



**PHILIPPINE
FOSSIL GAS
LANDSCAPE**

July 2021

WRITTEN BY
Avril De Torres, Isabel Patricia Soresca, and Bill Warren Gerona

DESIGNED BY
Mari Jeanie Derillo

PUBLISHED BY
Center for Energy, Ecology, and Development

CONTACT
All correspondences should be addressed to 132 Matahimik Street, Diliman, Quezon City Philippines 1100.
For general inquiries, e-mail us at info@ceedphilippines.com

For other information, visit www.ceedphilippines.com.

Executive Summary

Amidst news of Malampaya Deep Water Gas-to-Power Project's declining supply and nearing depletion and the de-rating of the Ilijan Combined-Cycle Gas Turbine Plant which is partly to blame for the recent Luzon Grid red alert, the Department of Energy and members of Congress are positioning fossil gas as the new preferred fuel.

The Philippine Energy Plan 2018-2040 and pending legislations at the Senate and House Energy Committees envision a "world-class, investment-driven and efficient" fossil gas midstream and downstream industries that would develop the country as the LNG trading and trans-shipment hub of Asia-Pacific. This vision comes at the cost of energy security, equity, and sustainability. CEED recommends the following measures to minimize the tradeoffs of gas' energy trilemma:

This report seeks to provide an overview of the Philippine fossil gas landscape today, and takes stock of proposed policies, laws, and plans for the upstream, midstream, and downstream fossil gas industries and their implications to energy security, power rates, critical ecological areas, and climate goals.

Key points

Upstream – the new preferred fuel threatens energy security

- All fossil gas supply in the country today is indigenous, coming from only three active gas fields: the Malampaya Deep Water Gas-to-Power Project in Palawan, which is the country's biggest source of fossil gas, and other smaller gas fields—the Libertad Gas Field in North Cebu and Alegria Oil Field in South Cebu. DOE expects discovery and commercial production from 7 more gas fields in Palawan, Isabela, Mindoro, and Maguindanao by 2040.
- Fossil gas' meager share of 6% in the country's total energy supply, equivalent to 3.63 MTOE, is forecasted to increase to 11% in 2040, equivalent to 15.88 MTOE. If there are no additional discoveries of natural gas reserves, future supply will depend solely on

imported Liquefied Natural Gas (LNG).

- Relying on overseas LNG will expose the country to impending threats of supply disruption from natural and human-induced disasters and pandemics, and increase energy insecurity. DOE overlooks these threats and risks and even includes the acceleration of the implementation of LNG projects, as part of its medium-term nine-point agenda, forgetting the lessons from the Oil Crisis of the 1970s by promoting overseas petroleum yet again.
- At the start of June and in the middle of scorching summer heat, the National Grid Corporation of the Philippines declared a red alert for the Luzon Grid, a shortage partly brought about by the de-rated Ilijan Combined-Cycle Gas Turbine Plant due to Malampaya gas restriction.

Midstream – Challenging DOE's vision of Asia Pacific's LNG Hub

- There are currently seven proposed LNG terminals (Table 4). FGEN LNG Corporation, Excelerate Energy L.P., and Shell Energy Philippines, Inc are each proposing Floating Storage and Regasification Unit Terminals. EWC and Vires Energy Corporation are proposing an LNG Storage and Regasification Terminal. While Linseed Field Power Corp. is proposing an LNG Import Facility.
- The DOE and proponents of [Senate Bill No. 2203](#) or the Midstream Natural Gas Industry Development Bill, which is being criticized due to its [climate-blind](#) framework, envision the country as the LNG trading and trans-shipment hub in Asia-Pacific. There are several challenges to this LNG hub vision other than climate imperatives:
 - The country is lagging behind its Southeast Asian neighbors. There are 17 operating LNG Import Terminals in Southeast Asia—7 in Indonesia, 6 in Malaysia, 3 in Thailand, 1 in Brunei, and 1 in Singapore (Table 3).
 - At least 11 LNG terminals have been proposed in the past two decades, yet there is still no operating LNG terminal in the country today. In the early 2000s, GNPow-er Mariveles's LNG complex was scrapped and converted into a coal-fired power plant because of the uncertainty in the price of

LNG¹. Energy World Corporation's Pagbilao LNG Hub Terminal and Power Station, which had its groundbreaking ceremony in 2009, still has not completed construction today, due to "funding concerns, regulatory hold ups and delays to gaining approval to connect to the national grid"².

- The Philippines experience extreme weather and frequent typhoons, which have been reasons for cancelled LNG terminals in other countries.

Downstream – Gas power expansion and power rates

- There are only six operating gas-fired power plants in the country, with a total installed capacity of 3.45 GW. In the next six years, seven proposed gas plants, with a total capacity of 7.1GW, are expected to start commercial operations. Under the Philippine Energy Plan's 2040 Clean Energy Scenario, gas is expected to have an additional capacity of 18.2 GW compared to 2018.
- All the gas-fired power plants in Batangas are supplying 61% or the biggest share of the total electricity purchased by Meralco, through the Wholesale Electricity Spot Market and Power Supply Agreements.
- Meanwhile, in the entire country, gas generates only 18% of the Generation Mix. Under the Philippine Energy Plan's 2040 Clean Energy Scenario, this is forecasted to increase to 26.6%. The Clean Energy Scenario forecast should be expected to further increase if House Bill No. 3031, otherwise known as the "Downstream Natural Gas Industry Development Act", is signed into law as it mandates the promotion and inclusion of fossil gas in the energy mix.
- Meralco's gas power supply agreements have effective rates at plant gate (PSA rates) ranging from Php 3.7121 (First NatGas Power Corp.'s San Gabriel CCGT Plant) to 5.5348/kWh (South Premiere Power Corp.'s Ilijan CCGT Plant).

¹ Independent Commodity Intelligence Services (ICIS), GN Power's Philippines import proposal crushed by price pressure, As of February 9, 2009. Alena Mae S. Flores (Manila Standard), Shift to coal from LNG defended, As of August 4, 2014.

² Id., p. 49. Emphasis supplied.

- Considering that most power supply agreements pass-on the cost of fuel and forced outages to electric consumers, the actual generation rates charged by gas suppliers to Meralco consumers were around Php 4.4562 to 6.2789 higher than their PSA rates in the past year (Figure 7). In November 2020, First NatGas Power Corp.'s San Gabriel CCGT Plant recorded a generation rate of [Php 9.991/kWh](#).
- While gas supply is wholly indigenous today, relying on imported LNG once Malampaya is depleted will leave the electric consumers at the mercy of volatile LNG prices in the region, no different from imported coal. This is a real and growing concern considering that just this month, news broke that Asia, the world's largest LNG importing region, will pay for the most expensive LNG summer prices in seven years³.

Gas developers and financiers

- First Gen Corporation, which developed the country's first gas-fired power plant in the country in 2000, is still the country's top gas developer, operating 2,174.5 MW or 63% of the total installed gas capacity. First Gen is also venturing into midstream gas projects, with one proposed Floating Storage & Regasification Unit (FSRU) Terminal in Santa Rita, Batangas City expected to start operations next year. KEPCO Ilijan Corp., a consortium composed of Korean Electric Power Corporation, Mitsubishi Corporation, and Team Energy Corporation, comes in second at 1,277 MW or 37%.
- Coal developers are starting to venture into gas. SMC Global Power Holdings, the country's top coal developer, through its subsidiary Excellent Energy Resources Inc. has the biggest capacity share ownership at 1,740 MW or 25% of the total installed capacity of all proposed gas plants today (Figure 9). GNPowder Ltd. Co., Lloyds Energy Phil. and Mariveles Power Inc. came in second at 1,200 MW or 17% each. Aboitiz Power Corp. and Meralco PowerGen Corp. have also signified interest in gas projects.
- The country's [top financiers for coal projects](#) such as Bank of the Philippine Islands

³ Id., p. VIII.

Recommendations – Addressing the Gas Trilemma

- **Rationalize and harmonize energy and power policies, laws, and plans towards increasing energy security.** Energy insecurity is a real and material risk of promoting fossil gas today due to the nearing depletion of the Malampaya gas field and the lack of commercial gas discovery so far, and the security risk that come with exploring gas fields in waters within or near China's nine-dash line claim. The rationalization and harmonization of policies, laws, and plans should start with repealing fossil fuel subsidies, prohibiting DOE to take a technology neutral stance, and finally declaring a coal phase-out policy.
- **Expedite grid expansion and modernization to maximize variable renewable energy integration and review power procurement practices to promote energy equity.** No different from imported coal, gas suppliers are passing on expensive fuel and other costs to electric consumers, which are expected to further spike once gas power plant operators start importing LNG. Moreover, if the grids remain baseload-reliant and inflexible, gas cannot be expected to play its role as a better complement to variable renewable energy technologies. It can only serve to replace coal as a baseload resource or, worse, crowd-out renewable energy without replacing coal.
- **Develop an energy transition plan that is aligned with the 1.5°C Paris temperature goal, which will prevent crowding-out of renewables and carbon lock-in from fossil fuels.** Experiences from other countries teach us that gas can either serve as a bridge fuel or a roadblock in the energy transition. Prematurely adopting policies promoting gas, without first developing an energy transition plan that is aligned with the 1.5°C Paris temperature goal, will position gas as roadblock.

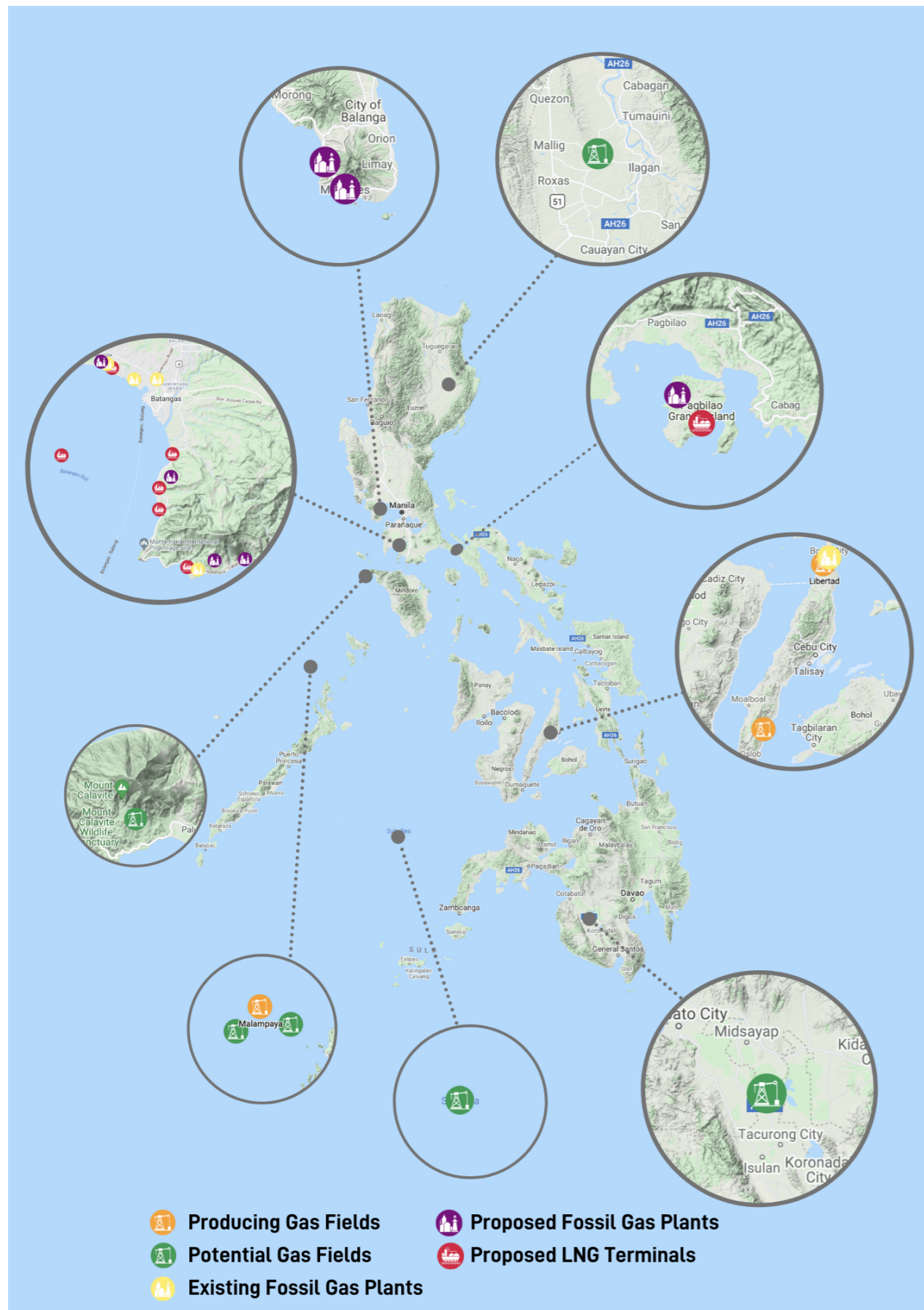
(BPI) Banco de Oro (BDO), Philippine National Bank (PNB), and Metrobank are likewise funding gas-fired power plants. Several foreign banks such as MUFG Bank Ltd. (Japan), Standard Chartered (UK), Japan Bank of International Cooperation (Japan), and KfW-IPEX (Germany) are likewise financing gas expansion in the country.

Verde Island Passage - the country's next climate battleground

- Almost all of the existing and proposed LNG terminals and gas-fired power plants are located in Batangas. Except for EWC's Pagbilao Terminal, six proposed LNG terminals are located in Batangas City and Batangas Bay. Out of the total 13 existing and proposed gas-fired power plants, nine are in Batangas City and Batangas Bay.
- The Batangas Province is part of the Verde Island Passage Marine Corridor. The Verde Passage is located within the globally significant Coral Triangle, an area considered the center of the world's marine shorefish biodiversity, an area with the highest diversity and endemism in the world.
- The build-up of gas projects in Verde Passage comes against the backdrop of the coal industry's sunset and the formulation of climate-blind legal and regulatory frameworks for gas.
- Most recently, a broad network of frontline communities, civil society organizations, and people's organizations have called for the rejection of the bills due to the issues of energy insecurity, expensive and volatile power rates, climate-blind framework, and threats to health, environment, and livelihood. These circumstances combined signal the start of the country's next climate battle, with the world acclaimed Verde Passage as its battleground.

