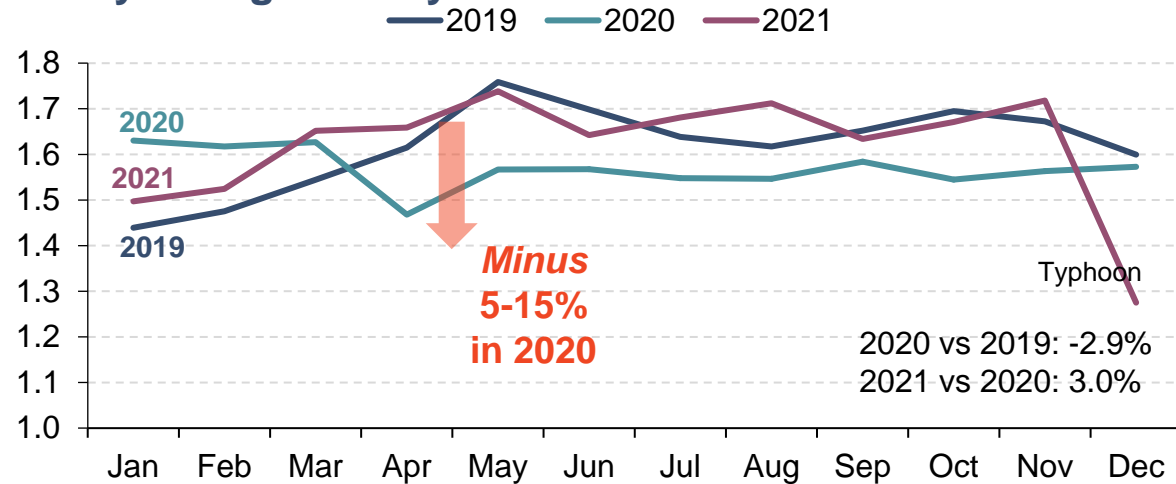
Near-term: Impact of COVID-19 on Demand

Power demand in Luzon and Visayas has bounced back to pre-covid level in 2021 and load has been growing in Luzon in 2022

Luzon Avg Monthly Load



Visayas Avg Monthly Load



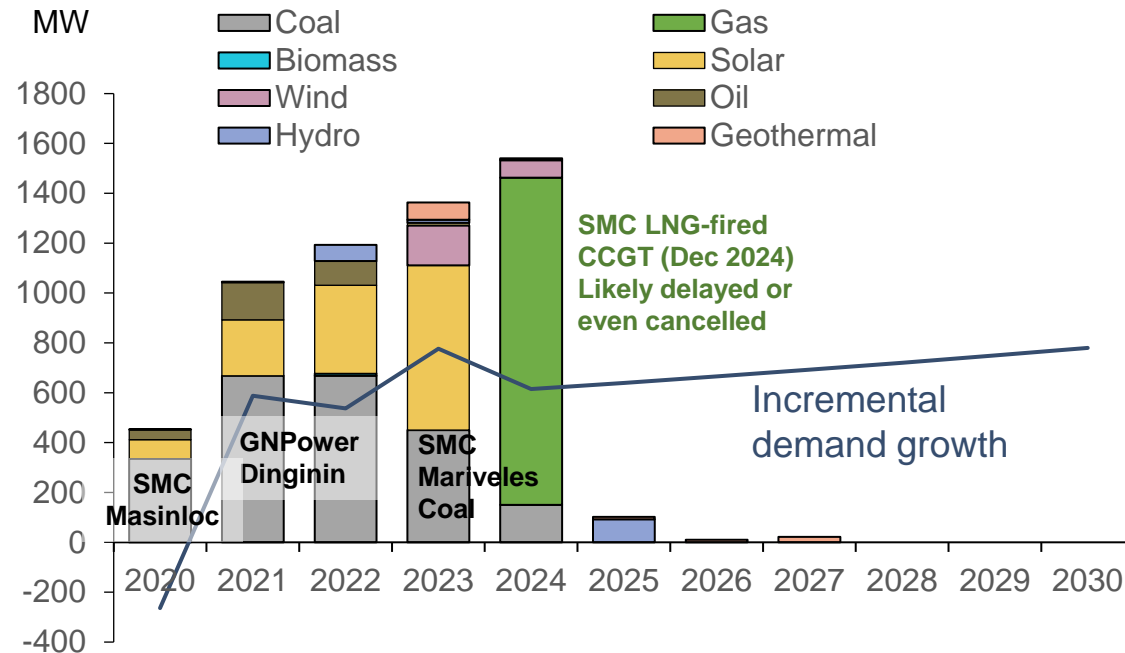
- **Mar 17, 2020 to May 15, 2020:** Average load was down 10-25% in Luzon and 5-15% in Visayas
- **May 24, 2020 to early Aug 2020:** Residential load is sensitive to climatic conditions. With a heat wave hitting the Philippines during the period, the reduction in average load dropped to less than 10 percent. Easing of ECQ in June – early Aug also helped demand to rebound
- **Aug 4, 2020 – Nov 2020:** Restrictions are on and off. Demand drop is still 5-6 percent in most weeks, as most businesses still operated on reduced work hours and load shifted from C&I to residential.
- **Dec 2020 – December 2021:** Restriction are on and off. But power demand has been relatively resilient, and largely bounce back to pre-covid level in 2019.
- **Jan 2022 - present:** Restrictions were reduced to alert levels and face-to-face classes and workplaces have been allowed.

- **2020 vs 2019 demand growth:** Luzon: **-5.7%**; Visayas: **-2.9%**.
- **2021 vs 2020 demand growth:** Luzon: **+7.3%**; Visayas: **+3.0%**.
- **Jan-Oct 2022 vs 2021 peak load growth:** Luzon: **+6.6%**; Visayas: **+1.1%**.

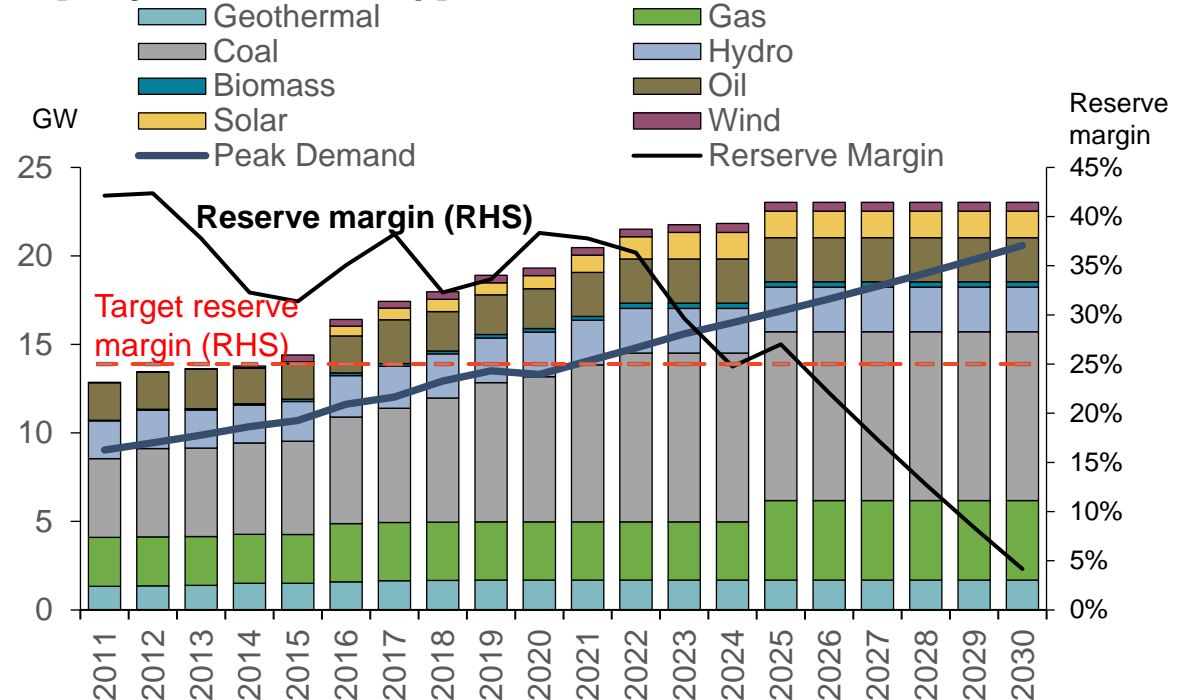
Near-term Market Fundamental

New capacity and gas infrastructure need to be financed soon, or the Philippines market could experience power shortage after 2024

Incremental Committed Supply and Demand [WESM market - Luzon + Visayas]



