

# ASEANのエネルギー分野の 現状・関連動向に係る調査 － 定点調査業務2023

報告書 - Philippines



ARTHUR D LITTLE

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**1. 一次エネルギー構成**

- a. 国全体
- b. 今後の政策(マスタープラン(化石燃料選択、再生可能エネ導入予定等))

**2. 化石エネルギー**

- a. 石油、石炭、天然ガスの国内需給率と今後の予測
- b. 石油、石炭、天然ガスの輸出入先
- c. 主な油田、石炭鉱山、天然ガス田のマッピング、産出量、開発／運営事業者名
- d. 今後数年以内に開発が開始される主な油田、石炭鉱山、天然ガス田のマッピング、四総産出量、開発／運営事業者名
- e. 石炭火力発電の導入状況及び今後の導入方針
- f. 石油、石炭、天然ガスの国内販売価格
- g. 権限所掌省庁と部局

**3. パイプライン(ガス・石油)**

- a. 規定する法律と内容
- b. 主なガス・石油パイプライン網のマッピング、各輸送量、開発・運営事業者名
- c. 今後の政策とそれを規定する法律
- d. 権限所掌省庁と部局

**4. 次世代・再生可能エネルギー**

- a. 太陽、風力、地熱、バイオマス、水力、水素等の構成割合
- b. 主な太陽光、風力、地熱、水力発電事業場所のリスト(特に水力は揚水/自流/貯水式、可変式の有無情報も)とマッピング、開発者／運営事業者名
- c. 現状のバイオマス燃料の利用状況と今後の予測
- d. 権限所掌省庁と部局
- e. CCUS関連政府・民間の最新動向、主なCO2排出源、CCS貯留ポテンシャル
- f. COP28に向けたCN関連政策・技術動向(ブルーカーボン、e-fuelなど)

**5. 発電事業者**

- a. 参入条件を規定する法律と内容
- b. 発電事業者名とその法人形態(国営、株式会社等)、参入予定事業者名
- c. 電力自由化状況(発電、送電、配電の独占状況)
- d. 各事業者の発電量シェア

- e. 事業者に対する国からの補助金状況
- f. 権限所掌省庁と部局

**6. 発電所**

- a. 稼働中の主な発電所のマッピング
- b. 当該発電所の種別(石油火力、石炭火力、ガス火力等)、事業主体のリスト
- c. 発電所建設に係る問題点(土地収用の状況、地域住民のコンセンサス、燃料の調達等)整理
- d. 判明している発電所建設計画のマッピング
- e. 権限所掌省庁と部局

**7. 電力品質**

- a. 規定する法律と内容
- b. 電力品質の現状(停電、瞬低、電圧変動状況等)
- c. 電力品質向上に向けた主な取組状況(関連政策及び具体的事業名)
- d. 権限所掌省庁と部局

**8. 送電網**

- a. 規定する法律と内容
- b. 超超高電圧(UHV、500kV)・超高圧(EHV、220-275kV)・それ以下の主な送電網のマップ表示
- c. 今後の政策とそれを規定する法律
- d. 予定されている主な送電線敷設事業名
- e. 権限所掌省庁と部局

**9. 電力料金**

- a. 現状とそれを規定する法律
- b. 補助金投入状況
- c. 当該国での特殊事情
- d. 再生可能エネFITに関する動向
- e. 権限所掌省庁と部局

**10. 電力需給状況**

- a. 電力供給状況と需要状況(逼迫度)

# 1. 一次エネルギー構成

## フィリピンの主な一次エネルギー源は石油と石炭

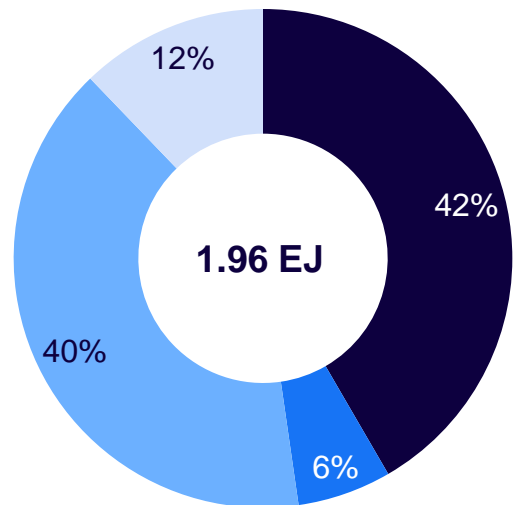
### Primary energy consumption

2021, Exajoules



Philippine's primary energy demand in 2021 is 1.96 EJ, with oil and coal accounting for over 80% with oil at 0.82 EJ (42%) and coal at 0.79 EJ (40%). RE consumption comes in third at 0.24 EJ (12%), of which 0.09 EJ is comprised of hydropower followed by natural gas at 0.12 EJ (6%)