No different from imported coal, gas suppliers are passing on expensive fuel and other costs to electric consumers, which are expected to further spike once gas power plant operators start importing LNG.

Gas Projects in the Philippines



Upstream Oil and Gas Road Map

	PETROLEUM RESERVE	ADDITIONAL DISCOVERY	PRODUCTION
MEDIUM TERM (2019 – 2022)	<ul style="list-style-type: none"> Increase delineated oil to 48.73 MMB and gas to 4.67 TCF 	<ul style="list-style-type: none"> Drill 1 oil and 2 gas fields 	<ul style="list-style-type: none"> Produce 5.60 MMB crude oil and 0.59 TCF natural gas
LONG TERM (2022 – 2040)	<ul style="list-style-type: none"> Increase delineated oil to 57.12 MMB and gas to 5.87 TCF 	<ul style="list-style-type: none"> Drill 2 oil and 2 gas fields 	<ul style="list-style-type: none"> Produce 114.44 MMB from 11 oilfields and 4.04 TCF from 7 gas fields
OVERALL OBJECTIVES BY 2040 Increase indigenous petroleum reserves to 57.12 MMB oil, 5.87 TCF gas and produce 114.44 MMB oil, 4.04 TCF gas to contribute to the country's energy requirements			

Downstream Natural Gas Roadmap

	LEGISLATIVE AGENDA AND POLICY ADVOCACY CAMPAIGN	DNGI STANDARDS DEVELOPMENT	DNGI PROGRAM MANAGEMENT MONITORING AND IMPLEMENTATION	COMMUNICATION INITIATIVES
MEDIUM TERM (2019 – 2022)	<ul style="list-style-type: none"> Develop and implement policy plans rules and regulations on natural gas supply security, safety and access Develop HSSE codes and practices JAO to strengthen the established inter-agency HS-SEIMT Update the Natural Gas Framework PDNGI Development Plan Advocate passage of natural gas rules/bill Capacity Skills/Development Create a Special TWG to provide technical support in the evaluation of Permit Applications Establish bilateral partnership with the academe Establish bilateral partnership with the academe, international organization, institute, industries to map out regulatory, technical and commercial capabilities 	Develop PNS on: <ul style="list-style-type: none"> LNG Facility/Safety Rules/Codes HSSE Standard Inspection Manual Transmission Pipeline Distribution Pipeline Natural Gas related ancillary facilities 	<ul style="list-style-type: none"> Implement DC 2017-11-0012 Rules and Regulation of the Philippine Downstream Natural Gas Industry Registry of Operators and natural gas facilities Accreditation of LNG Importer Acknowledge Importation and Supply and Transport Technical review and evaluation of permit application of proposed natural infrastructure, projects for NTP, PCERM and POM and recommends to C-REC for endorsement to the Secretary 	<ul style="list-style-type: none"> Promote Natural Gas Market Development Conduct IEC/familiarization to promote natural gas Develop informational Materials for natural gas Conduct Market Study/ Desk Research & Database Desk Research & Database Market Survey/Profiling with GPDP Excise tax and incentives for imported LNG Inventory of natural gas technology for non-power applications Profiling of potential gas market/ consumer

LONG TERM (2022 - 2040)

- Develop and implement policy plans rules and regulations on natural gas supply security, safety and access
- Implement DC on Rules to implement the PNS on Natural Gas Facilities
- Implement HSSE codes and practices
- Implement and/or amend JAO if required to make it responsive on the requirements of the established inter-agency HSSE-IMT
- Develop Natural Gas Security and/or Contingency Plan
- Implement TPA Rules/Code, IRR of the Natural Gas Law
- Update every three (3) years the PDNGI Development Plan
- Capacity Skills/Development
- Advocate the establishment of Philippine Energy Institute
- Renewal and or continue the establishment of bilateral partnership with the academe, international organization, institute, industries to map out regulatory technical and commercial capabilities
- Continue to support exchange program or on-the-job training for actual exposure to develop the long-term skills program for DNG
- Continue to identify and participate training programs
- Continue to develop and/or amend/update PNS (LNG Facility/Safety Rules/Codes, HSSE Standards, Inspection Manual, Transmission Pipeline, Distribution Pipeline, Natural Gas related ancillary facilities, Natural Gas Quality, Transportation and storage of natural gas)
- Implement the promulgated standard and safety codes on natural gas facilities
- Processing of SEC endorsement of potential natural gas players
- Conduct Monitoring Activities on the following:
 - Facility Inspection/validation to ensure compliance by operators on HSSE activities during construction, operation and maintenance in cooperation with the inter-agency HSSE-IMT
 - Natural Gas Supply Development
 - Natural Gas Infrastructure Development
 - Implementation of LNG hub terminal in Luzon and Visayas
 - Natural gas project in small and off grid islands
- Natural Gas utilization and pricing statistics
- Study on price indices of LNG
- Evaluate emerging trends
- Study the commercial application of natural gas seepages, coal bed methane, hydrates, and other potential sources of natgas
- Promote Natural Gas Infrastructure Development Program to potential investor
- Facilitate and coordinate the conduct of pre-application conferences to potential investors interested in the development of DNGI
- Update the Natural Gas Development Program
- Conduct Study and Assessment on potential natural gas projects
- Evaluates potential sites for natural gas facilities/project

OVERALL OBJECTIVES BY 2040

To establish a world-class, investment driven and efficient natural gas industry that makes the natural gas the preferred fuel by all end-use sectors

Table of Contents

Executive Summary	3
Part One: Upstream – The new preferred fuel threatens energy security	10
Fossil gas—the new preferred fuel	10
Hastening the exploration of potential gas fields	12
DOE overlooks gas' threat of energy insecurity	13
History repeating itself: The Oil Crisis of the 1970s and Luzon Grid's Red Alert	14
Part Two: Midstream - Challenging DOE's vision of Asia-Pacific's LNG hub	15
Mounting opposition on climate-blind midstream plans	15
Two decades of delayed and shelved LNG terminals	16
Part Three: Downstream – Massive build-up of gas power plants and and	18
power rates	
7.1 GW additional gas capacity in the next decade	18
Powering more than half of Meralco's demand	22
Gas' expensive and volatile power rates, no different from coal	24
Part Four: Gas developers and financiers	26
First Gen Corp.—the country's top gas developer	28
Coal developers venture into gas	29
Gas expansion financiers	30
Part Five: Verde Island Passage - the country's next climate battleground	31
Gas build-up in Verde Island Passage	31
Climate-blind legal and regulatory proposed frameworks for midstream and downstream gas	32
Cautions from EERI's proposed Batangas CCGT Plant and BCE's proposed LNG and CCGT Plant	32
Part Six: Addressing the Gas Trilemma	35
References	37

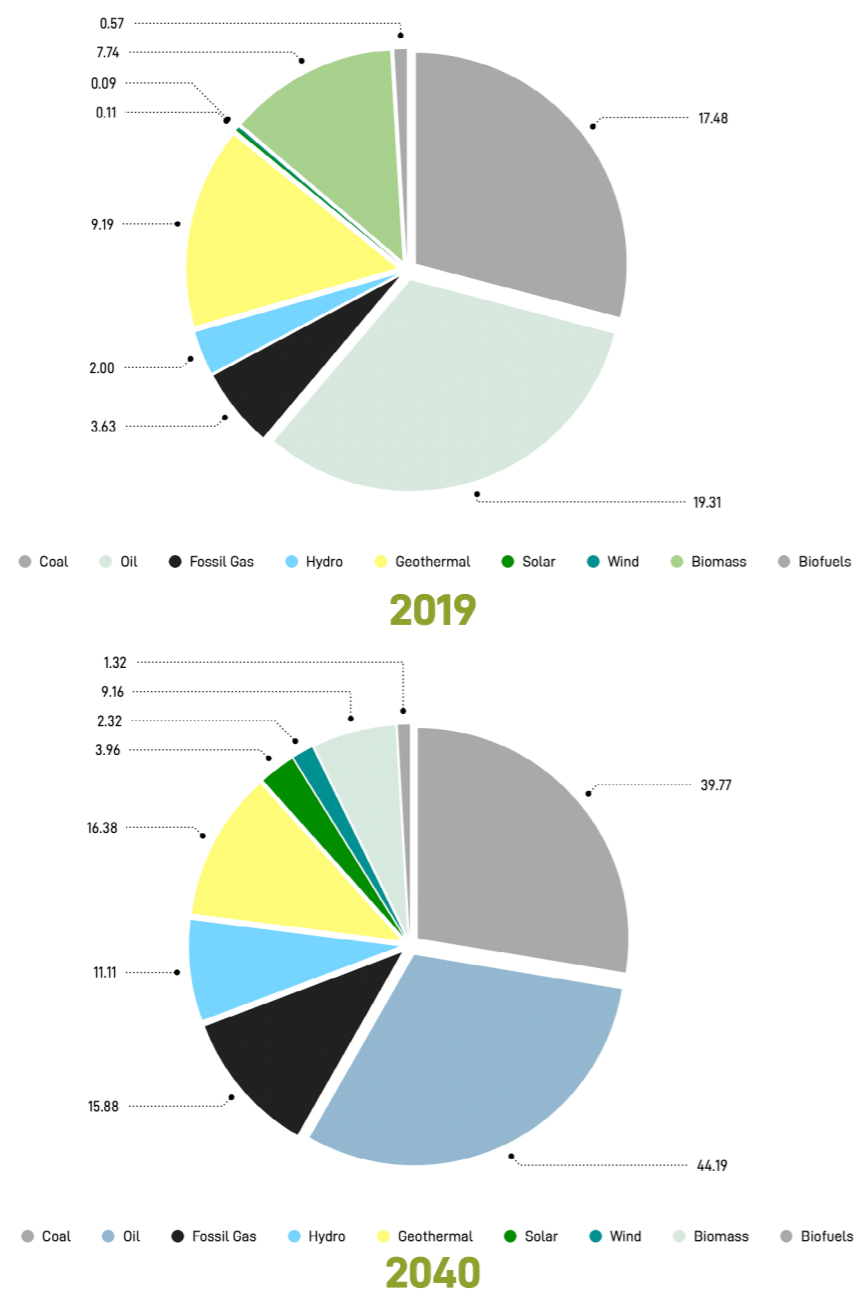
Part One: Upstream – The new preferred fuel threatens energy security

Fossil gas—the new preferred fuel

Fossil natural gas, or simply fossil gas, has a meager share of 6% in the country's total energy supply, equivalent to 3.63 MTOE.

This, however, is expected to change according to DOE's Philippine Energy Plan 2018-2040 (PEP). The PEP's Natural Gas Roadmap intends to establish a "world-class, investment-driven, and efficient natural gas industry to make it the preferred fuel for end-use subsectors"⁴. Under the 2040 Clean Energy Scenario, gas is forecasted to comprise 11% of the country's total primary energy supply.

Figure 1. Total Primary Energy Supply, by Fuel, 2019 v. 2040 CES



⁴ DOE, Philippine Energy Plan 2018-2040, p. X.

All fossil gas supply in the country today is indigenous, coming from only three active gas fields: the Malampaya Deep Water Gas-to-Power Project in Palawan, which is the country's biggest source of fossil gas, and other smaller gas fields—the Libertad Gas Field in North Cebu and Alegria Oil Field in South Cebu.

Table 1. Producing Gas Fields

Name	Location/Basin	Company/Contractor	Service Contract No.	Area Coverage (has.)
Malampaya	Offshore Northwest Palawan	Malampaya Energy	38	83,000.00
Libertad	Onshore/offshore North Cebu	Forum Exploration, Inc.	40	340,000.00
Alegria	Onshore/offshore South Cebu	China International Mining Petroleum Company Ltd.	49	197,000.00

Sources: DOE, PEP 2017-2040, p. 31; DOE, PEP 2018-2040, p. 71.

Located 820 meters deep and 80 kms off the coast of Palawan Island is the [offshore Malampaya Gas Field](#). Malampaya is the second commercial gas discovery in the Philippines, following the San Antonio Gas Field in Isabela, which was decommissioned in 2008. Malampaya was commissioned in October 2001, with commercial production starting in June 2002.

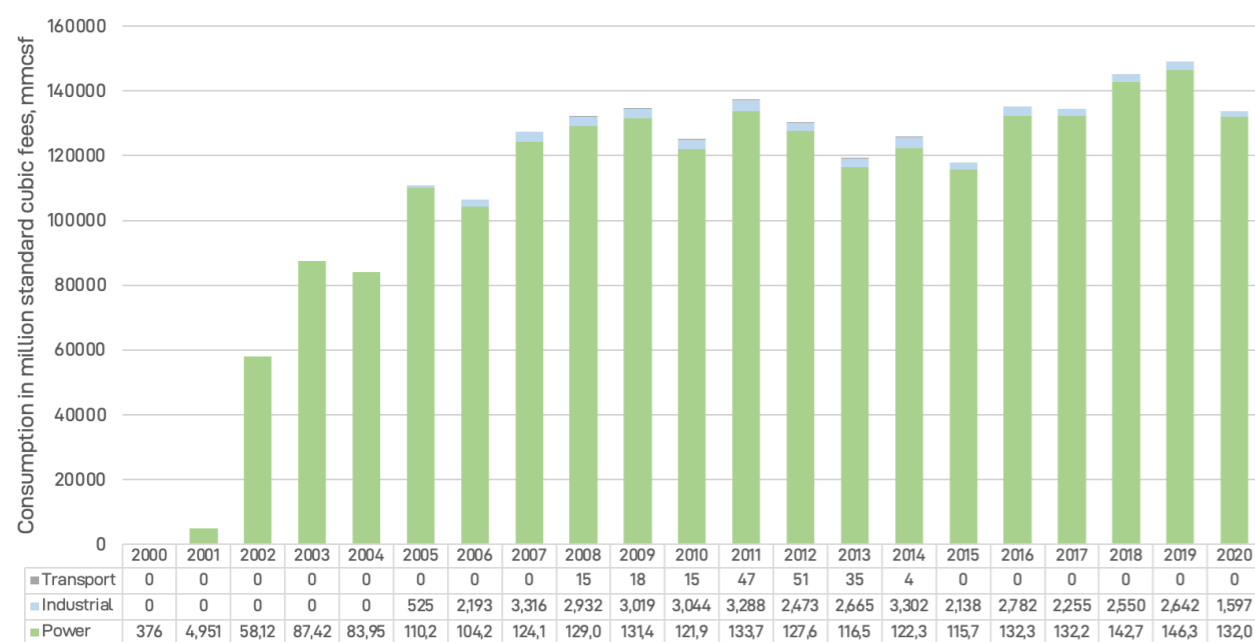
Despite its dwindling reserves, Philippine Tycoon Dennis Uy's Udenna Corporation, through its subsidiary Malampaya Energy, [recently acquired](#) Shell Philippines Exploration B.V.'s (SPEX) 45% operating interest in Malampaya. This increases Malampaya Energy's operating interest in Malampaya to 90% since it acquired Chevron Malampaya LLC's 45% interest in the gas field in 2019. Philippine National Oil Company-Exploration Corporation (PNOC-EC) holds the remaining 10% interest.