Supply and Demand Dynamics in WESM [Only Committed Cap]



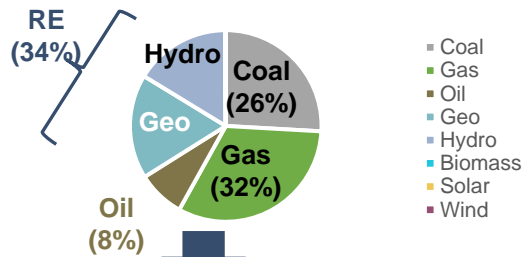
- **Annual demand growth in Luzon and Visayas is 600-800 MW.** Committed new thermal capacity is the GNPowr Dinginin Coal Unit 2, SMC Mariveles Coal Units 2, 3 and 4 and probably the SMC LNG-fired Ilijan plant. Renewable capacity is mainly solar (a total of 700 MW in 2020-23).
- Market is expected to tighten from 2022 onwards, and new capacity is required from 2025 to meet the target reserve margin of 25%.
- **The uncertainty on gas supply after the expiry of Malampaya gas contract also creates price uncertainties.**

Note: For solar and wind capacity, their effective capacity contributing to reserve margin is de-rated based on their average capacity factor.
Source: DOE, WaterRock Energy Research and Analysis

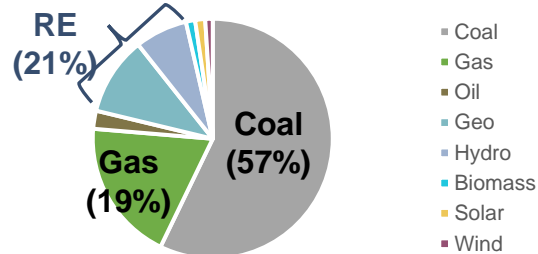
Medium- and long-term Drivers: Future Energy Mix

The Philippine government has ambitious plans to shift the energy mix away from coal in the long term

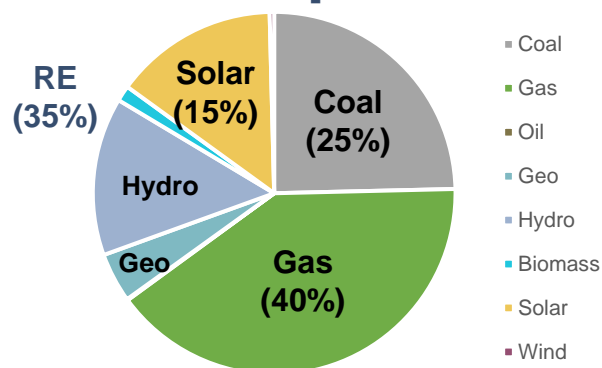
2008: 61 TWh [Actual]



2020: 102 TWh [Actual]



2040: 364 TWh [Government Plan]

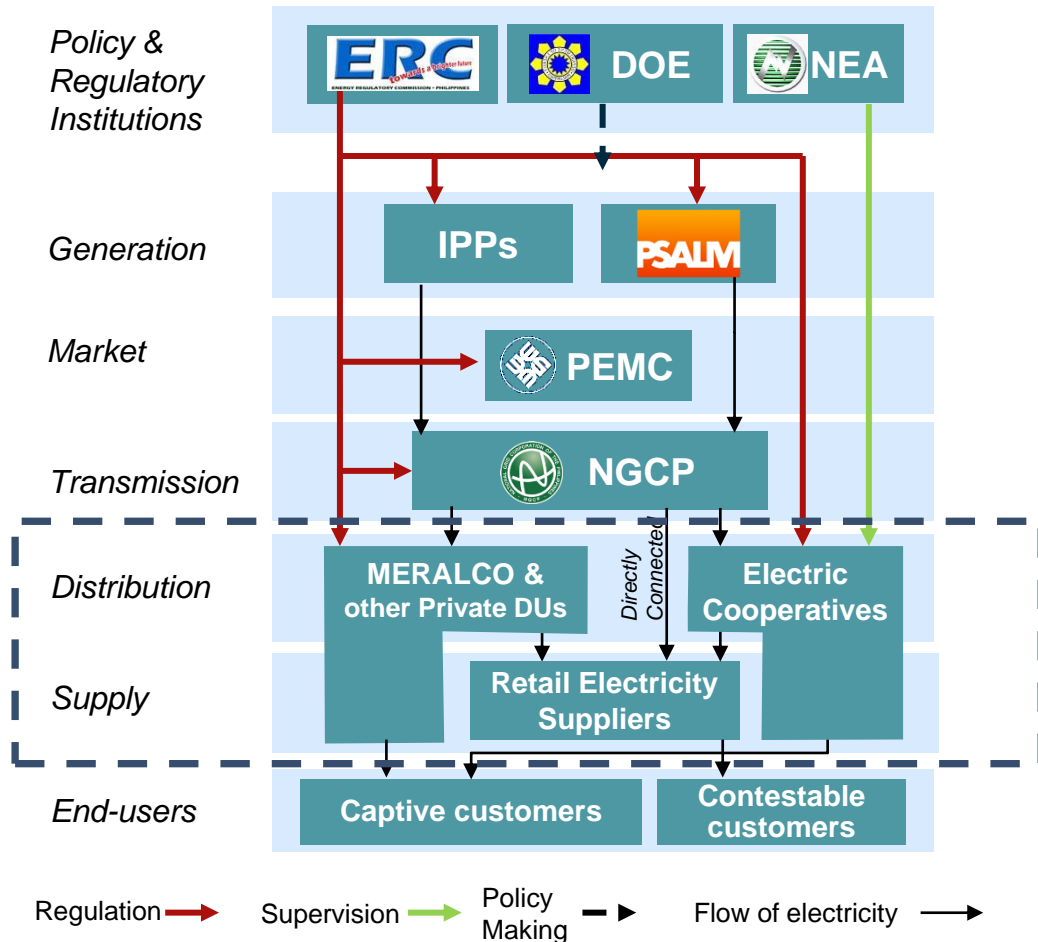


- Coal was the predominant resource to meet growing demand in the past decade. The Philippine energy mix could become too homogenous for over-relying on coal, making it susceptible to coal supply disruption.
- Gas production is highly uncertain after 2024, posing risk on future gas availability to existing CCGT plants and power supply adequacy.
- Wind and Solar addition has been slow post feed-in-tariff regime in 2016-2020. **Activities have picked up for solar projects since 2021. 230 MW solar capacity was added in 2021, and about 1 GW solar and 160 MW wind capacity are under construction.**
- **The government has ambitious plans to expand gas, solar and hydro capacity.** As the Philippine market is de-regulated, it remains to be seen whether investors will follow the government's guidance.
 - Key recent RE policy that can influence the energy mix is the renewable portfolio standard (RPS), which ensures a minimum incremental RE share based on electricity sales.
- **Market fundamental is expected to tighten, and the uncertainty on gas supply can create further price uncertainty and resource adequacy concern.**
- Even though the government has ambitious plans for RE capacity expansion, it will still depend on the incentives of different key generation companies and distribution utilities to invest.

Investment in the Philippine Power Sector

As the market is deregulated, the economics of building and running different types of generation technologies is the key driver for capacity investment

Current structure of the Philippines electricity industry (since the start of RCOA in June 2013)



- The Distribution Utilities (DU, both private and electric cooperatives) are responsible for the distribution and supply of power to the captive consumers within their franchise.
 - Each DU comes up with its own **power supply procurement plan (PSPP)** to meet the demand for the captive customers based on a least-cost and technology neutral approach. It also submits the plan to the DOE. That is why the DUs are very influential in the market. **The government policy on Renewable Portfolio Standard (RPS) can influence the renewable and non-renewable mix in the PSPP.**
 - DU's capacity procurement needs to go through a **competitive selection process (CSP)**, and the primary determining factor is cost.
- Since June 2013, Retail Competition and Open Access (RCOA) has started in Luzon and Visayas. The share of the load from contestable customers is 20-25%.
 - Retail contracts between renewable capacity and large end-users are driven by private negotiations. **While some end-users values the carbon free aspect of RE, cost and supply reliability are still the primary drivers for retail contracts.**