Oil Natural Gas Coal RE\*



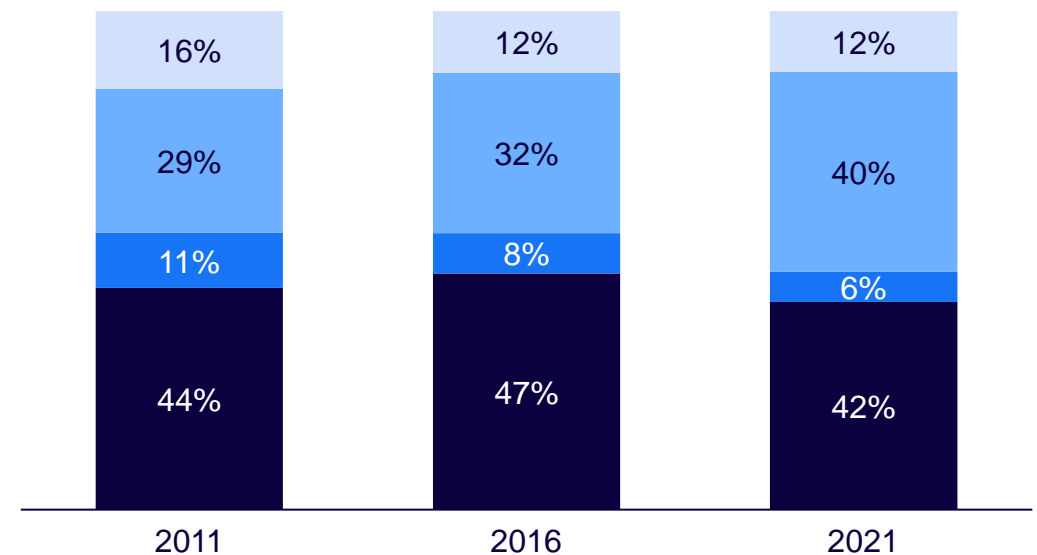
### Historical primary energy consumption

2011 – 2021, %



Oil currently has the largest weight, averaging ~44%. This is followed by coal, which has seen an increased dependency in recent years, as increase of 11% from 2011 mix of 29% to 40% in 2021. Surprisingly, RE comes in third, with natural gas dependency at all time low of just 6% in 2021.