Meanwhile, the [Libertad Gas Field](#) is located in the northern half of Cebu Island plus part of the Tañon Strait to the west and of the Visayan Sea to the north. Specifically, the Libertad Gas Field is located southeast of Bogoto town proper in northern Cebu. Libertad is wholly operated by Forum Exploration Inc., which is owned by Canadian company, Forum Energy Corporation, and Forum Pacific, Inc.

[Alegria Oil Field](#), is the newest oil field discovery located in Alegria, Cebu. It was only in 2016 when Department of Energy's (DOE) and service contractor China International Mining Petroleum Company Limited established that the oil field has commercial quantities of oil and gas. [According to DOE Secretary Alfonso G. Cusi](#), Alegria could produce enough natural gas to supply the requirements of a small power plant with a capacity of 60 megawatts. It is not clear whether Alegria currently supplies fuel to any power plant or industry.

Most of the fuel supplied by the gas fields are consumed by the power sector (Figure 2). Malampaya supplies fuel to five gas-fired power plants in Batangas while Liberated supplies fuel for DESCO, Inc.'s embedded gas-fired power plant in Bogoto City, Cebu, the only operating gas plant outside of Luzon.

Figure 2. Gas Consumption, by Sector (2000-May 2020)



Source: DOE, Natural Gas Production/Consumption as of 4 May 2021

Hastening the exploration of potential gas fields

After almost two decades of commercial production, Malampaya's service contract is set to expire in 2024, and its remaining reserves depleted between 2027 and 2029. It is in this context that DOE has been exerting much effort into boosting investment opportunities in the upstream oil and gas sector.

The Philippine Energy Plan 2018-2040 (PEP) states that the DOE is advocating for the resolution of pending issues affecting the stability of petroleum service contracts and the resumption of exploration activities that are under Force Majeure. Part of the action plan is the continuous formulation and implementation of policy issuances on the upstream petroleum sector that would hasten the exploration activities and discovery of new fields in the country; and continuous bilateral and multilateral cooperation with other countries to strengthen oil and gas activities, petroleum security and potential synergy between parties.

Overall, DOE seeks to increase gas production from 0.14 TCF in 2020 to 4.04 TCF in 2040, coming from seven gas fields.

Table 2. Potential Gas Fields

Name	Location/Basin	Company/ Contractor	Service Contract No.	Area Coverage (has.)
San Martin	Offshore Northwest Palawan	Malampaya Energy	38	83,000.00
Sampaguita	Offshore Northwest Palawan	Forum (GSEC 101) Ltd.	72	
Mangosteen	Quirino, Isabela	PNOC-EC (Cagayan Basin Exploration)	37	36,000.00

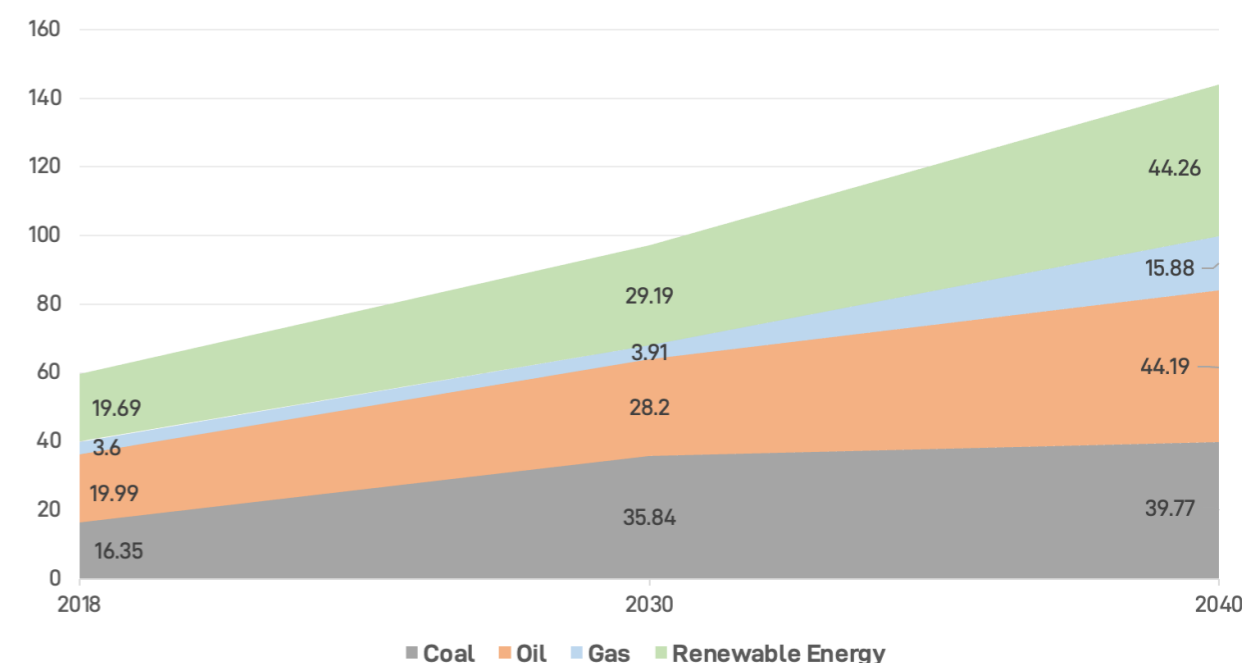
Progreso	Onshore/ Offshore Mindoro	Mindoro-Palawan Oil and Gas, Inc.	53	
Sulu Sea	Sulu Sea	Total E & P Phils. BV	56	
Sultan sa Barongis	Maguindanao	PNOC-EC		
Sta. Monica 1				

Sources: DOE, PEP 2017-2040 Presentation; DOE, PEP 2018-2040, p. 71.

DOE overlooks gas' threat of energy insecurity

Considering the DOE's overall objective for upstream gas, the PEP's Clean Energy Scenario forecasts gas to increase its share in the Total Primary Energy Supply from 6% in 2019 to 11% in 2040, equivalent to 15.88 MTOE.

Figure 3. Total Primary Energy Supply, by Fuel, 2019 v. 2040 CES



Source: DOE, PEP 2018-2040

However, the DOE recognizes that an increased dependence on gas while we are nearing the depletion of Malampaya will pose energy insecurity threats and risks to the country. The PEP mentions these as the critical implications of increasing dependence on gas:⁵

"2. If there are no additional discoveries of natural gas reserves, supply depends solely on the importation of Liquefied natural gas (LNG) to meet domestic requirements after Malampaya's resource depletion.

3. Although higher energy self-sufficiency level (58.0percent in REF and 64.1 percent CES) is seen to achieve over the planning period as compared with the 2018 level, still a considerable portion of the supply mix is sourced overseas. Dependence on imported energy, specifically oil and coal, and even LNG, is vulnerable to impending threats of supply disruption from natural and human-induced disasters and pandemics that

⁵ Department of Energy (DOE), Philippine Energy Plan 2018-2040, p 49. Emphasis supplied.

place the country's energy supply security at risk.”

In the same PEP, DOE overlooks these threats and risks and even includes the acceleration of the implementation of LNG projects, as part of its medium-term nine-point agenda, supposedly for natural gas supply security.⁶ This is a clear policy conflict, where DOE seeks to increase energy security however is promoting overseas fuel supply, particularly overseas LNG.

History repeating itself: The Oil Crisis of the 1970s and Luzon Grid's Red Alert

The COVID-19 pandemic also exposed that we are still facing similar energy insecurities today due to our heavy reliance on imported coal.

These are the same threats we are bound to confront if we adopt a policy increasing dependence on overseas LNG by promoting midstream and downstream gas.

There is no need to belabor the grave implications of relying on overseas fuel for energy demand. It is in fact the oil crisis of the 1970s that led to the enactment of the Oil Exploration and Development Act. The Act sought to increase supply security by promoting indigenous energy for the country, which at the time was relying on petroleum for more than 90% of its energy needs.

The COVID-19 pandemic also exposed that we are still facing similar energy insecurities today due to our heavy reliance on imported coal. These are the same threats we are bound to confront if we adopt a policy increasing dependence on overseas LNG by promoting midstream and downstream gas. Unfortunately, the DOE and members of Congress seem to have forgotten the lessons from half a century ago by promoting overseas petroleum yet again.

Notably, renewable energy should be the preferred indigenous resource to replace petroleum and coal. The Renewable Energy Act of 2008, which was enacted more than a decade ago, declares as policy the acceleration of the exploration and development of renewable energy resources to achieve energy self-reliance and to reduce the country's dependence on fossil fuels and thereby minimize the country's exposure to price fluctuations in the international markets⁷. However, due to the DOE's delay in issuing the implementing rules and regulations for the policy mechanisms under the Act, renewables have lagged significantly behind.

In the meantime, absent any new commercial gas discovery and operating LNG terminals, we will have to confront head-on the implications of giving preference to fossil gas amidst the declining supply of Malampaya. At the start of June and in the middle of scorching summer heat, the consequence was [Luzon Grid's red alert](#). The de-rated Ilijan CCGT Plant due to the Malampaya gas restriction is part of the power plants blamed for the alert, although the coal plants that are undergoing prolonged, forced and planned outages and the lack of strong regulatory measures to hold generation companies accountable should be blamed primarily.

⁶ Department of Energy (DOE), Philippine Energy Plan 2018-2040, p VIII.

⁷ Republic Act No. 9513, Renewable Energy Act of 2008, Section 2(a).

Part Two: Midstream - Challenging DOE's vision of Asia-Pacific's LNG hub

The DOE envisions the country as the LNG trading and trans-shipment hub in Asia-Pacific, placing the country as an LNG distributor and exporter as well.⁸ The country is however lagging behind its Southeast Asian neighbors in LNG projects. There are 17 operating LNG Import Terminals in Southeast Asia—seven in Indonesia, six in Malaysia, three in Thailand, one in Brunei, and one in Singapore (Table 3).

Table 3. LNG Terminals in Southeast Asia

Country	No of LNG Terminals	Type	Status
Brunei	1	Export	Operating
Burma (Myanmar)	2	Import	In Development (Proposed)
Cambodia	1	Export	In Development (Proposed)
Timor-Leste	0	NA	NA
Indonesia	2	Export	Operating
	5	Import	Operating
	1	Export	In Development (Proposed)
	1	Import	In Development (Proposed)
	1	Export	In Development (Under Construction)
	3	Import	In Development (Under Construction)
Laos	0	NA	NA
Malaysia	4	Export	Operating
	2	Import	Operating
	1	Export	In Development (Under Construction)
Philippines	1	Import	In Development (Proposed)
	1	Import	In Development (Under Construction)
Singapore	1	Import	Operating
Thailand	2	Import	Operating
	1	Import	In Development (Under Construction)
Vietnam	2	Import	In Development (Proposed)
	2	Import	In Development (Under Construction)

Source: Global Energy Monitor

Mounting opposition on climate-blind midstream plans

To achieve the LNG Hub vision, DOE acknowledges the urgent need to formulate policies and a legislative framework for the development of LNG projects.

Apart from DOE Department Circular No. DC2017-11-0012, otherwise known as the Rules and Regulations Governing the Philippine Downstream Natural Gas Industry, there is no law that covers all aspects of the midstream gas industry, including transportation, transmission, storage, and marketing of gas. [Senate Bill No. 2203](#), or the Midstream Natural Gas Industry Development Act,

⁸ Id., p X.

which is pending in the Senate Committee on Energy, seeks to provide for this legal and regulatory framework.

However, the Bill is criticized for being [climate-blind](#) as it promotes gas to the point of crowding out renewable energy and encouraging a carbon lock-in. While the Bill declares as policy the need to diversify energy sources, and promote gas as a complementary fuel to variable renewable energy, it fails to integrate the necessary policies to ensure that gas will be used as a transition fuel. This means that gas should serve as a substitute low-carbon fuel for coal and oil to reduce carbon dioxide emissions in the near future while also providing a leverage to enable renewables.

Two decades of delayed and shelved LNG terminals

The LNG hub vision should be also considered against the backdrop of the country's two decades of delayed and shelved LNG terminals. There has been at least 11 LNG terminals that have been proposed in the past two decades, yet there is still no operating LNG terminal in the country today.

As early as 2002, GNPowder Mariveles received an environmental compliance certificate for its energy complex to be built in Alas-asin, Mariveles, Bataan. The Complex comprises of an LNG import and regasification facility, a combined-cycle gas turbine plant, and a high-voltage direct current transmission system.⁹ The project was, however, scrapped and converted into a coal-fired power plant because of the uncertainty in the price of LNG.¹⁰

The second LNG hub to be proposed was Energy World Corporation's (EWC) Pagbilao LNG Hub Terminal and Power Station. It had its groundbreaking ceremony in 2009.¹¹ A decade later, the project was certified as a project of national significance under Executive Order No. 30, series of 2018, which grants it an expedited processing of permits. Yet, to date, the Pagbilao LNG Hub has not completed its construction, and is scheduled to operate in 2022¹² or 2024.¹³ The delays were reportedly due to "funding concerns, regulatory hold ups and delays to gaining approval to connect to the national grid"¹⁴.