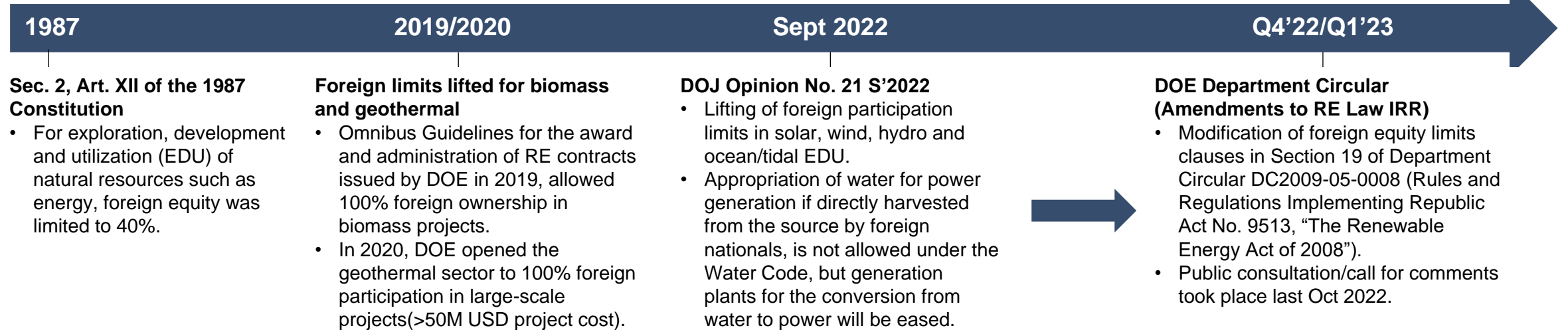
Note: The Philippines Electricity Market Corporation (PEMC) acts as market operator of the Wholesale Electricity Spot Market (WESM), which include Luzon and Visayas. National Grid Corporation of the Philippines (NGCP) provides high-voltage transmission services in the two main grids; while the assets are state-owned, as concessionaire NGCP operates, maintains and invests in the system.

Source: WaterRock Energy Research

Easing of 40:60 Rule for Foreign Investors

DOE is in the process of amending the RE Law IRR to relax the 40:60 rule for solar, wind and other RE technologies

Foreign equity limitations



Impacts to Investors

- For existing RE service and operating contracts, we see that there is **no need to issue a separate process for increasing the equity participation of foreigners**, as the terms of the binding agreement is between the foreign investor and the local partner.
- For prospective RE contracts, once the DOE Department Circular is approved, **foreign entities can opt to directly perform the EDU of renewable energy sources and they will be governed directly by the existing 2019 Omnibus Guidelines on the application and administration of RE contracts and registration of RE developers.**
- Under the Water Code, appropriation of water for power generation if directly harvested from the source by foreign nationals, is not allowed, while generation plants for the conversion from water to power will be eased. **This will however not affect full foreign participation on floating PV or offshore wind energy contracts** since there is no appropriation of water for power generation (i.e. water is not used as an input in power generation).
- We expect the amendatory IRR to be available by end of 2022 to early 2023.**

Investment Opportunities in the Philippines Power Sector

Opportunities

Market Context

a
To meet growing demand



- Post COVID-19, demand in Luzon, Visayas and Mindanao is expected to grow 4-6 percent on the back of strong economic growth.
- Annual incremental capacity to meet the growing demand is 600-800 MW

b
To displace old technology/
infrastructure



- Domestic gas production is expected to decline after 2022 due to depleting gas reserve; new LNG terminals offer a cost-effective solution to ensure availability of gas to existing and new CCGT capacity
- Old coal and gas plants built in the 1990s need to be replaced or refurbished

c
To acquire privatized assets



- PSALM has a mandate to privatize its assets under EPIRA, and it planned to privatize 165 MW Casecnan hydro, 797 MW CBK pumped storage hydro and 200 MW Mindanao coal power IPP contracts in 2022-2024. **The public bidding for the 165 MW Casecnan hydro project is scheduled in 1H 2023.**

d
M&A Opportunities



- Merger & acquisition opportunities are likely to be sporadic as most of the “obvious” targets have been divested.
- Easing of the 40:60 foreign equity limitation may open opportunities for capital infusion into Filipino-owned renewable energy contracts.

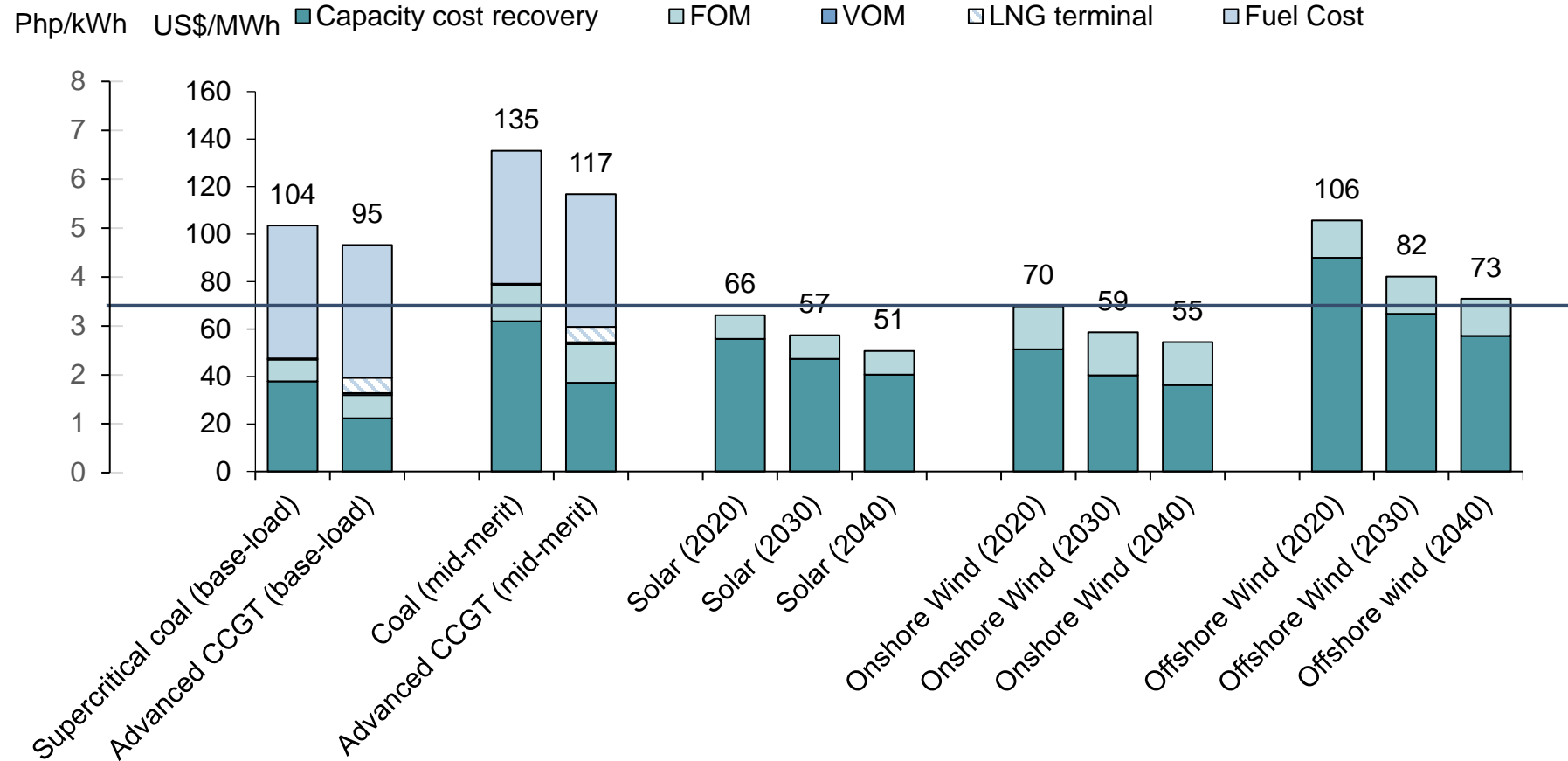
e
Special projects



- Cost of renewable technologies (such as battery energy storage) could become more economical for ancillary service and energy arbitrage if their cost can fall further.

a To Meet Growing Demand (Renewable Capacity) The Philippines have good wind and solar resources, and their costs are lower than building new thermal plants