In 2019, it was also reported that the China National Offshore Oil Corp. (CNOOC) and Phoenix Petroleum Philippines Inc. are putting on hold their Tanglawan LNG hub venture in Batangas. In the same year, the Philippine National Oil Company (PNOC) entered into a Memorandum of Understanding with Lloyds Energy, a Dubai-based LNG company, for the development of LNG facilities and generation plants in Limay, Bataan and Mabini, Batangas.¹⁵ However, in the latest PEP, there are no listed LNG terminals to be developed in Limay or Mabini.¹⁶ There has likewise been no information on the progress of the projects thus far.

According to the [Institute for Energy Economics and Financial Analysis](#), LNG import infrastruc-

⁹ Asian Development Bank (ADB), Summary of Environmental Impacts: GN Power 2x600mw LNG Fired Combined-cycle Power Plant Project.

¹⁰ Independent Commodity Intelligence Services (ICIS), GN Power's Philippines import proposal crushed by price pressure, As of February 9, 2009. Alena Mae S. Flores (Manila Standard), Shift to coal from LNG defended, As of August 4, 2014.

¹¹ Business World, Natural gas import projects slow out of the gate - Fitch Solutions, As of June 26, 2019.

¹² Department of Energy (DOE), Philippine Energy Plan 2018-2040, p 80.

¹³ DOE, Philippine Energy Plan 2018-2040, p. 80.

¹⁴ Business Worlds, Natural gas import projects slow out of the gate — Fitch Solutions, As of February 5, 2020.

¹⁵ Ronnel W. Domingo (Inquirer), Lloyds Energy looking to build power plants in PH, As of June 26, 2019.

¹⁶ Department of Energy (DOE), Philippine Energy Plan 2018-2040, p 80.

tures in Asia are also highly vulnerable to extreme weather. Floating storage and regasification units (FSRUs) are considered cheaper alternatives to land-based import terminals but are difficult to operate in poor weather conditions. In Malta, storms caused the inoperability of FSRUs resulting to the shut-down of gas-fired power plants. In Bangladesh, plans for additional FSRUs were cancelled due to their unreliability during the monsoon season. The Philippines' vulnerability to extreme weather events should also be considered before allowing the three proposed FSRUs to proceed as planned.

In total, there remains seven proposed LNG terminals (Table 4). FGEN LNG Corporation, Excelerate Energy L.P., and Shell Energy Philippines, Inc. are each proposing FSRUs. EWC and Vires Energy Corporation are each proposing an LNG Storage and Regasification Terminal. While Linseed Field Power Corp. is proposing an LNG Import Facility.

It is reported that Vires LNG Storage and Regasification Terminal will be built in Simlong, Batangas City. The same project site where Simlong Energy Development Corporation¹⁷ plans to build an energy complex by virtue of an MOU with Chinese companies: China Gezhouba Group Co. Ltd, China Petroleum Pipeline Engineering Co. Ltd. and the China Harbour Engineering Corp. The energy complex expects to develop the energy hub in three phases: the first phase is for the construction of a refinery for naphtha; the second phase involves the construction of an energy port for oil, natural gas and LNG; and the final phase, the construction of a 1,560-megawatt power plant.

Out of the eleven projects, seven have received from the DOE a Notice to Proceed (NTP), 2 namely FGEN LNG Corporation and Energy World Corporation's (EWC) Pagbilao LNG Hub Terminal have received a Permit to Construct, Expand, Rehabilitate, Modify (PCERM), and none have received a Permit to Operate and Maintain. Vires Energy Corporation is still under evaluation¹⁸

Table 4. Proposed LNG Terminals

Proponent	Parent Company/ Power Holding	Location	Project	Status	Target Operation Date
Energy World Gas Operations Philippines Inc.	Energy World Corporation Ltd. (Australia)	Barangay Ibabang Polo, Pagbilao Grande Island, Quezon Province	LNG Storage and Regasification Terminal	Proposed -NTP Received -PCERM received -POM not received	2022/2024
Linseed Field Power Corp.	Atlantic Gulf and Pacific Company of Manila, Inc.	Ilijan Batangas	LNG Import Facility	Proposed -NTP Received -PCERM no information -POM not received per project	2022
FGEN LNG Corporation	First Gen Corporation - 80%, Tokyo Gas Co., Ltd. - 20%	Barangays Sta. Clara, Sta. Rita Aplaya, and Bolbok in Batangas City	Floating Storage & Regasification Unit (FSRU) Terminal	Proposed -NTP Received -PCERM received -POM not received	2022

¹⁷ Philippine Daily Inquirer, P155-B energy complex to rise in Batangas, As of May 2, 2019

¹⁸ Department of Energy (DOE), DOE Receives Update on Vires Project, As of April 28, 2021.

Excelerate Energy L.P.		About 9.5 km offshore in Bay of Batangas	Floating Storage Regasification Unit (FSRU) Terminal	Proposed -NTP Received -PCERM no information -POM not received per project	2022
Vires Energy Corporation	A Brown Company Inc.	Batangas Bay, Barangay Simlong, Batangas City	Integrated Natural Gas-Fired Power Plant and LNG Storage and Regasification Terminal	Proposed -NTP Received -PCERM not received -POM not received	2023
Batangas Clean Energy, Inc.	Gen X Energy LLC, LCT Energy & Resources Inc	Barangay Pinamucan Ibaba, Batangas City	LNG Storage and Regasification Terminal	Proposed -NTP Received -PCERM no information -POM not received per project	2025
Shell Energy Philippines, Inc.		Tabangao, Batangas City	Floating Storage & Regasification Unit (FSRU) Terminal	Proposed -NTP Received -PCERM no information -POM not received per project	No information
CNOOC, Phoenix Petroleum Philippines Inc. PNOOC		Batangas, Batangas Province, Philippines	Tanglawan LNG Terminal	On hold ¹⁹	No information
PNOOC		Limay, Second District, Bataan, Philippines	No information	On hold ²⁰	No information
PNOOC		Mabini, Batangas	Complete Value Chain LNG Facility	Cancelled ²¹	No information
GNPower	AboitizPower, AC Energy	Mariveles, Bataan	No information	Cancelled ²²	No information

Part Three: Downstream – Gas power expansion and power rates

7.1 GW additional gas capacity in the next decade

Currently, there are only six operating gas-fired power plants in the country, with a total installed capacity of 3.45 GW. Similar to the midstream gas projects, all gas-fired power plants are located in Batangas Province except for DESCO's 1 MW embedded plant in Bogo City, Cebu.

The oldest and biggest gas plant in the country is KEPCO Ilijan Corp.'s 1,277 MW Ilijan Com-

¹⁹ Reuters, "Planned \$2 Billion LNG Project in Philippines put on hold". December 18, 2019.

²⁰ Gonzales, Iris, "LNG Project faced delay as Government flip-flops", August 13, 2017.

²¹ Philippine National Oil Company. "Project Status as of January 23, 2019".

²² Independent Commodity Intelligence Services (ICIS), GN Power's Philippines import proposal crushed by price pressure, As of February 9, 2009. Alena Mae S. Flores (Manila Standard), Shift to coal from LNG defended, As of August 4, 2014.

bined-Cycle Gas Turbine, which started commercial operation in June 5, 2002. SMC, through its wholly-owned subsidiary, South Premiere Power Corp (SPPC), successfully bid for the appointment as the IPPA for the Ilijan Power Plant in May 2010. SPPC assumed administration of the Ilijan Power Plant on June 26, 2010 in accordance with the Ilijan IPPA Agreement.²³

While the [Senate Bill No. 2203] declares as policy the need to diversify energy sources, and the promote gas as a complementary fuel to variable renewable energy, it fails to integrate the necessary policies to ensure that gas will be used as a transition fuel.

The newest operating gas plant is Prime Meridian Powergen Corp.'s 100 MW Avion Open Cycle Gas Turbine in Bolbok, Batangas, which started operations in August 2016.

Table 5. Operating Gas-Fired Power Plants as of 31 December 2020

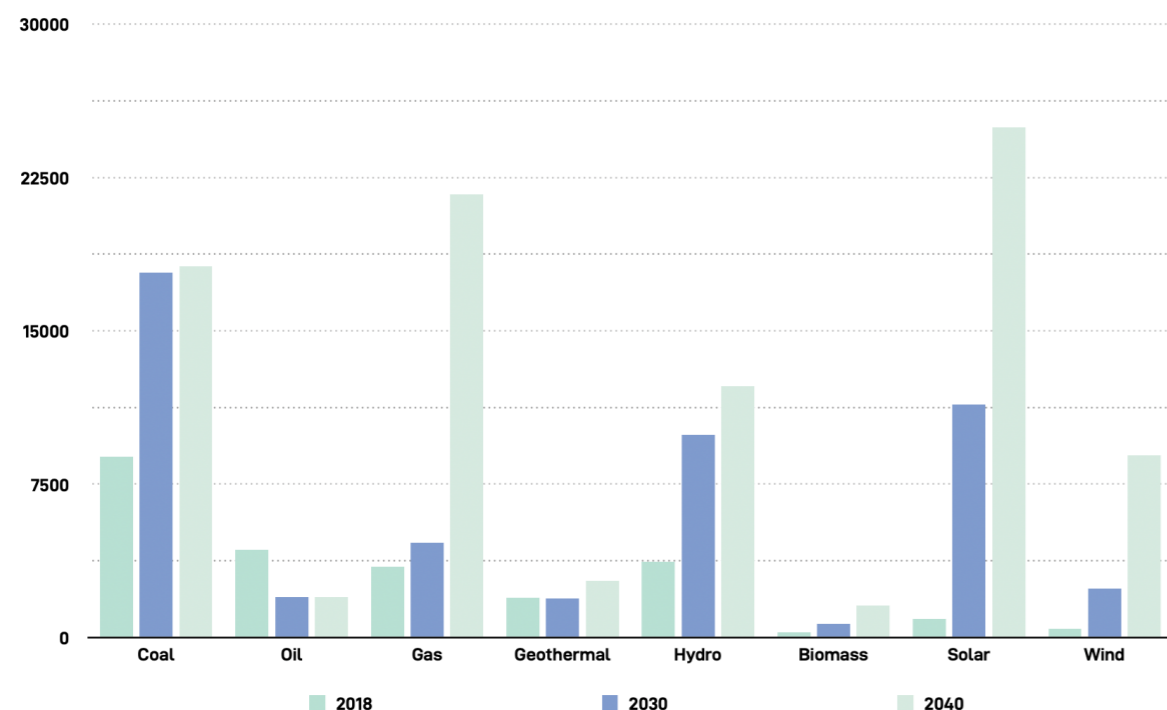
Facility Name	Subtype	Capacity, MW		No of Units	Location	Operator	IPPA	Date Commissioned/ Commercial Operation
		Installed	Dependable					
Avion	Open Cycle Gas Turbine	100.6	97	2	Bolbok, Batangas	Prime Meridian Powergen Corp	Prime Meridian Powergen Corp	Aug 2016
Ilijan	Combined-Cycle Gas Turbine	1277	1200	6	Ilijan, Batangas	KEPCO Ilijan Corp	South Premiere Power Corp	Jun 2002
San Gabriel	Combined-Cycle Gas Turbine	430	420	1	Sta. Rita, Batangas	First Nat-Gas Power Corp	First NatGas Power Corp	Jul 2016
San Lorenzo	Combined-Cycle Gas Turbine	549.1	526.6	2	Sta. Rita, Batangas	FGP Corp	FGP Corp	Sep 2002
Santa Rita	Combined-Cycle Gas Turbine	1094.8	1042.5	4	Sta. Rita, Batangas	FGP Corp	FGP Corp	Unit 1 & 2 - Jun 2000
DESCO Natural Gas	Gas Engine	1	0	1	Bogo City, Cebu	DESCO Inc.	DESCO Inc.	Feb 2012
Total		3452.5	3286.1					

Source: DOE, List of Existing Power Plants as of 31 December 2020

Gas-fired power plants' capacity and generation is forecasted to leap in the next two decades under the PEP's clean energy scenario (CES). Under the CES, gas is expected to have an additional capacity of 867 MW by 2030, and 18.2 GW by 2040. Gas will see one of the biggest total capacity additions by 2040 compared to 2018, second only to solar.

²³ San Miguel Corporation (SMC), Annual Reports: 2016.

Figure 4. Installed Capacity by Fuel Type, 2018, CES 2030, and CES 2040



Source: DOE, PEP 2018-2040

However, the 867 MW forecasted capacity addition by 2030 is much lower than the total capacity of all the proposed gas plants that are expected to start commercial operations in the next six years.

Based on DOE’s latest list of private sector-initiated projects, there are seven proposed gas-fired power plants with a total capacity of 7.1 GW. Out of the seven gas plants, three have already secured financial closure.

There are also 10 proposed gas projects with a total capacity of 10.4 GW that were removed from DOE’s list in the past year.