Total Levelized Cost of Energy for New Coal, Gas, Solar and Wind



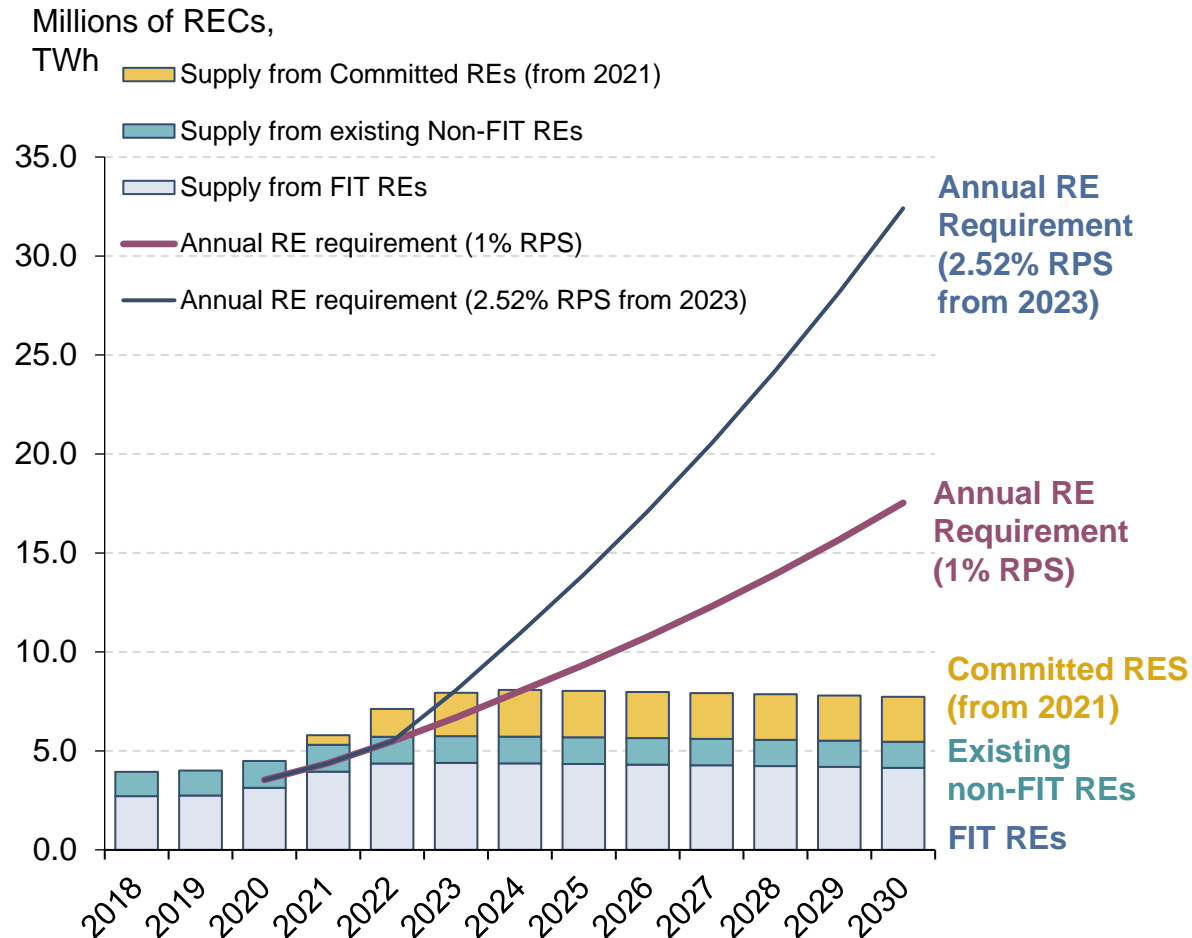
Note: Brent price is assumed to be USD 80/barrel and delivered LNG price to the LNG terminal is USD 9.6/MMBtu. LNG terminal fee is USD 1/MMBtu. Newcastle FOB coal price is USD 130/tonne, and delivered coal price to the power plant is USD 6.1/MMBtu. CAPEX of coal is assumed to be USD 2000/kW and CAPEX of gas is assumed to be 1300/kW. For base-load application, capacity factor is assumed to be 75% for coal and gas capacity; for mid-merit application, capacity factor of gas is assumed to be 45%. Average capacity factor of solar is assumed to be 17%, onshore wind 31% and offshore wind 40%. Post-tax real-term WACC is assumed to be 7.7%. Cost of equity is 13.8%, pre-tax cost of debt is 7.2%, gearing rate is 45%

Source: WaterRock Energy Research and Analysis

a) To Meet Growing Demand (Renewables)

Depending on the RPS obligation, the capacity gap is 5-15 GW of solar and wind capacity by 2030, translating to 0.5-1.5 GW of annual RE capacity need

Fundamental Supply and Demand of RECs, 2018-2030



- Renewable Portfolio Standard (RPS):** In 2017, the DOE released a circular on RPS, which was formally started since 2018. The first compliance year is 2020, and all DUs can meet the requirement in the first 2-3 years. Key Design Elements:
 - Obligation is to increase RE share by 1% each year starting from 2019. The latest DOE circular issued in Sept 2022 increased the annual obligation to 2.52% from 2023 onwards.
 - The on-grid Mandated Participants (MPs) are load serving entities (DUs/ECs, retailers, etc).
 - RE market is to be set up to facilitate the trading of RE certificates (RECs) to help MPs to meet their RPS obligation.
- Green Energy Auction Program (GEAP):** The DOE will facilitate the signing of long-term RE contracts via Green Energy Auction Program (GEAP) to help RE financing. This will then help DUs to meet the RPS obligation.
 - The first tender was held early 2022 after releasing its rules via a DOE Department Circular in December 2021.
 - By 2030, the renewable capacity gap could be 4-7 GW if 1% incremental RPS is adopted or 9-17 GW if 2.52% incremental is adopted after 2023.

Market Route for Solar and Wind

There are multiple channels to commercialize solar and wind capacity in the Philippines, although each has its own challenges or risks

Contracting with DUs via CSP

- Since 2015, contracting with DUs is required to go through Competitive Selection Process (CSP). Meralco DU and other DUs will likely need to procure renewable capacity to meet their demand growth and the renewable portfolio standard.
 - For the large DUs (like Meralco), their CSP usually attracts attention, and they have to make it “fair”. For the small DUs and ECs, it is necessary to have good local connections to understand the background and nuances of their procurement needs.
-

Green Energy Auction Program

- This is organized by the DOE and is open to existing and greenfield uncontracted capacities. On 18 January 2022, The DOE released the first Notice of Auction for a total of 1260 MW solar, 380 MW wind, 130 MW hydro and 230 MW biomass in the Luzon, Visayas and Mindanao grids.
 - The ERC releases the GEAR price within 60 days before the issuance of the detailed Terms of Reference for the auction. The first auction, called GEA-1 took place last June 2022.
-

Retail Contracts

- Retail Competition Open Access (RCOA) has been progressing relatively slow, and it is dominated by Gen-tailers and DUs; but new wind and solar developers can still compete with others in this market. Avg generation cost in the retail contracts have been in \$70-100/MWh (i.e. 3.5 – 5.0 peso/kWh). Key challenge for the wind and solar retailers is the need to balance their generation with customers’ load profile.
 - RE developers can also contract GEOP or RCOA operators for their green power.
-

WESM Market

- Wind and solar capacity in Luzon and Visayas can sell to the WESM market. WESM prices are volatile, but the average WESM will need to be increased to incentivize new capacity entry.
 - The average solar generation prices are expected to be around USD 80/MWh (4 peso/kWh) in 2024-2030 and gradually decline to USD 70/MWh (3.5 peso/kWh). The average wind generation price are forecasted to be around USD 75/MWh (3.75 peso/kWh) in 2024-2040 and decline to USD 70/MWh (3.5 peso/kWh).

a To Meet Growing Demand (Renewables)

The first Green Energy Auction Program (GEAP) has a total of 1260 MW solar and 380 MW wind in Luzon, Visayas and Mindanao

Notice of Auction on Jan 18, 2022

Target Capacity

RE Resource	Luzon	Visayas	Mindanao
	Target Capacity (MW)		
Hydro	80	-	50
Biomass	60	120	50
Solar	900	260	100
Wind	360	20	-
Total	1,400	400	200

Timelines

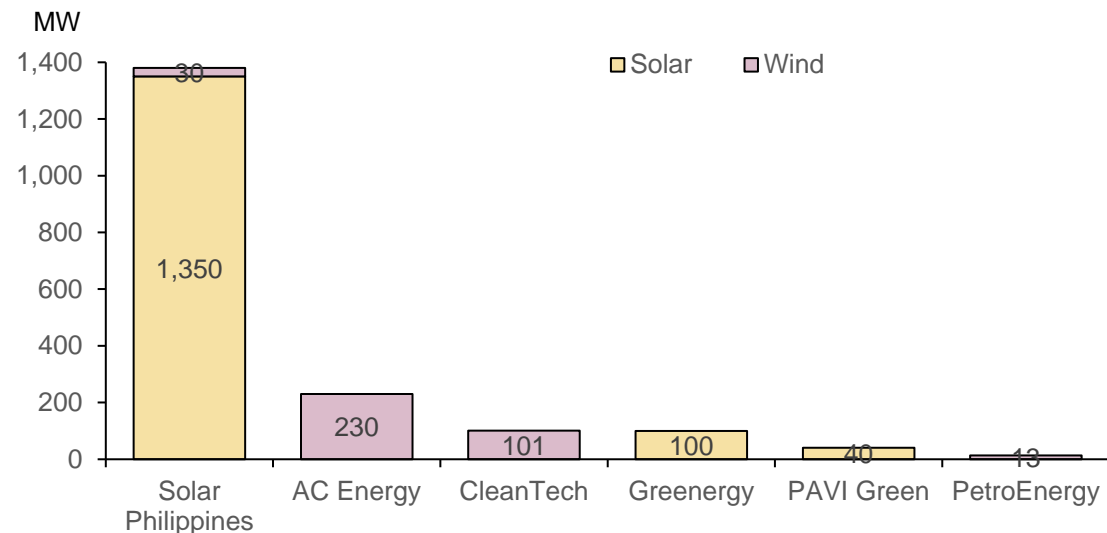
Activities	Timelines (D=Day)
1. ERC's Issuance of GEAR Price	D
2. Release of Terms of Reference (TOR) and Auction Round Procedures (ARP)	D 1
3. Start of Registration of Qualified Suppliers	D 1 + 15
4. Last day of Registration of Qualified Suppliers	D 16 + 10
5. Evaluation of Qualified Suppliers	D 26 + 5
6. Posting of Qualified Bidders	D 31 + 1
7. Pre-bid Conference for Qualified Bidders	D 32 + 1
8. Conduct of Auction	D 33 + 20
9. Posting of the Notice of Award	D 53 + 3

- Winners for the first round of green auction was announced in June 2022.
 - For solar, Solar Philippines is a big winner; winning bid prices are 3.4-3.67 peso/kWh, close to the GEAR price of 3.6779 peso/kWh.
 - For wind, the winners are more diverse; winning bid prices for wind are unexpectedly low (3.9-4.6 peso/kWh, which is much lower than the GEAR Price of 6.0584 Php/kWh). The wind projects also need to be completed by September 2025, which can be a challenge.

GEA-1 Results

Solar Philippines dominated the winning bidders' list; target capacities were fully subscribed

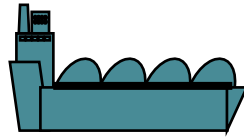
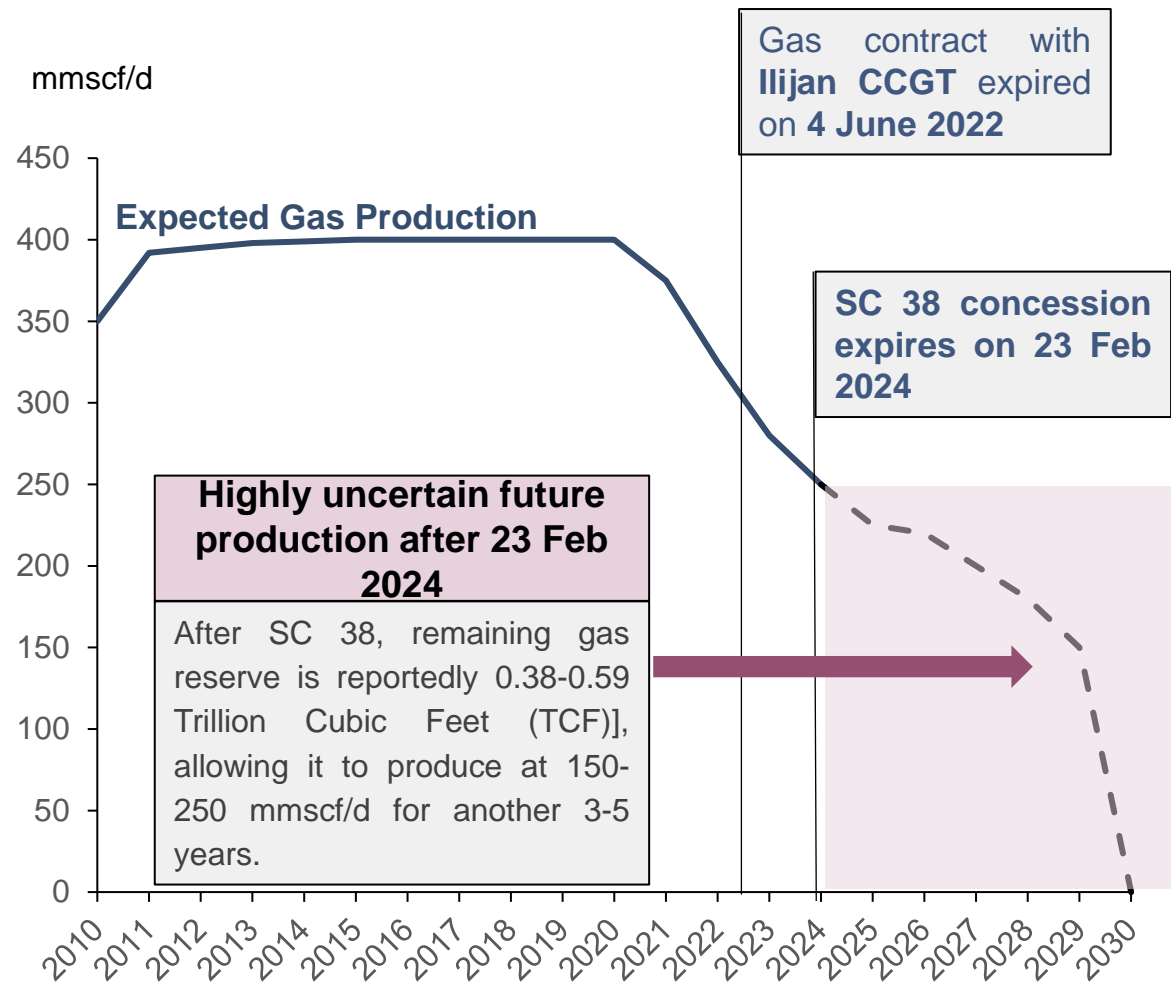
GRID	TECHNOLOGY	PROJECT NAME	DEVELOPER	MOTHER CO.	OFFERED PRICE (PhP/kWh)	OFFERED CAPACITY (MW)	TARGET DELIVERY DATE	STATUS
Luzon	Solar	PAVI Green Naga Solar Power Plant Project	PAVI Green Renewable Energy, Inc.	PAVI Green	3.40	40.40	26/12/2024	Development
Luzon	Solar	Talugtug Solar Power Project	Greenery Solutions Inc.	Greenery	3.41	99.98	01/03/2025	Development
Luzon	Solar	Concepcion Tarlac 2 Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	Solar Philippines	3.67	200.00	25/12/2025	Under construction
Luzon	Solar	Santa Rosa Nueva Ecija 2 Solar Power Project	Solar Philippines Nueva Ecija Corporation	Solar Philippines	3.67	280.00	25/12/2025	Development
Luzon	Solar	Tayabas Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	Solar Philippines	3.67	450.00	25/12/2025	Development
Visayas	Solar	Kananga-Ormoc Solar Power Project	Solar Philippines Visayas Corporation	Solar Philippines	3.68	300.00	25/12/2025	Development
Mindanao	Solar	General Santos Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	Solar Philippines	3.68	120.00	25/12/2025	Development
Luzon	Wind	Caparispisan II Wind Power Project	Amihan Renewable Energy Corp.	AC Energy	3.86	70.00	24/12/2025	Development
Luzon	Wind	Calatagan Wind Power Project	Solar Philippines Calatagan Corporation	Solar Philippines	4.20	30.00	25/12/2025	Development
Luzon	Wind	Balaoi and Caunayan Wind Power Project	Bayog Wind Power Corp.	AC Energy	4.44	160.00	24/12/2025	Under construction
Luzon	Wind	Kalayaan 2 Wind Power Project	CleanTech Global Renewables, Inc.	CleanTech	4.64	100.80	01/09/2025	Development
Visayas	Wind	13.2MW Nabas-2 Wind Power Project	Petrowind Energy, Inc.	PetroEnergy	5.76	13.20	25/05/2025	Development



- **Solar Philippines'** subsidiaries were able to bag over 70% of solar and wind capacities: 1,350 MW solar and 30 MW wind. It remains to be seen whether the firm would settle all its financial obligations under GEAP, like the performance bond. It disclosed that it settled the Santa Rosa 2 SPP bond via surety worth PHP16.5M, or about 0.12% of the performance bond.
- 200 MW Concepcion 2 SPP solar and 160 MW Balaoi/Caunayan wind are the only projects under construction as of early Dec 2022.
- Other projects were able to obtain their Certificates of Commerciality, and are awaiting financing, permitting (e.g. land acquisition) and other clearances to push through with construction.