Table 6. Proposed Gas-Fired Power Plants as of 31 March 2021

Facility Name	Operator	Facility Type	Location	Status	Capacity	Target Testing and Commissioning	Target Commercial Operations
EWC CCGT Power Plant	Energy World Corp	CCGT Power Plant	Brgy. Ibabang Polo, Grande island, Pagbilao, Quezon	Committed	650	Dec-22	Dec-22
Batangas Combined Cycle Power Plant - Phase 1	Excellent Energy Resources Inc. (EERI)	CCGT Power plant	Brgy. Dela Paz Proper, Batangas City	Committed	875	Jun-23	Mar-23

Batangas Combined Cycle Power Plant - Phase 2	Excellent Energy Resources Inc. (EERI)	CCGT Power plant	Brgy. Dela Paz Proper, Batangas City	Committed	875	TBD	Jun-24
LLoyds Energy Phil.	LLoyds Energy Phil.	Floating Power Plant	San Pascual, Batangas Bay	Indicative	1,200	Dec-22	Dec-23
GNPower Sisiman LNG Combined Cycle Power Plant	GNPower Ltd. Co	CCGT Power Plant	Mariveles, Bataan	Indicative	1,200	Jun-27	Dec-27
Natural Gas-Fired Power Plant	Batangas Clean Energy, Inc.	LNG Power Plant	Pinamucan Ibaba, Batangas City	Indicative	1,100	Mar-25	Dec-25
Mariveles Natural Gas Power Project	Mariveles Power Inc	LNG Power Plant	Mariveles, Bataan	Indicative	1,200	Jun-26	Jun-26
Lucidum LNG Power Plant	Lucidum Energy Inc.	LNG Power Plant	Silanguin Bay, Zambales	Removed from Indicative List (31 March 2021)	300	TBD	TBD
SMC Ilijan LNG Power plant	SMC Global Power Holdings Corp	LNG Power Plant	Batangas	Removed from Indicative List (31 March 2021)	3,600	TBD	Phase 1: Dec 2024 Phase 2: TBD Phase 3: TBD
Natural Gas-fire power plant	Batangas Clean Energy Inc	Gas-fired Power Plant	Pinamucan Ibaba, Batangas City	Removed from Indicative List (31 March 2021)	1,100	Mar-25	Dec-25
Ilijan LNG Power Plant	Excellent Energy Resources (EERI)	LNG Power Plant	Batangas	Removed from Indicative List (31 March 2021)	1,750	Jun-23	Phase 1: Mar 2023 Phase 2: Jun 2024
500 MW VIRES LNG-fired power barge project	VIRES Energy Corp	LNG Power Plant	Batangas Bay Area, Batangas	Removed from Indicative List (31 October 2020)	500	TBD	TBD
Sta. Maria Power Plant	First Gen Ecopower Solutions Inc.	CCGT Power Plant	Sta Rita, Batangas	Removed from Indicative List (31 October 2020)	450	TBD	TBD
Combined Cycle Gas Turbine Project	Limay LNG Power Corp	CCGT Power Plant	Limay, Bataan	Removed from Indicative List (31 October 2020)	1,100	TBD	TBD

Gas Turbine Power plant	Millenium Energy Inc	Gas Tubrine Power Plant	Navotas Fish Port	Removed from Indicative List (31 October 2020)	210	TBD	TBD
First Gen Ecopower Solutions Inc.	First Gen Ecopower Solutions Inc.	CCGT Power Plant	Batangas City	Removed from Indicative List (31 October 2020)	1,260	TBD	TBD
Argao Floating CCGT Power plant	PHINMA Energy Corp	Floating CCGT Power Plant	Brgy. Bula-sa, Argao, Cebu	Removed from Indicative List (31 October 2020)	138	TBD	TBD

Source: DOE, List of Private Sector Initiated Power Projects as of 31 March 2021

Powering more than half of Meralco's demand

All the gas-fired power plants in Batangas are selling their electricity to Manila Electric Company (Meralco).

Table 7. Meralco's Contracted and Pending Gas Power Supply Agreements

GenCo and Facility	Type	Minimum MW	PSA Start	PSA End
First Gas Power Corporation – Sta. Rita	Base	720	Aug-00	Aug-25
First Gas Power Corporation Sta. Rita	Intermediate	359.75	Aug-00	Aug-25
FGP Corp. – San Lorenzo	Base	360	Oct-02	Oct-27
FGP Corp. – San Lorenzo	Intermediate	197.95	Oct-02	Oct-27
First NatGas Power Corporation - San Gabriel	Base	210	26-Jun-18	25-Feb-24
First NatGas Power Corporation - San Gabriel	Intermediate	218	26-Jun-18	25-Feb-24
South Premiere Power Corp. - Ilijan Plant	Base	670	26-Dec-2019	25-Dec-2029
South Premiere Power Corp. - Ilijan Plant	Intermediate	290	26-Feb-2020	25-Dec-2024

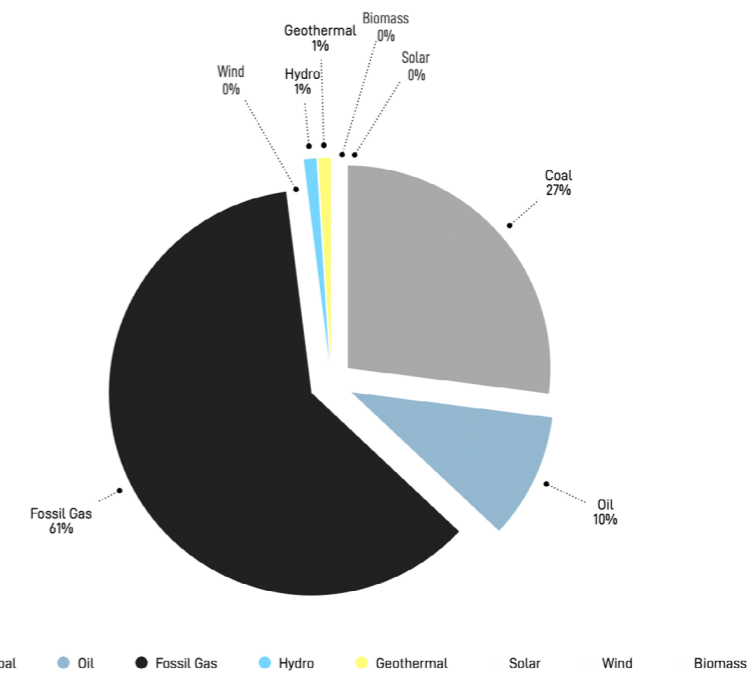
Source: Meralco, PSPP 2020-2029

Considering electricity purchased through the WESM in addition to PSAs, fossil fuels supply nearly 97% of Meralco's total electricity purchased (Energy Generation Mix) in 2019, according to Greenpeace Philippines' recent report [Decarbonizing Meralco](#). Gas has the biggest share in the mix at 61%, equivalent to 20,354.47 GWh total electricity purchases, followed by coal amounting to 8,971.10 GWh or 27% of the energy mix. Renewable energy accounts for a meager share of 2.60%.

Gas has the biggest share in the mix at 61%, equivalent to 20,354.47 GWh total electricity purchases, followed by coal amounting to 8,971.10 GWh or 27% of the energy mix.

Renewable energy accounts for a meager share of 2.60%.

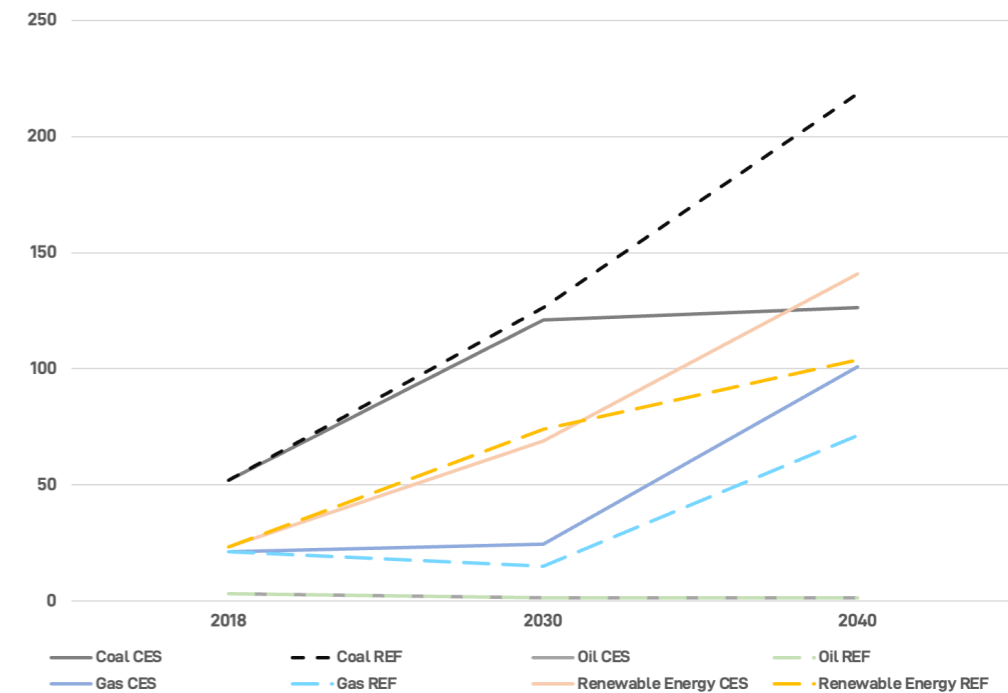
Figure 5. Meralco Electricity Purchased Mix (GWh), 2019



Source: Greenpeace Philippines, [Decarbonizing Meralco](#)

In the entire country, gas generates only 18% of the Generation Mix. Under the PEP's clean energy scenario, gas' share is forecasted to increase to 26.6% by 2040, making it the second largest source of electricity generation, with solar coming in third at 12.2%.

Figure 6. Philippines Gross Generation, By Fuel Type (TWh), Reference Scenario (REF) v. Clean Energy Scenario (CES)



Source: DOE, PEP 2018-2040

The Clean Energy Scenario forecast for gas should be expected to further increase if House Bill No. 3031, otherwise known as the "Downstream Natural Gas Industry Development Act" is signed into law.

The bill mandates the preparation of development plans for the downstream fossil gas and the inclusion of fossil gas in the energy mix to be determined by the Department of Energy (DOE). The entire downstream fossil gas value chain is also included in the Investment Priority Plan, which entitles all of these projects to income tax holiday and other incentives under the Omnibus Investment Code. The Philippine Energy Plan should be revised accordingly.

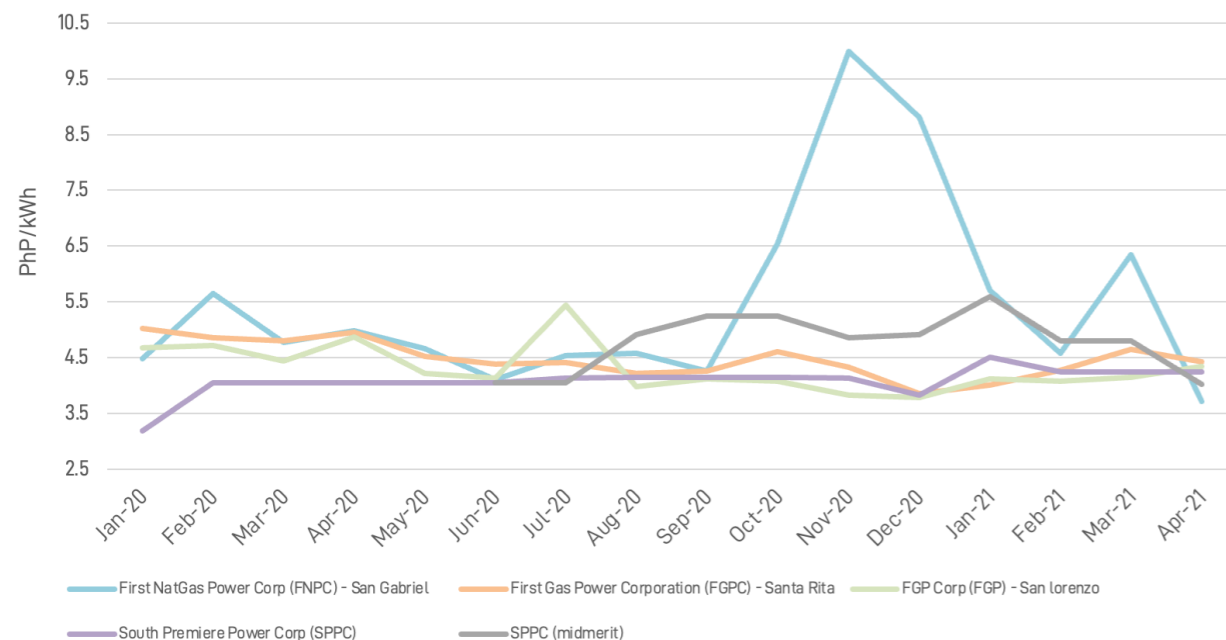
Gas' expensive and volatile power rates, no different from coal

Meralco's gas PSAs have effective rates at plant gate (PSA rates) ranges from Php 3.7121 to 5.5348/kWh, with First NatGas Power Corp.'s (FNPC) San Gabriel CCGT Plant selling the lowest rate and South Premiere Power Corp.'s (SPPC) Ilijan CCGT Plant the highest.

In the past year, First NatGas Power Corp.'s San Gabriel CCGT in Sta. Rita, Batangas City charged the highest generation rate at 9.991 Php/kWh.

However, considering that most power supply agreements pass-on the cost of fuel and forced outages to electric consumers, the actual generation rates charged by gas suppliers to Meralco consumers were around Php 4.4562 to 6.2789 higher than their PSA rates in the past year (Figure 7). In the past year, First NatGas Power Corp.'s San Gabriel CCGT in Sta. Rita, Batangas City charged the highest generation rate at 9.991 Php/kWh.

Figure 7. Meralco Gas Generation Rates, January 2020 to April 2021



Source: Meralco, Generation

In comparison with power rates from other fuels, gas is clearly neither a more affordable nor reliable option. In terms of PSA rates, gas rates are more expensive than solar. Solar Philippines Tarlac Corp.'s Solar Farm has a PSA rate of Php 2.99/kWh.

While Meralco's gas PSA rates are lower than the cheapest PSA rates for coal (Php 4.0459/kWh

- SMEC's Sual Coal Plant), hydro and geo (Php 5.19 /kWh - First Gen Hydropower Corporation - Pantabangan-Masiway Hydroelectric Power Plant and Bac-Man Geothermal Power Plant), the actual generation rates charged by gas suppliers to electric consumers are much higher.