b To displace old technology/infrastructure
LNG Terminals can ensure the availability of gas for existing and new CCGT capacity, and increase flexibility in the system

Future Production of Malampaya Gas Field

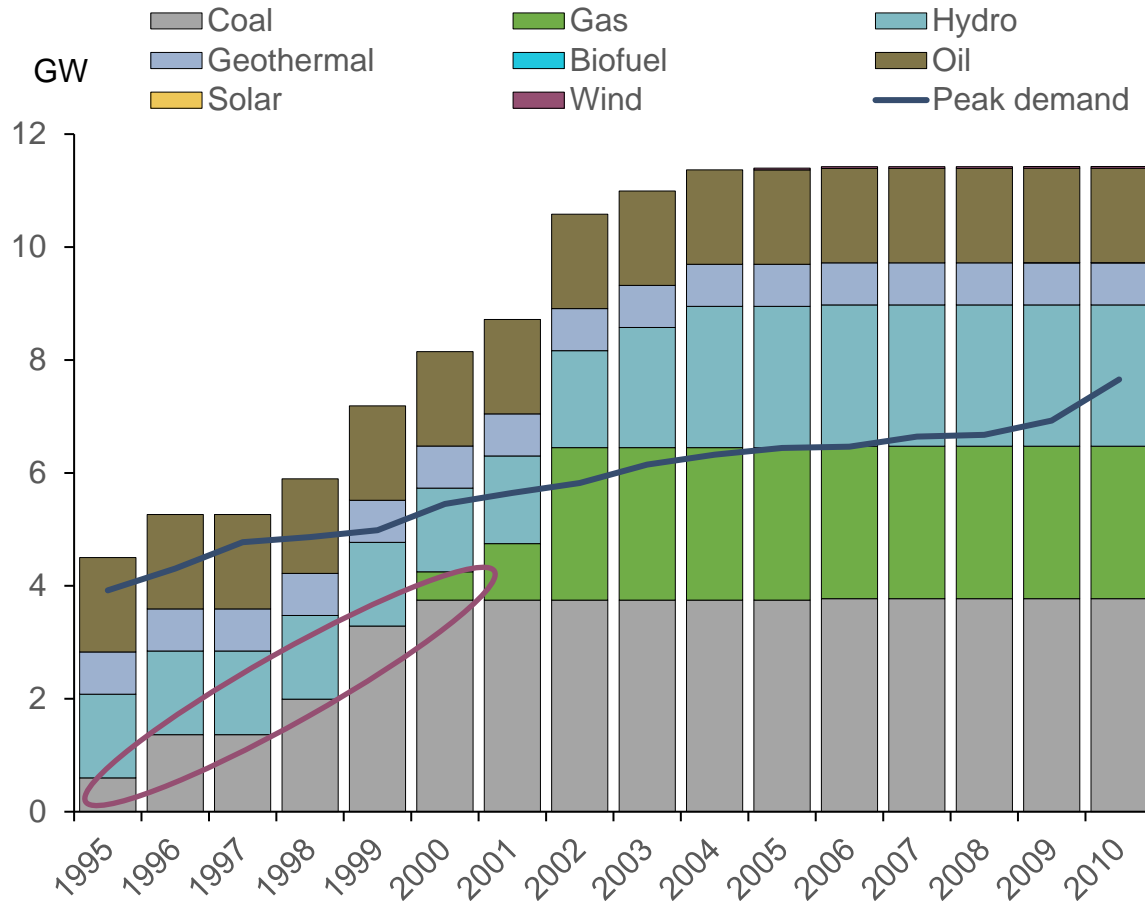


An LNG terminal is critical to:

- Ensure the availability of gas to both existing and new gas capacity
 - Gas capacity is cost competitive for mid-merit application; gas can also provide values for improving environmental sustainability and enhancing energy security in the Philippines.
- Provide flexibility values and
- Provide other knock-on positive impacts such as increased negotiation leverage and learning to position the Philippines as one of the LNG trading hubs in Asia.

b To displace old technology/infrastructure
The old coal and gas capacity will need to be replaced or refurbished in 2020s

Capacity Addition in 1995-2010 in Luzon



- The first wave of coal-fired power projects (totaled 3.1 GW*) was built in 1996-2000 in Luzon, which was under the fast track program backed up 25-year power sale agreements to relieve power shortage in 1990s.
- These coal projects are reaching the end of their economic life, so they need to be replaced or refurbished.
- 2.7 GW of CCGT capacity signed back-to-back long-term power sale agreements (PSAs) with Meralco DU, and they are commissioned in early 2000s. They will also need to be refurbished in late 2020s.

*Note: The old coal plants include 2x300 MW Calaca units, 2x 382 MW Pagbilao units, (315+344) MW Masinloc units, 2x647 MW Sual units and 460 Quezon power unit.
 The old gas plants include 1200 MW Ilijan, 1043 MW Santa Rita and 527 MW San Lorenzo units.

c To acquire privatized assets
PSALM has plans to privatize several assets in 2020-2022, but the process is delayed

Remaining PSALM Power Assets for Privatization

	Rated Capacity	Sale	Status
Malaya Thermal Power Plant (Luzon),	650 MW oil plant	Physical asset	Sold to Belgrove Power Corp for 3.1235 billion peso (USD 96/kW)
Caliraya-Botocan-Kalayaan (CBK) HEPPs	797 MW contracted capacity (pumped storage hydro-power plant operated by CBK Power Company in Luzon)	IPP BROT/PPA contract up to 07 Feb 2026; IPP contract transfers to IPPA	2020 (delayed); Commencement of sale 2H 2022, IPP contract turnover to winning bidder by 2024
Mindanao coal-fired power plant	200 MW contracted capacity (coal plant in Mindanao)	IPP BOT/PPA contract up to 15 Nov 2031 operated by STEAG State Power; IPP contract transfers to IPPA.	2022 (delayed); IPP commencement of sale 2023, turnover 2024
Casecnan HEPP	228 GWh contracted energy (hydro-power plant operated by CE Casecnan Water and Energy Company in Luzon)	IPP BOT/PPA contract up to 05 Apr 2022; target to sell the physical asset.	2021 (delayed); Public bidding and asset turnover to winning bidder by 1H 2023
Agus-Pulangi HEPPs (Mindanao)	1001.1 MW Hydro	Physical asset.	Privatization is subjected to consultation with Congress and PSALM Board's policy direction

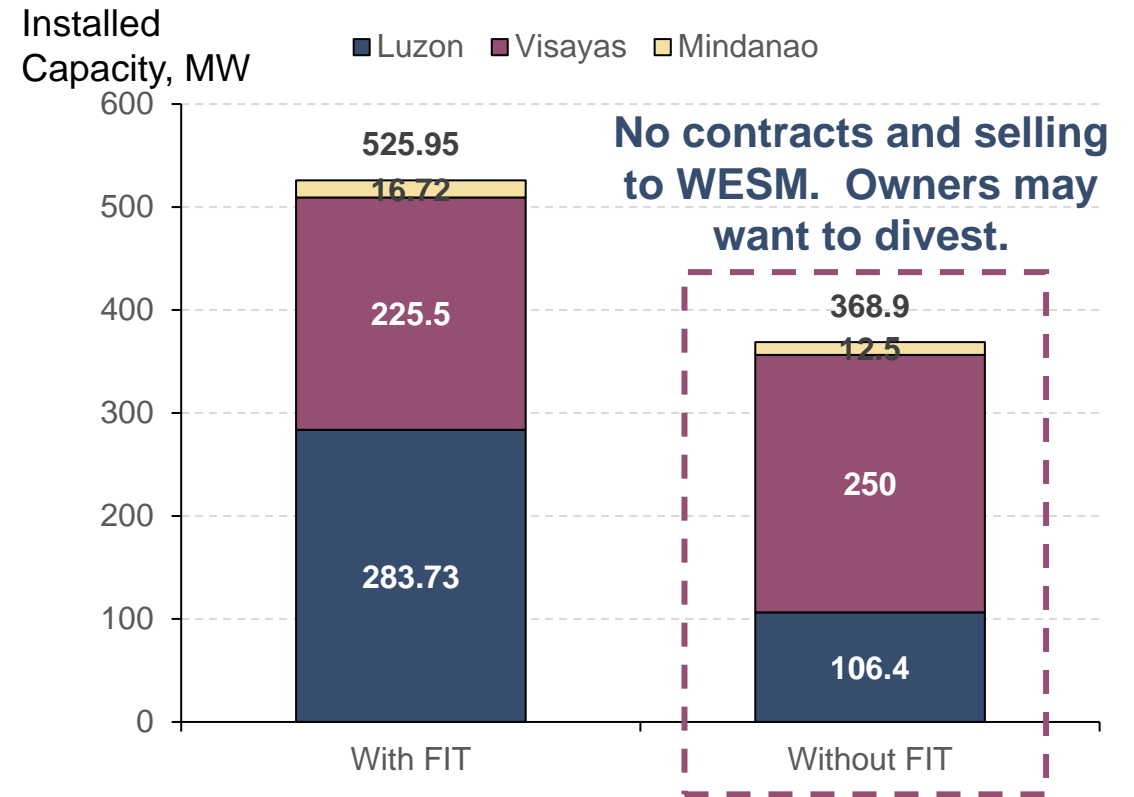
d M&A Opportunities

Merger & acquisition opportunities are likely to be sporadic as most of the “obvious” targets have been divested

Selected M&A activities in 2016-2021

2016	<ul style="list-style-type: none"> AboitizPower paid Blackstone \$1.2 bn in GNPower coal project deal
2017	<ul style="list-style-type: none"> GIC and Macquarie Infrastructure Fund bought Philippines’ EDC share for up to \$1.3 billion
2018	<ul style="list-style-type: none"> SMC Power acquired AES coal project for \$1 billion
2019	<ul style="list-style-type: none"> AboitizPower acquired 60 percent of AC Energy’s thermal energy unit Ayala Corp acquired Phinma Energy KEPCO acquired 38 percent in Solar Philippines’s 50 MW Calatagan FIT Solar plant; Citicore acquired the PH solar portfolio of Armstrong
2021	<ul style="list-style-type: none"> JERA acquires 27% of outstanding shares of Aboitiz Power Corp.
2022	<ul style="list-style-type: none"> Sale of SPEX 45% Malampaya share to Prime Infra Aboitiz Power and Mainstream JV for the 90MW Libmanan Wind Project

Potential Divestment Opportunities Exist for the “Stranded” Solar Plants Built in 2016



There is also a pending amendment to open the renewables sector to full foreign ownership

e Special Projects

Many other niche opportunities also exist, and detailed assessment of local factors are required

There are likely increasing opportunities on “green” solutions

- **Behind the meter generation (like rooftop solar).** A targeted business development plan is important to have a focused effort to build up the business. Different business models can be adopted
 - For example, for B2B rooftop solar business, one can adopt different models: (a) consumer owned; (b) solar leasing; (c) solar PPA; (d) solar + retail.
- **Battery energy storage to provide ancillary service.** Given the lack of additional capacity to supply ancillary services, battery could be a cost competitive option to provide regulating reserves
 - As solar and wind capacity account for a higher percentage of installed in Visayas and there is also a lack of flexible capacity in the Visayas grid, the value of battery is likely the highest among the three main grids.
- **Technologies for demand response.** With tightening market fundamental, the Philippines government (like many other countries) will likely look to see how it can introduce demand response programs in the medium-term.

We have also observed notable shifts in recent months in capital flow from coal to green technologies from international and local financing entities. Although investments in new coal capacities continue, we anticipate companies to pivot towards renewables in the short and long terms.

Even with the identified opportunities, there are many hurdles to overcome to commercialize and capture the value

? Many Questions Remain to be Answered

- What are the available **Commercial Mechanisms** that define commercial opportunities?
- Who are the **Competitors** and what are their motivations and commercial objectives?
- What are the **Risks** that need to be evaluated?
- Does the investment **Create Future Options** which may become valuable?
- What are the **Exit Options**?

**We can work closely with you
to address these questions
one-by-one**

Outline

1 Background and Investment Opportunities in the Philippines Power Market

2 Introduction to WaterRock Energy Economics

WaterRock Energy offers advisory services to help clients to make better decision in the power and gas sector in Asia

A Boutique Market and Economic Consultancy

Focus on Asian power and gas markets and assets

Highly experienced team

Practical, analytical, nimble, client-focused with deep local knowledge and connection with local regulators/companies

Commercial and Regulatory Support

Transaction support, market analysis, regulatory support, Tariff benchmark

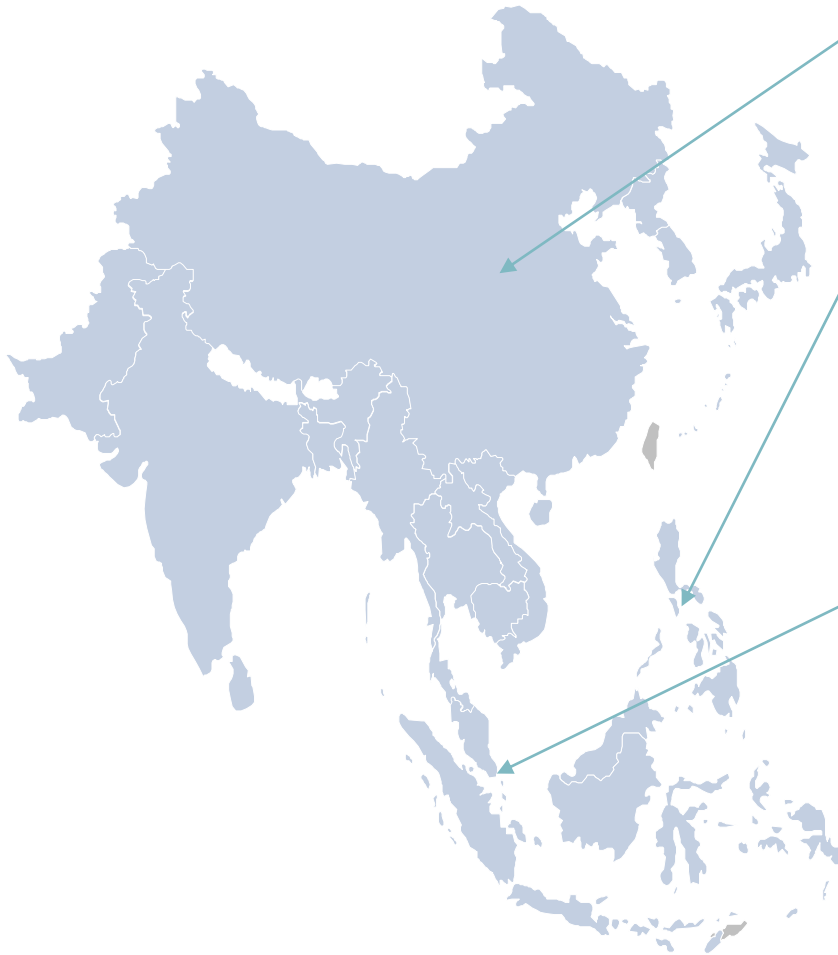
Strong client base

Regulators, grid companies, utilities, PE funds, financial institutions, gas suppliers and importers

Our Key Clients (since July 2018)



Extensive Experience in ASEAN and China Power and Gas Markets



For foreign investors and gas exporters to mainland China, Taiwan and Hong Kong:

- More than 10 GW of due-diligent studies on issues such as regulatory risks, fundamental power supply ad demand, renewables curtailment and tariff forecast
- Multiple detailed provincial level natural gas studies on key drivers of gas demand, economics of gas-to-power and opportunities of selling LNG to greater China region.

For both domestic and international players in the Philippines:

- More than 5 GW of due-diligent studies on thermal and renewables plants.
- Multiple studies on the opportunities and risks of investing in LNG terminals.

For Singapore regulators:

- Energy market design issues such as market power mitigation and resource adequacy studies
- Fuel mix and carbon emission related projects

For existing generators, large consumers and potential investors:

- More than 2 GW of due-diligent studies on wholesale electricity price and end-user tariff forecast; modelling support to existing Gencos
- Over-contracted gas and financial sustainability issues.

Regional studies:

- Multiple studies on investment opportunities in the electricity sector in Asia
- Multiple studies on regional gas market and opportunities of selling LNG to Asia.

Highly experienced team to support transaction work, market and regulatory studies on power and gas sectors in the Philippines

Liutong Zhang (Director and modelling)



- 14 years of experience on the power and gas sector in the Philippines, Singapore and greater China region
- Led more than 20 GW of RE and thermal power due-diligent/market studies in the Philippines, Singapore and greater China region in the past 5 years
- BEng from NUS, Singapore (1st class honor and full scholarship)

Oscar Alvarez (Consultant)



- >10 years of experience in the ASEAN energy sector
- Business development of renewable projects for international and domestic companies
- Master's Degree in Environment and Natural Resources Management (Special citation for exemplary academic achievement), University of the Philippines

Jimmy Shih (Commercial expert)



- 40+ years of business development and energy consulting for power projects in Asia
- Led AES team on wind project development in China and ASEAN in 2007-09
- Master of Science, University of London



- Individual team members have backgrounds in economics, engineering, regulation and market modelling in the electricity and gas industry, as well as power and IPP business development, M&A, and project financing.
- This enables the team to look at markets, asset valuation and regulatory/policy decisions from a truly multifaceted perspective.