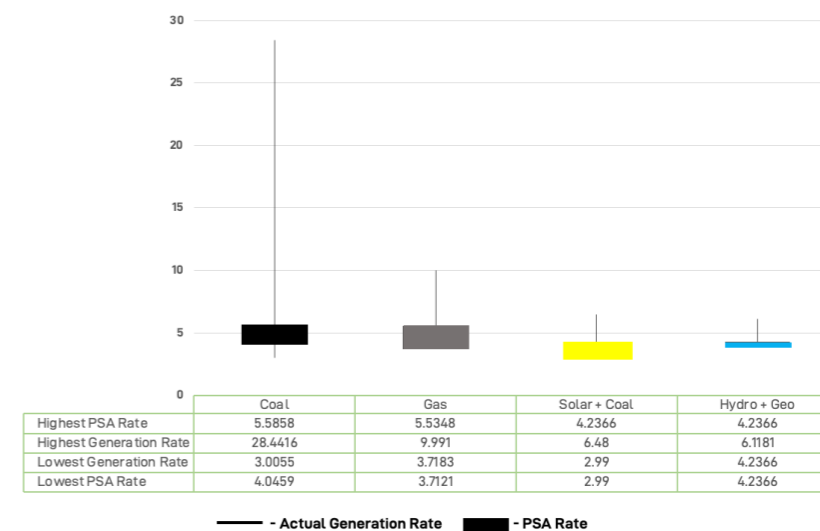
In the past year, gas generation rates footed by electric consumers fluctuated to exorbitant rates, even reaching up to Php 6.2789/kWh higher than the PSA rate. In November 2020, FNPC's San Gabriel CCGT Plant recorded a generation rate of [Php 9.991/kWh](#). It should be noted however, that while Meralco purchases electricity from Gas Generation Companies for baseload and intermediate demand, it does not unbundle the rates for baseload and intermediate demand in its reported generation rates. Thus, this limits the extent of understanding the causes for the rate increases.

Coal, however, remains the most volatile fuel, charging Meralco consumers as high as Php 28.4416/kWh in March 2020 (Quezon Power Phils Ltd. Co.'s Pagbilao Coal Plant).

Meanwhile, in the past year, the highest generation rate charged by AC Energy's coal and solar PSA is [Php 6.48/kWh in September 2020](#), and First Gen Hydropower Corporation - Pantabangan-Masiway Hydroelectric Power Plant and Bac-Man Geothermal Power Plant is [Php 6.1181/kWh in February 2021](#) (Figure 7). Coal, however, remains the most volatile fuel, charging Meralco consumers as high as [Php 28.4416/kWh in March 2020](#) (Quezon Power Phils Ltd. Co.'s Pagbilao Coal Plant).

Figure 8 compares the PSA rates contracted by Meralco from coal, gas, solar, hydro, and geothermal suppliers, and the volatility of the power rates of coal and gas.

Figure 8. Meralco PSA and Generation Rates, by Fuel Type, January 2020 to April 2021



Source: ERC, DOE

*The 4.2366 rate is from AC Energy's Mid-merit PSA, which nominated two solar plants and one coal plant.

There are many lessons learned from our overseas coal-reliant power system. Coal supply is mostly imported and is thus vulnerable to international coal price risk and currency fluctuation, which are passed-on to consumers on top of the PSA rate.

During this pandemic, the constraints on coal imports and drastic decrease in energy demand combined with anomalous power supply agreements and billing practices resulted to exorbitant power rates and the infamous bill shock. To this day, many Filipinos are still struggling to foot their electricity bills and are now facing threats of disconnections.

While gas supply is wholly indigenous today, relying on imported LNG once Malampaya is depleted will leave the electric consumers at the mercy of volatile LNG prices in the region. This is a real and growing concern considering that just this month, news broke that Asia, the world's largest LNG importing region, will pay for the most expensive LNG summer prices in seven years.²⁴

Part Four: Gas developers and financiers

The limited information available on the contractors, developers, and financiers of existing and proposed gas projects are provided in Table 8.

Table 8. Gas Developers and Financiers

Name	Contractor/ Proponent	Parent Company/Power Holding	Project Financier
Gas Fields			
Producing			
Malampaya	Malampaya Energy	Udenna Corp. PNOC	
Libertad	Forum Exploration, Inc.	Forum Energy Corpora- tion of Canada	
Alegria	China International Mining Petroleum Com- pany Ltd.	Polyard Petroleum Inter- national Group Limited	
Potential			
San Martin	Malampaya Energy		
Sampaguita	Forum (GSEC 101) Ltd.		
Mangosteen	PNOC-EC (Cagayan Basin Exploration)		
Progreso	Mindoro-Palawan Oil and Gas, Inc.		
Sulu Sea	Total E & P Phils. BV		
Sultan sa Barongis	PNOC-EC		
Sta. Monica 1			
Proposed LNG Terminals			
LNG Storage and Regas- ification Terminal	Energy World Gas Op- erations Philippines Inc.	Energy World Corp. Ltd. (Australia)	DBP LBP AUB
LNG Import Facility	Linseed Field Power Corp.	Atlantic Gulf and Pacific Co.	
Floating Storage & Re- gasification Unit (FSRU) Terminal	FGEN LNG Corporation	First Gen Corporation Tokyo Gas	
Floating Storage Re- gasification Unit (FSRU) Terminal	Excelerate Energy L.P.		

Integrated Natural Gas- Fired Power Plant and LNG Storage and Regas- ification Terminal	Vires Energy Corpora- tion	A Brown Company, Inc.	
LNG Storage and Regas- ification Terminal	Batangas Clean Energy, Inc.	Gen X Energy LLC LCT Energy & Resources Inc	
Floating Storage & Re- gasification Unit (FSRU) Terminal	Shell Energy Philip- pines, Inc.		
Tanglwan LNG Terminal	CNOOC, Phoenix Petroleum Philippines Inc.	Udenna Corp.	
No information	PNOC		
Power plants			
Existing			
Avion OCGT	Prime Meridian Power- gen Corp.	First Gen Corporation	BDO, PNB, MUFG Bank, Ltd.
Ilijan CCGT	KEPCO Ilijan Corp	KEPCO Philippines (Ko- rea Electric Power Corp.) Mitsubishi Corporation (Japan) TeaM Energy Corpo- ration (Tokyo Electric Power Co., Marubeni Corp., and Kyushu Elec- tric) (Japan)	Japan Bank of Interna- tional Cooperation
San Gabriel CCGT	First NatGas Power Corp.	First Gen Corporation	Euler Hermes, KfW-IPEX
San Lorenzo CCGT	FGP Corp	First Gen Corporation	Various local banks not specified
Santa Rita CCGT	FGP Corp	First Gen Corporation	Various lenders not specified
DESCO Gas Engine	DESCO Inc.		Metrobank
Proposed			
EWC CCGT Power Plant	Energy World Corp. Ltd. (Australia)		DBP, LBP and AUB, Standard Chartered Bank, BPI
Batangas CCGT Power Plant -Phase 1	Excellent Energy Re- sources Inc.	SMC Global Power Hold- ings	
Batangas CCGT Power Plant - Phase 2	Excellent Energy Re- sources Inc.	SMC Global Power Hold- ings	
LLoyds Energy Phil. Floating Power Plant	LLoyds Energy Phil.		
GNPower Sisiman LNG CCGT Power Plant	GNPower Ltd. Co	Power Partners Ltd. Co.	
Natural Gas-Fired Power Plant	Batangas Clean Energy, Inc.	Gen X Energy LLC LCT Energy & Resources Inc	
Mariveles LNG Power Plant	Mariveles Power Inc.		

²⁴Tsvetana Paraskova, Asia Braces For Expensive LNG This Summer, Oil Price, 26 May 2021. <https://oilprice.com/Energy/Gas-Prices/Asia-Braces-For-Expensive-LNG-This-Summer.html>

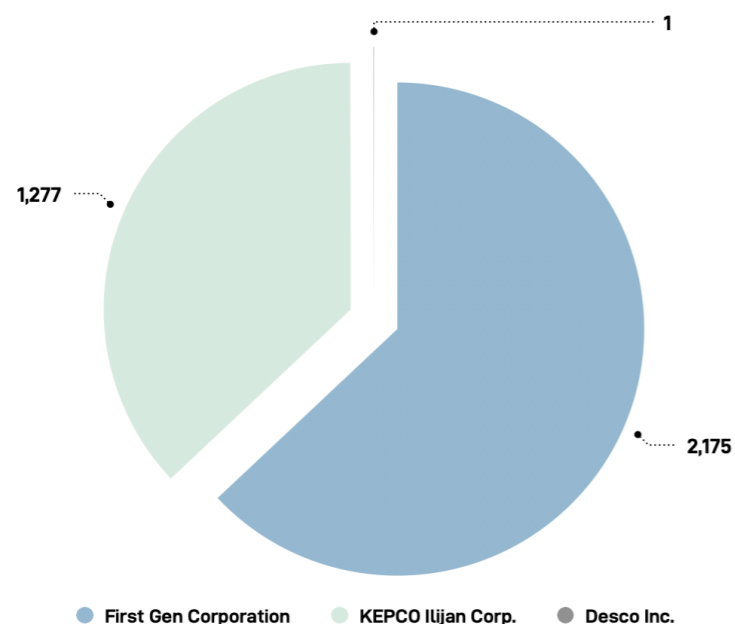
First Gen Corp.—the country's top gas developer

First Gen Corporation touts itself as one of the leading providers of clean and renewable power in the Philippines. It developed the country's first gas-fired power plant in 2000. First Gen considers the Santa Rita and San Lorenzo CCGT plants as pioneering projects that formed the cornerstone of the Malampaya Gas-to-Power Project.²⁵ Today, First Gen is still the country's top gas developer.

Among the only three gas-fired power plant operators, First Gen, through its several subsidiaries Prime Meridian Powergen Corp., First NatGas Power Corp., and FGP Corp., has the biggest capacity share of 2,174.5 MW or 63%. First Gen is followed by KEPCO Ilijan Corp., a consortium composed of Korean Electric Power Corporation, Mitsubishi Corporation, and TeaM Energy Corporation, at 1,277 MW or 37%. DESCO, Inc. 1 MW gas engine's capacity share does not even reach 1%.

First Gen is also venturing into midstream gas projects, with one proposed Floating Storage & Regasification Unit (FSRU) Terminal in Santa Rita, Batangas City expected to start operations next year.

Figure 9. Capacity Share Ownership of Existing Gas Power Plant as of 2021



In First Gen's 2020 Integrated Report, however, it stated that while it is embarking on a timely shift to LNG, it is also "planning for its eventual phaseout in ways that complement a pathway to Carbon Neutrality by 2050 and consistent with a 1.5 degrees Celsius target"²⁶.

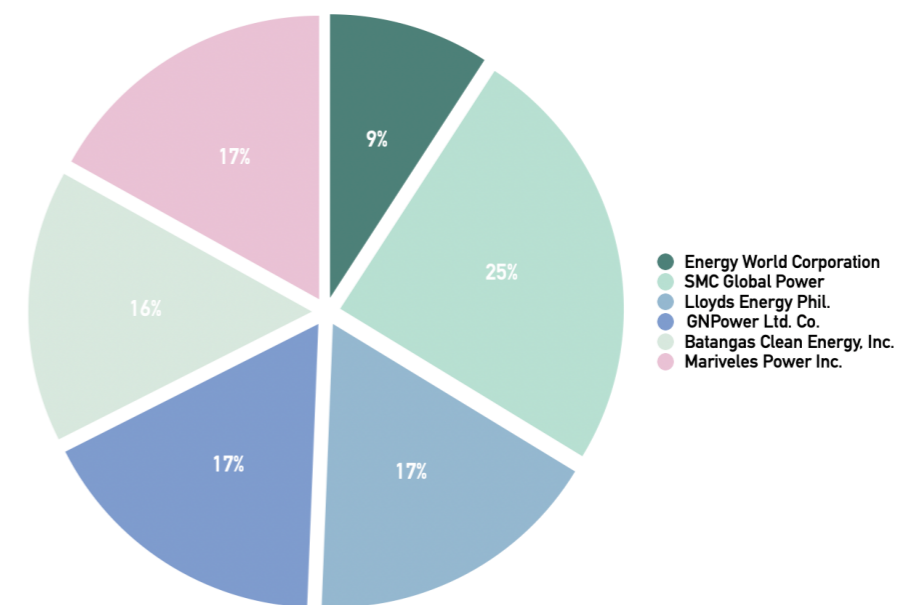
Coal developers venture into gas

Coal developers are starting to venture into gas. SMC Global Power Holdings, the country's top coal developer, has the biggest capacity share ownership in all of the proposed gas power plants today. Its subsidiary Excellent Energy Resources Inc.'s proposed gas plant has a total capacity of 1,740 MW, comprising 25% of the total proposed capacity of all gas-fired power plants (Figure 10).

²⁵ First Gen, *Corporate Profile*. <https://www.firstgen.com.ph/our-company/corporate-profile>
²⁶ First Gen Corporation. 2020 Integrated Report. GRI102-14. <https://www.firstgen.com.ph/static-assets/assets/file-uploads/investor-relations/reports-and-presentations/reports/First%20Gen%202020%20Integrated%20Report%20Final.pdf>

GNPower Ltd. Co., Lloyds Energy Phil. and Mariveles Power Inc. come in second at 1,200 MW or 17%. Gnpower Ltd. Co. has been operating a pulverized subcritical coal plant in Mariveles, Bataan since 2013.

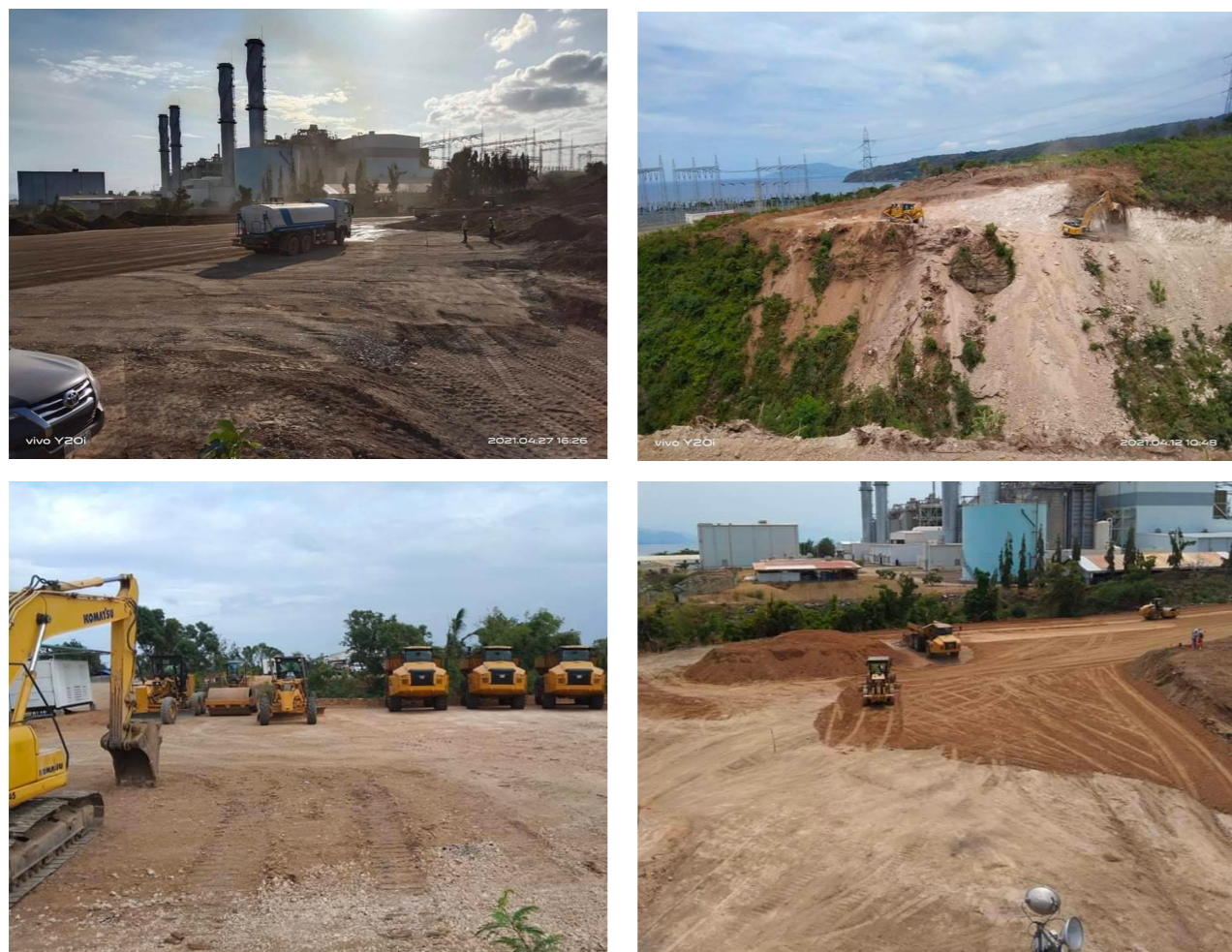
Figure 10. Capacity Share Ownership of Proposed Gas Power Plant as of 2021



Other coal developers have also signified interest in gas projects. Aboitiz Power Corp. president and chief executive Emmanuel V. Rubio said at a press briefing that it has pivoted away from coal even before the DOE announced a coal moratorium.²⁷ Rubio says that AboitizPower has set up a team to look into natural gas as a serious option for their baseload strategy.

Most recently, Meralco Chairman Manuel V. Pangilinan said in a press briefing that Meralco should look into participating in the gas business.²⁸ In the same report, Meralco PowerGen Corp. president and chief executive officer Rogelio L. Singson also said that the heavily opposed and long delayed Atimonan Coal Plant is a candidate for conversion into a gas plant.

²⁷ Ronnel W. Domingo (Inquirer), *AboitizPower shuns coal in favor of natural gas*, As of November 6, 2020.
²⁸ Business World, *Meralco weighs foray into gas business*, As of March 3, 2021.



Project site of Ilijan LNG Terminal Import Facility Project - Linseed Field Power Corporation

Gas expansion financiers

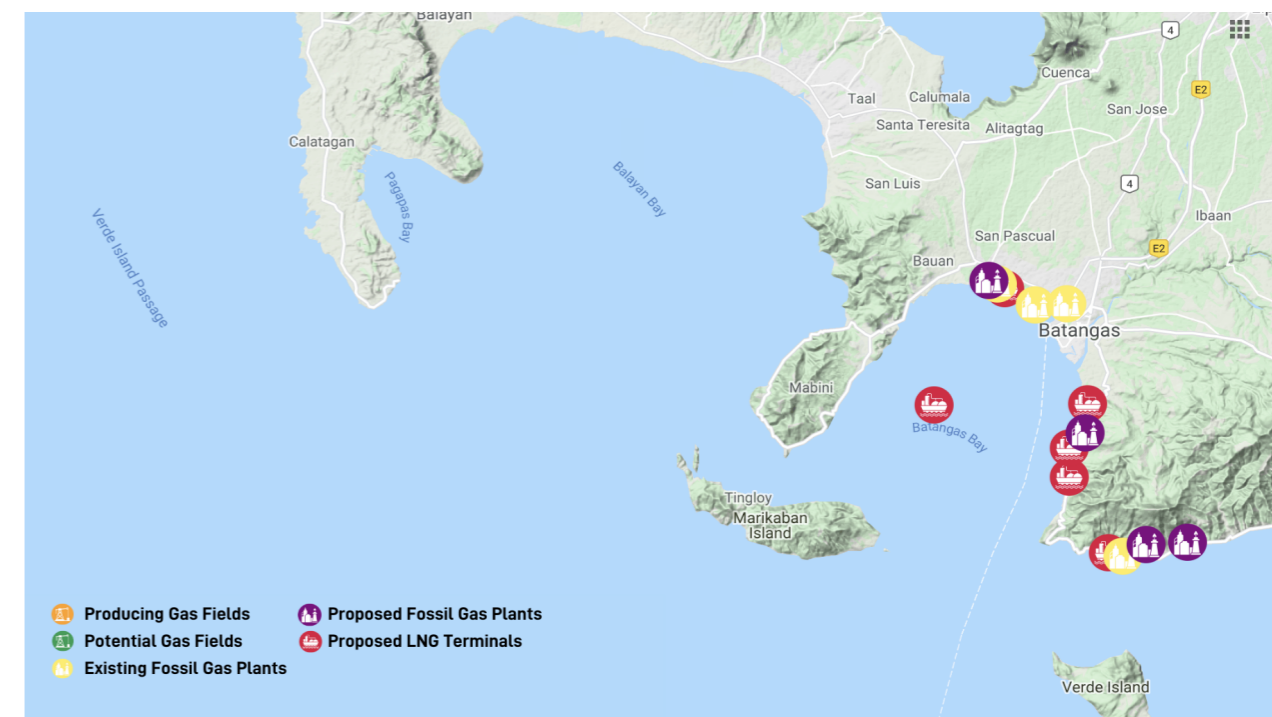
There is likewise limited information regarding the financing of gas projects in the country (Table 8). Based on available data, the [top financiers for coal projects](#) in the country such as Bank of the Philippine Islands (BPI) Banco de Oro (BDO), Philippine National Bank (PNB), and Metrobank are likewise funding gas-fired power plants.

BDO and PNB, together with MUFG Bank, Ltd. (the largest bank in Japan), financed First Gen Corporation's Avion OCGT, which is the latest gas-plant to go online in the country. Metrobank financed DESCO's Gas Engine in Cebu City. BPI, Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP), and Asia United Bank (AUB) are financing Energy World Corp. Ltd.'s proposed CCGT plant and LNG Storage and Regasification Terminal and in Pagbilao, Quezon.

In addition to MUFG Bank, Ltd., several other foreign banks are financing gas expansion in the country: Standard Chartered (UK), Japan Bank of International Cooperation (Japan), and KfW-IP-EX (Germany).

Part Five: Verde Island Passage - the country's next climate battleground

Gas build-up in Verde Island Passage



Almost all of the existing and proposed LNG terminals and gas-fired power plants are located in Batangas. Except for EWC's Pagbilao Terminal, the 6 proposed LNG terminals are located in Batangas City and Batangas Bay. Out of the total 13 existing and proposed gas-fired power plants, 9 are in Batangas City and Batangas Bay.

The Batangas Province is part of the Verde Island Passage Marine Corridor. The Verde Passage is located within the globally significant Coral Triangle, an area considered the center of the world's marine shorefish biodiversity, an area with the highest diversity and endemism in the world.²⁹

The Verde Passage is a conservation corridor that spans five provinces: Batangas, Occidental Mindoro, Oriental Mindoro, Marinduque and Romblon. Verde Passage encompasses 36 marine protected areas (MPAs), 24 of which are in Batangas, and 12 in Oriental Mindoro.³⁰ Its abundant fish and megafauna support over 7 million people in those provinces, whose livelihoods include fishing, aquaculture, and tourism.³¹

In Batangas alone, there is a strong MPA Network, comprising of government and nongovernment organizations, people's organizations, and academic, which monitors and manages the Batangas MPAs through complementary and collaborative efforts at the local, regional, and national levels.³²

²⁹ Carpenter, K. and Springer, V., *The Center of the Center of Marine Shore Fish Biodiversity*.

³⁰ Sollestre, L., Awitan, L., and Amboya, R., *Marine Protected Area Networking in the Center of the World's Marine Shorefish Biodiversity Abundance: Verde Island Passage Marine Corridor*.

³¹ Conservation International, *Vulnerability Assessment of Verde Island Passage*.

³² Ibid.

Climate-blind legal and regulatory proposed frameworks for midstream and downstream gas

The build-up of gas projects in Verde Passage comes against the backdrop of the coal industry's sunset and the formulation of climate-blind legal and regulatory frameworks for gas. Last October, DOE issued a coal moratorium, several pipeline coal projects have since been shelved, while the remaining projects continue to face strong opposition from frontline communities, electric consumers, and climate justice advocates.

Meanwhile, the Energy Committees of the House of Representatives and Senate are deliberating HB3031 and SB2203 respectively, which seek to develop midstream and downstream natural gas industries towards promoting overseas LNG and developing the country as the LNG trading and transshipment hub in Asia-Pacific.

CEED's recent [briefer](#) on the bills explained why the proposed bills are climate-blind. The briefer emphasized on the lack of an immediate phase-out of coal and the eventual phase-out of gas, after it has served its purpose as a bridging fuel to the energy transition. The bills are also silent on the long-standing problem with the inflexible grid and the immediate need to develop it to maximize the integration of variable renewable energy sources.

Most recently, a broad network of frontline communities, civil society organizations, and people's organizations have called for the rejection of the bills due to the issues of energy insecurity, expensive and volatile power rates, climate-blind framework, and threats to health, environment, and livelihood. These circumstances combined signal the start of the country's next climate battle, with the world acclaimed Verde Passage as its battleground.

Cautions from EERI's proposed Batangas CCGT Plant and BCE's proposed LNG and CCGT Plant

Massive build-up of gas projects in Verde Passage will certainly threaten this critical ecosystem. The declared potential impact and residual effects in the EIS Reports for the proposed gas projects of EERI (Batangas 2x875MW CCGT Plant) and BCE (1,100 MW LNG Power Plant and LNG Storage and Regasification Terminal) provides a clear picture of these threats, including unavoidable impacts (Table 9).

Worth noting here are the lack of mention of critical impacts to: (1) marine ecology such as surface water contamination from leakages of chemical additives or wastewater, and aquatic contamination; (2) health of communities, aggravating existing respiratory and cardiovascular diseases, and put elderly, children, and other vulnerable groups at greater risk of developing complications; (3) livelihoods of impoverished coastal communities such as the lower fish catch; and (3) climate impacts due mainly to methane emissions.

Table 9. EERI's Batangas CCGT Plant & BCE's Batangas LNG Terminal and CCGT Plant - Summary of Main Impacts and Residual Effects after Applying Mitigation

Phase	Environment	Potential Impact	Residual Effects
Construction phase	Land – Terrestrial Ecology	<ul style="list-style-type: none"> Vegetation removal of approximately 18.50 ha (or 70.5% of the total Project Site inland area) will lead to habitat loss, fragmentation, edge effects and potential impacts on the presence of wildlife and vegetation species (native, endemic and threatened species) Change in subsurface underground geomorphology Soil Contamination 	Unavoidable impact due to land clearing activities
		<ul style="list-style-type: none"> Change/Inconsistency in Land Use Change in surface landform/terrain/slope Change in sub-surface underground geomorphology Soil erosion Vegetation removal and loss of habitat Threat to existence and/or loss of important local species Threat to abundance, frequency and distribution of important species Hindrance to wildlife access 	
	Water - Marine Ecology	Physical damage to the fringing reef in the foreshore area which could result to loss of coral cover (0.29 ha with an average HCC of 42%)	Unavoidable impact due to construction of offshore components
		<ul style="list-style-type: none"> Change in drainage morphology/ inducement Change in stream, lake water depth Depletion water resources/ competition in water use Degradation of groundwater quality 	
	Air – Ambient Air Quality	<ul style="list-style-type: none"> Degradation of air quality due to fugitive dusts such as wheel entrained dusts, storage and handling of materials, and stockpiles of construction equipment and combustion of construction vehicles and heavy equipment 	Unavoidable but impacts may be lessened if mitigating measures are properly implemented
		<ul style="list-style-type: none"> Change in local climate and local temperature Degradation of Air Quality Increase in ambient noise level Increase in greenhouse gas emissions Increase concentration of gas emission from vehicles/ trucks Dust generation/ increase of suspended particles during construction 	
	People	<ul style="list-style-type: none"> Traffic during peak hours (6:00 am to 8:00 pm 11:00 to 1:00 PM and 4:00 to 7:00 PM) Road safety and vehicular implemented accidents Construction-related hazards Spread of communicable diseases from migrant workers 	Unavoidable but impacts may be lessened if traffic management measures are properly Road safety and vehicular implemented

Operation phase	Land – Terrestrial Ecology	<ul style="list-style-type: none"> Subsidence and Liquefaction Soil contamination 	
	Water - Marine Ecology	<ul style="list-style-type: none"> The coral reef area will experience a 1.5-2.0°C increase in sea surface temperature (SST) during the operation of the outfall under normal wind conditions. Increase in sea temperature is detrimental to the existing marine environment especially the coral reef. High temperature increase can cause coral bleaching and negative physiological effects to reef fish Degradation of water quality Depletion of water resources/ competition in water use Water contamination due to accidental release of fuel, lubricants and chemicals 	Unavoidable impact
	Air – Ambient Air Quality	<ul style="list-style-type: none"> Degradation of ambient air quality due to emissions from fuel-based power generation Increase in ambient noise level Increase in greenhouse gas emissions Air pollution from emergency generators and vehicle emissions 	
	People	<ul style="list-style-type: none"> Generation of sewage/solid waste Change in population (size, distribution) In-migration Overburdening of public social services Introduction of disease between migrant and local workers Increased social and economic financial activity Fire hazard Generation of health hazards to plant workers & the public 	
Abandonment Phase	Land – Terrestrial Ecology	<ul style="list-style-type: none"> Soil contamination 	
	Water - Marine Ecology	<ul style="list-style-type: none"> Disposal of wastes may lead to possible impacts from spills and discharges of contaminants affecting groundwater quality 	
	Air – Ambient Air Quality	<ul style="list-style-type: none"> Generation of noise Generation of dusts 	
	People	<ul style="list-style-type: none"> Nuisance Decommissioning activities may cause local disturbance or damage through increased road traffic, noise, etc. 	