Our key strengths to support transaction, quantitative modelling and regulatory work in the Philippines

Long and deep experience in renewable and thermal generation in the Philippines

- **Completed due diligence studies for more than 5 GW of thermal, geothermal, wind and solar projects in the Philippines**, and advised multiple clients on entry strategy to renewable and gas sector in the Philippines
 - Liutong Zhang (Lucas) was involved in or led several market due-diligence studies, including the acquisition of Global Business Power (GBP)'s power assets by MPIC and Meralco, the sale of Sithe Global's Mariveles coal plant, the sale of AES Masinloc coal plant, and the acquisition of the EDC geothermal asset by MIRA and GIC in 2015-2018
 - In 2019-2022, the WaterRock Energy team, led by Lucas, completed more than 8 projects on renewable and gas market entry strategy and modelling studies for foreign investors. In early 2020, Lucas was invited to present to the Philippines' Energy Committee of the Senate and Philippines' House of Representatives on the role of natural gas and economics of building new LNG terminals [Examples are shown in the next three slides].
- Mr Oscar Alvarez and Mr Jimmy Shih have **practical experience in developing renewable projects in the Philippines** and Oscar is physically located in the Philippines. The team also have good contact with the key regulatory bodies in the Philippines.

International perspective and a robust and objective approach

- The team have extensive experience for project developers and financial investors on transaction support engagements in other competitive electricity markets like Singapore
- The firm has built and used an in-house robust power dispatch model to forecast dispatch and price of each power plant in the Philippines.

Our key strengths to support transaction, market or regulatory work in the Philippines

Key Strength of WaterRock

Long and deep experience in all kinds of generation sources

Advising > 5 GW of renewable and thermal capacity investment or M&A

In-depth understanding of regulatory and policy issues

Advising foreign investors on CSP, RPS, ROCA and WESM market design

Strong network of local contacts

Good relationship with local experts and regulators (ERC, DOE, Energy Committee)

Power Optimization Tool of WaterRock Energy

(to systematically understand cost competitiveness, dispatch and market price of existing and new power plants)

Key inputs

Power dispatch and optimization model

Illustrative supply curves

Key supply parameters:

- Capacity
- Heat rate
- Fuel input and fuel price
- Variable operating cost
- Historical bid price

Key demand parameters:

- Demand profile
- Demand growth

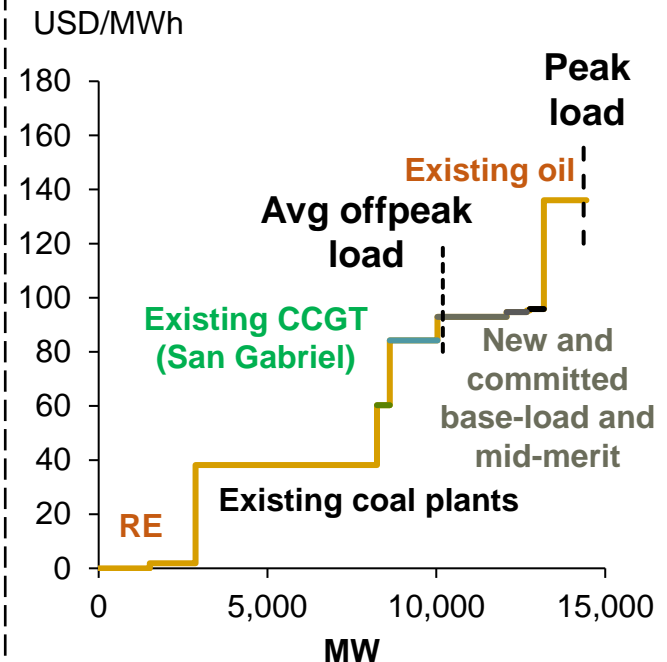
New entry economics:

- Capital cost
- WACC/hurdle rate

Dispatch Module

Long-term optimization

Capacity Expansion Module



Examples of Project Experience in the Philippines

2020-22	Multiple	2012-18	Multiple	2011-22	Multiple	2017	For an IPP
WaterRock Energy provided multiple detailed market studies, price and dispatch forecast services		Led/Involved in due-diligence studies on buying and selling renewable assets in the Philippines		Led multiple detailed market studies on energy mix, power contracting and RE regulation		Involved in the sale due-diligent study for AES's Masinloc coal plants	
2019-21	JBIC	2015-17	PE house & Meralco	2011-18	Multiple	2016-17	Banks
WaterRock Energy provided multiple studies on the role of renewables and gas/LNG in the Philippines		Quantify and assess the value of a pumped storage plant to help negotiation of a PSA		Led multiple studies on the economics of investing in LNG terminals in Luzon, Visayas and Mindanao		Involved in a buy side due-diligent market study for the purchase of geothermal assets by MIRA and GIC	
2019	Gas Investor	2015-17	IPP & ERC	2010-19	Multiple	2015	For a PE house
WaterRock Energy provided a market entry study on the economics of investing in an LNG terminal in Luzon		Quantify and assess the value of a battery storage plant to justify approval of a power agreement		Led/involved in business development for several solar and geothermal projects in the Philippines		Involved in the sale due-diligent study for Blackrock's GN Power coal asset	

Example A (2019-2020)

Advise JBIC and the government on the role of gas and the economics of building an LNG terminal in the Philippines

Key Scope and Delivered Work (2019-20)

- **Scope:** develop a framework to assess the value of gas-fired power capacity in the Philippines and present to key government stakeholders on ways to enable the construction of LNG terminal(s) if needed.
- **Work delivered** by the WaterRock Energy Team (Lucas, Oscar, Kelvin and Jimmy):
 - Assessed the value of gas capacity and LNG terminal infrastructure based on a **trilemma value framework (Cost, Sustainability and Security)**
 - **Used a power dispatch model** to quantify a distribution of expected gas and LNG demand under different scenarios in the Philippines market and also quantified the flexible value of gas as share of intermittent renewable sources increase
 - Proposed **key enablers and government actions** required to facilitate the entry of LNG terminal based on international best practice
 - **Presented key findings** to the Energy Committees of the Senate, the House of Representatives, DOE and ERC.

JBIC Workshop on Role of Natural Gas in the Philippines for the Energy Committee of Senate by WaterRock Energy Economics (Jan 2020)



JBIC news clips link: Title: [JBIC Holds Workshop on the Gas Sector in the Philippines at the Senate of the Philippines](#);

Title: [JBIC Makes Presentation about the Status of the Gas Sector in the Philippines at the Country's House of Representatives](#).

Example B (2013-2021)

Advised multiple foreign investors on WESM price forecast and the economics and strategy of investing in thermal and renewable projects in the Philippines

A Study to understand the economics of CCGTs and an LNG terminal in Luzon in H1 2019

- **Scope:** Provide a robust analysis on the economics of investing in an LNG terminal in Luzon for an international investor.
- **Work delivered** by the WaterRock Energy Team (Lucas):
 - **Used a power dispatch model** to quantify the expected dispatch and price of existing and new CCGT plants in the WESM market. Key analysis is also done to understand the position of existing and new gas plants in the merit order and economics of building a new LNG terminal in Luzon.
 - **A comprehensive report** to review the historical development of the gas sector in the Philippines, assess the economics of investing in an LNG terminal in Luzon and provide detailed analysis on the competitive selection process (CSP)

Market Studies and Price Forecast for Foreign and Local Power Investors by WaterRock Energy in 2020-21

- **Scope:** Provide multiple detailed WESM price forecast and market studies for foreign and local renewable and gas market investors.
- **Work delivered** by the WaterRock Energy Team (Lucas and Oscar):
 - **Used a power dispatch model** to forecast WESM price in the next 20 years under different scenarios. Key analysis is also done on expected levelized cost of building new solar plants over the year, any potential constraints for building solar capacity in the market and impact of the introduction of Renewable Portfolio Standard (RPS) etc.
 - **Comprehensive market reports** to provide analysis on supply and demand market fundamental, regulatory context, renewable portfolio standard, key market players, and key drivers and rationales of the price forecast outcome from the power dispatch model.

Thanks and Contact

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