Source: EERI, [EIS Report](#); BCE, [EIS Summary](#)

Part Six: Addressing the Gas Trilemma

The Philippines cannot promote the fossil gas industry without confronting the conflicting challenges of energy security, equity, and sustainability, or the so-called energy trilemma. CEED recommends the following measures to minimize tradeoffs:

1. Rationalize and harmonize energy and power policies, laws, and plans towards increasing energy security.

Energy insecurity is a real and material risk of promoting fossil gas today. For one, the nearing depletion of the Malampaya gas field and the lack of commercial gas discovery so far will force the country to either rely on overseas LNG for existing and proposed gas-fired power plants or underutilize gas-fired power plants for lack of supply.

The lack of energy self-sufficiency will leave the country vulnerable to supply disruption risks, which are heightened even more during the pandemic. Meanwhile, the underutilization of gas plants will expose gas developers and financiers to [stranded asset risks](#). There is also another overlooked but critical factor in the energy security conversation—the security risk that come with exploring gas fields in waters within or near China's nine-dash line claim, where it continues its military expansion and displays aggressive behavior against any foreign vessel.

Ensuring and increasing energy security has been a long-declared policy in several existing laws such as the Oil Exploration and Development Act of 1972, Electric Power Industry Reform Act of 2001, and the Renewable Energy Act of 2008. While there are many factors contributing to the problem of energy insecurity we face today, the DOE should be first to blame.

It is the declared policy of the Renewable Energy Act to “accelerate the exploration and development of renewable energy resources to achieve energy self-reliance” and “reduce the country's dependence on fossil fuels and thereby minimize the country's exposure to price fluctuations in the international markets”. Yet DOE's obstinate technology neutral stance and decade-long delay in issuing rules for mechanisms under the Renewable Energy Act significantly delayed renewable energy expansion.

The government's conflicting policies on fossil fuels and renewable energy also hinders the utilization of the country's untapped renewable energy potential. To this day, contractors exploring, developing, and producing fossil fuels receive incentives under the Oil Exploration and Development Act and the Coal Development Act of 1976. Meanwhile, renewable energy developers are granted incentives under the Renewable Energy Act.

The rationalization and harmonization of energy and power policies, laws, and plans towards increasing energy security is long overdue. This should start with repealing fossil fuels subsidies, prohibiting DOE to take a technology neutral stance, and declaring a coal phase-out policy.

2. Expedite grid expansion and modernization and review power procurement practices to promote energy equity.

Simply promoting fossil gas without addressing the prevalent ailments of a baseload-reliant power grid and anti-consumer power procurement practices will not address the problem of energy inequity.

No different from coal, gas suppliers are passing on expensive fuel and other costs to electric consumers, increasing generation rates from Php 4.4562 to 6.2789 higher than their PSA rates in

the past year (Figure 7). Once gas power plant operators start sourcing their fuel from overseas LNG, generation rates should be expected to spike further depending on global or regional LNG prices and currency fluctuations.

Moreover, if the grids remain baseload-reliant and inflexible, gas cannot be expected to play its role as a better complement to variable renewable energy technologies. It can only serve to replace coal as a baseload resource or, worse, crowd-out renewable energy without replacing coal. Frequent and prolonged outages from unreliable and inflexible coal plants and grid instability will continue to burden electric consumers who will not only suffer from brownouts but also pay the costs for reimbursable forced outages.

The solution is to prioritize and expedite grid expansion and modernization to maximize the integration of variable renewable energy into the grid, and review anti-consumer power procurement practices to protect electric consumers from unfavorable and anomalous power supply agreements.

3. Develop an energy transition plan that is aligned with the 1.5°C Paris temperature goal, which will prevent crowding-out of renewables and carbon lock-in from fossil fuels.

The DOE's roadmaps for the fossil gas industries position gas as the preferred fuel that will be developed into maturity and will drastically increase in share of both total primary energy supply and consumption, without a clear exit strategy. The roadmaps seem to have been developed inside a bubble, isolated from global climate imperatives.

Yet experiences from other countries teach us that gas can either serve as a bridge fuel or a roadblock in the energy transition. Prematurely adopting policies promoting gas, without first developing an energy transition plan that is aligned with the 1.5°C Paris temperature goal, will position gas as roadblock that will result to a carbon lock-in and a crowd-out renewable energy.

The Philippines cannot promote the fossil gas industry without confronting the conflicting challenges of energy security, equity, and sustainability, or the so-called energy trilemma.

The development of 1.5°C-aligned energy transition plan is urgently needed to clearly determine if gas is necessary for the country's energy transition, to what extent and for how long. Absent this plan, gas industries can create barriers against renewables, prolong the transition, and ultimately hinder reaching climate goals.

The energy transition plan should include the urgent phase-out of coal and oil, and eventually gas, through imposing an upper-limit or a maximum capacity for fossil fuels, mandatory retirement, conversion, or repurposing of fossil fuel infrastructures, emissions cap, and carbon tax that would gradually increase to price out coal and oil first, then fossil gas from the market.

References

Asian Development Bank, "Summary of Environmental Impact Assessment GNPOWER 2x600MW LNG-Fired Combine Cycle Power Plant Project in the Philippines", Published April 2004. <https://www.adb.org/sites/default/files/project-document/70043/phi-gnpower.pdf>

Business World, "Natural Gas Import Projects Slow out of the Gate – Fitch Solutions", Published February 5, 2020. <https://www.bworldonline.com/natural-gas-import-projects-slow-out-of-the-gate-fitch-solutions/>

Business Mirror, "4 LNG Players get DOE's Approval to Build Terminal", Published November 2, 2020. <https://businessmirror.com.ph/2020/11/02/4-lng-players-get-does-approval-to-build-terminal/>

Business World, "Meralco Weighs Foray into Gas Business", Published March 3, 2021. <https://www.bworldonline.com/meralco-weighs-foray-into-gas-business/>

Carpenter, K. & Springer, V. The center of the center of marine shorefish biodiversity. Published April 2005. Retrieved from Research Gate: https://www.researchgate.net/publication/227112122_The_center_of_the_center_of_marine_shore_fish_biodiversity_The_Philippine_Islands

Center for Ecology, Environment and Development, "The Decade in Review", Published May 7, 2020.

Conservation International. Vulnerability assessment of Verde Island Passage. Published 2010. https://www.conservation.org/docs/default-source/publication-pdfs/vulnerability-assessment-verdeislandpassage_philippines.pdf

Department of Energy, "Libertad Gas Field", <https://www.doe.gov.ph/natgas/libertad-gas-field>

Department of Energy, "Philippine Energy Plan 2018-2040", <https://www.doe.gov.ph/pep>

Department of Energy, "Laws & Issuances (Oil & Gas)". <https://www.doe.gov.ph/laws-issuances-oil-gas>

Department of Energy. DOE Marks PH as LNG Hub. March 23, 2021. <https://www.doe.gov.ph/press-releases/doe-marks-ph-lng-hub>

Department of Energy. DOE Receives Update on Vires Project. April 28, 2021 <https://www.doe.gov.ph/press-releases/doe-receives-update-vires-project>

Department of Energy. Natural Gas Production and Consumption as of February 8, 2021. <https://www.doe.gov.ph/natgas>

De Torres, CEED. Why the Midstream and Downstream Natural Gas Industries Development Bills are Climate-blind <https://ceedphilippines.com/wp-content/uploads/2021/04/CEED-Policy-Brief-On-Fossil-Gas-Bills.pdf>

Domingo, Ronnel, "Lloyds Energy looking to build power plants in PH", Published June 26, 2019. <https://business.inquirer.net/273316/lloyds-energy-looking-to-build-power-plants-in-ph>

Domingo, Ronnel, "AboitizPower shuns coal in favour of natural gas", Published November 26, 2020. <https://business.inquirer.net/311166/abotizpower-shuns-coal-in-favour-of-natural-gas>

Dommermuth, Carsten, "Small-scale LNG". MAN Energy Solutions. Accessed April 15, 2021. https://www.man-es.com/docs/default-source/energy-storage/man_whitepaper_small-scale_lng.pdf

Energy World Corporation, "Annual General Meeting 2009", Filed with OTCBB and Published July 22, 2010. <https://sec.report/otc/financial-report/34199>

ERIA, 'Investment in LNG Supply Chain Infrastructure Estimation', in Uemura T. and K. Ishigami (eds.), Formulating Policy Options for Promoting Natural Gas Utilization in the

East Asia Summit Region Volume II: Supply Side Analysis. ERIA Research Project Report 2016-07b, Jakarta: ERIA, 2018, pp.67-80.

First Gen, "Corporate Profile" Retrieved May 25, 2021. <https://www.firstgen.com.ph/our-company/corporate-profile>

First Philippine Holdings Corp. SEC 2021 Information Statement. <https://www.fphc.com/storage/app/media/SEC%2020-IS%20Def.pdf>

Flores, Alena Mae, "SMC unit to build P67-b power plant". Manila Standard. Published January 10, 2021 <https://www.manilastandard.net/business/power-technology/344053/smc-unit-to-build-p67-b-power-plant.html>

Flores, Alena Mae, "Shift to Coal from LNG defended", Publication August 4, 2014 <https://manilastandard.net/mobile/article/154002>

Global Energy Monitor, "Global Fossil Infrastructure Tracker". https://greeninfo-network.github.io/fossil_tracker/

Greenpeace, "Southeast Asia Power Sector Scorecard", Published September 23, 2020. <https://www.greenpeace.org/southeastasia/publication/44037/southeast-asia-power-sector-scorecard-assessing-the-progress-of-national-energy-transitions-against-a-1-5-degrees-pathway/>

Greenpeace, "Decarbonizing Meralco", Published April 14, 2021. <https://www.greenpeace.org/philippines/publication/10461/decarbonizing-meralco/>

Gonzales, Iris, "LNG Project faced delay as Government flip-flops", August 13, 2017. <https://www.philstar.com/business/2017/08/13/1728552/lng-project-faces-delay-govt-flip-flops>

House of Representatives, "House Bill No. 3031.", http://congress.gov.ph/legisdocs/basic_18/HB03031.pdf

Independent Commodity Intelligence Services, "GNPower's Philippines Import Proposal Crushed by a Price Pressure", Published February 9, 2007. <https://www.icis.com/explore/resources/news/2007/02/09/9293840/gn-power-s-philippines-import-proposal-crushed-by-price-pressure/>

International Energy Agency, "Southeast Asia Energy Outlook 2019", Published October 2019. <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

International Energy Agency, "Methane Tracker 2020", Published October 2019. <https://www.iea.org/reports/methane-tracker-2020/methane-from-oil-gas>

McDermott-Levy R, Kaktins N, Sattler B, "Fracking, the environment, and health." Am J Nurs. Published June 2013 doi: 10.1097/01.NAJ.0000431272.83277.f4. PMID: 23702766.

MERALCO. Meralco Generation Rates January 2020 – April 2021. <https://company.meralco.com.ph/news-and-advisories/rates-archives>

Philippine Daily Inquirer, "P155-B energy complex to rise in Batangas", Publication August 2, 2019 <https://business.inquirer.net/269632/p155-b-energy-complex-to-rise-in-batangas>

Philippine National Oil Company. "Project Status as of January 23, 2019". January 23, 2019. <http://www.pnoc.com.ph/images/Project-Status-asof-23January-2019.pdf>

Power Philippines, "Shell, 2 other companies plan LNG ventures", Published on January 13, 2021. <http://powerphilippines.com/shell-2-other-companies-plan-lng-ventures/>

Reuters, "Planned \$2 billion LNG project in Philippines put on hold". Published December 18, 2019. <https://www.reuters.com/article/us-phoenix-phil-cnooc-natgas/planned-2-billion-lng-project-in-philippines-put-on-hold-idUSKBN1YM15J>

Reuters. Japan-backed AG&P says gets approval to develop Philippines LNG terminal. March 8, 2021. <https://www.reuters.com/article/philippines-lng-imports-idUSL1N2L606Y>

Senate of the Philippines, "Senate Bill No. 2203." <http://legacy.senate.gov.ph/lisdata/3496831795!.pdf>

SMC Annual Report 2016. [https://smcglobalpower.com.ph/files/reports/17-A/Amended_SMC_Global_Annual_Report_2016_\(17-A\).pdf](https://smcglobalpower.com.ph/files/reports/17-A/Amended_SMC_Global_Annual_Report_2016_(17-A).pdf)

Soldo, Alimonti & Scrocca. Geothermal Repurposing of Depleted Oil and Gas Wells in Italy. Published September 11, 2020. <https://www.mdpi.com/2504-3900/58/1/9>

Sollerstre, Awitan & Amboya, "Marine Protected Area Networking in the Center of the World's Marine Shorefish Biodiversity Abundance: Verde Island Passage Marine Corridor", Published 2019. http://www.pemsea.org/sites/default/files/ICM_Case_Studies_Book_48_Part_III_CS46.pdf

Union of Concerned Scientists, "Environmental Impacts of Natural Gas". Published Jun 19, 2014. <https://www.ucsusa.org/resources/environmental-impacts-natural-gas>

United States SEC. KEPCO 2011 Form 20-F. <https://www.sec.gov/Archives/edgar/data/887225/000119312511178441/d20f.htm>



132 Matahimik Street, Diliman, Quezon City Philippines 1100
info@ceedphilippines.com
www.ceedphilippines.com