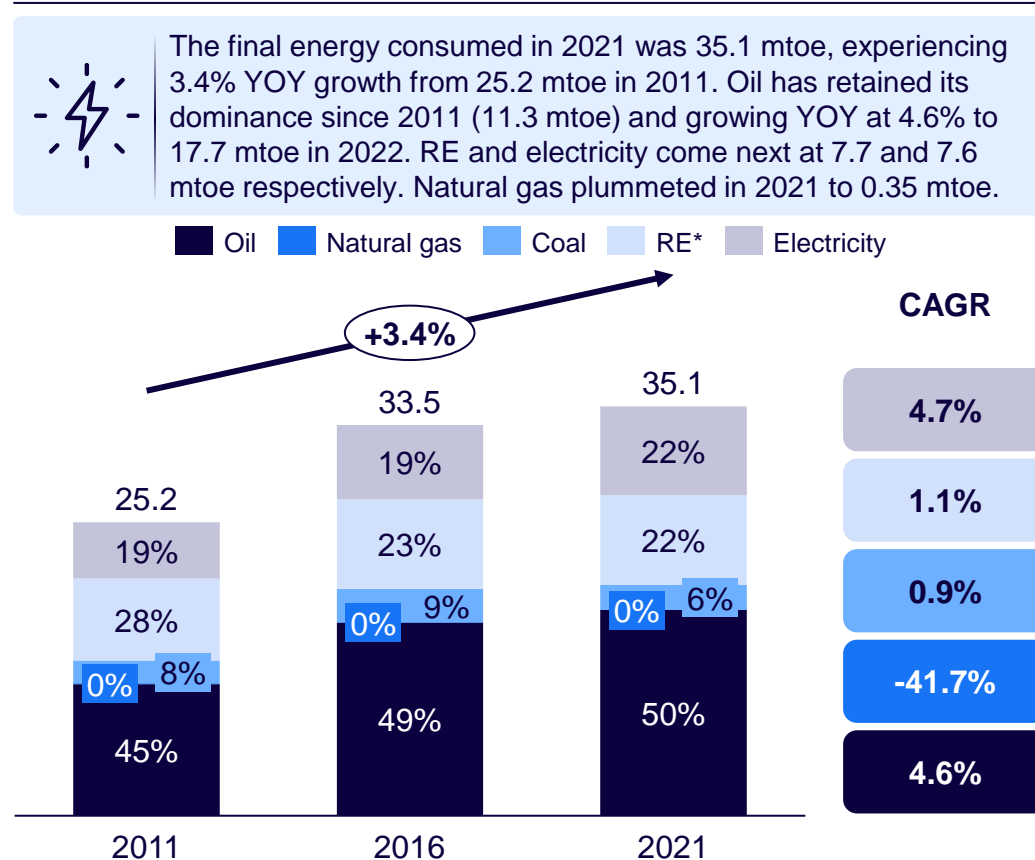
Oil Natural Gas Coal RE\*



## フィリピンの最終エネルギー消費の多くは石油が占めており、輸送と家庭が主な消費源

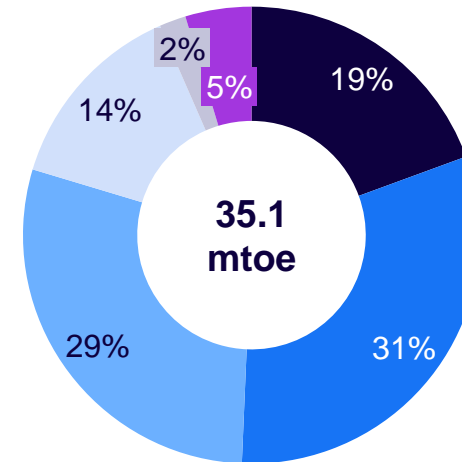
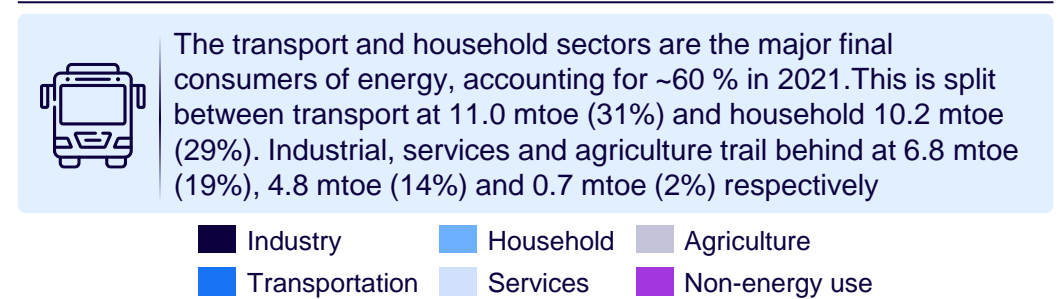
### Final energy consumption

2011 - 2021, mtoe<sup>1</sup>



### Final energy consumption, by sector

2021, mtoe<sup>1</sup>



## フィリピンのエネルギー関連の政策は以下

NON-EXHAUSTIVE

### Summary of energy policies

2023 (Revised)	<b>Philippine Energy Plan 2020-2040</b>	<ul style="list-style-type: none"> <li>Formulates <b>comprehensive sectoral roadmaps and targets</b> to advance the energy agenda</li> <li>Increase the production of clean and indigenous sources of energy and energy efficiency</li> <li>Promote a balance between the provision of reliable and reasonably priced energy services, support for economic growth, and protection of the environment</li> </ul>
2022	<b>Transmission Development Plan 2022-2040</b>	<ul style="list-style-type: none"> <li>Developed by the <b>National Grid Corporation of the Philippines</b> (NGCP) and guided by the overall objectives set in the power sector roadmap in the Philippine Energy Plan 2020-2040</li> <li>Enabling capacity-sharing through grid interconnection, transitioning to the smart grid, grid resilience through asset refresh, and full harmonization of renewable energy resources</li> </ul>
2021	<b>Power Development Plan 2020-2040</b>	<ul style="list-style-type: none"> <li>Developed by the Department of Energy, containing a power demand and supply outlook until 2040 and the <b>associated power sector roadmap</b></li> <li>Primary objectives are to enhance energy security, resiliency, access, and affordability while promoting a transparent and fair playing field in the power industry</li> </ul>
2018	<b>Various regional energy plans</b>	<ul style="list-style-type: none"> <li>Mindanao Energy Plan 2018-2040</li> <li>Marinduque Energy Plan 2018-2040</li> <li>Romblon Energy Plan 2018-2040</li> </ul>

## エネルギーに関するフィリピンの国家目標を支援するため、様々なセクター別ロードマップも策定されている(1/2)

NON-EXHAUSTIVE

### Overview of sectoral roadmaps

Name	Summary of long-term targets (2023-2040)
Upstream Oil and Gas Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Increase indigenous petroleum reserves to 57.12 MMB oil, 5.87 TCF gas and 56.81 MMB condensate</li> <li>• Drill 2 oil fields and 3 gas fields, to produce 115.37 MMB oil and 4.04 TCF gas</li> </ul>
Coal Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Increase indigenous coal reserves to 766 MMmt with 282 MMmt of production, to enhance energy security</li> </ul>
Downstream Oil Industry Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Introduce hydrolyzed fuel and higher bio-ethanol levels (E20)</li> <li>• Introduce ultra-low sulfur and develop a low-carbon fuel standard</li> </ul>
Downstream Natural Gas Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Continue monitoring the consumption of LNG in off-grid islands</li> <li>• Commission additional natural gas power plants</li> <li>• Promote the use of CNG in provincial buses and in the commercial and residential sectors</li> </ul>
Electric Power Industry Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Ensure a reliable and affordable supply of high-quality electric power</li> <li>• Expand access to electricity and ensure a transparent and fair playing field in the power industry</li> </ul>
Renewable Energy Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Accelerate the implementation of renewable energy projects, with regular updates to the national database</li> <li>• Increase RE installed capacity to at least 20,000 MW</li> </ul>



## エネルギーに関するフィリピンの国家目標を支援するため、様々なセクター別ロードマップも策定されている(2/2)

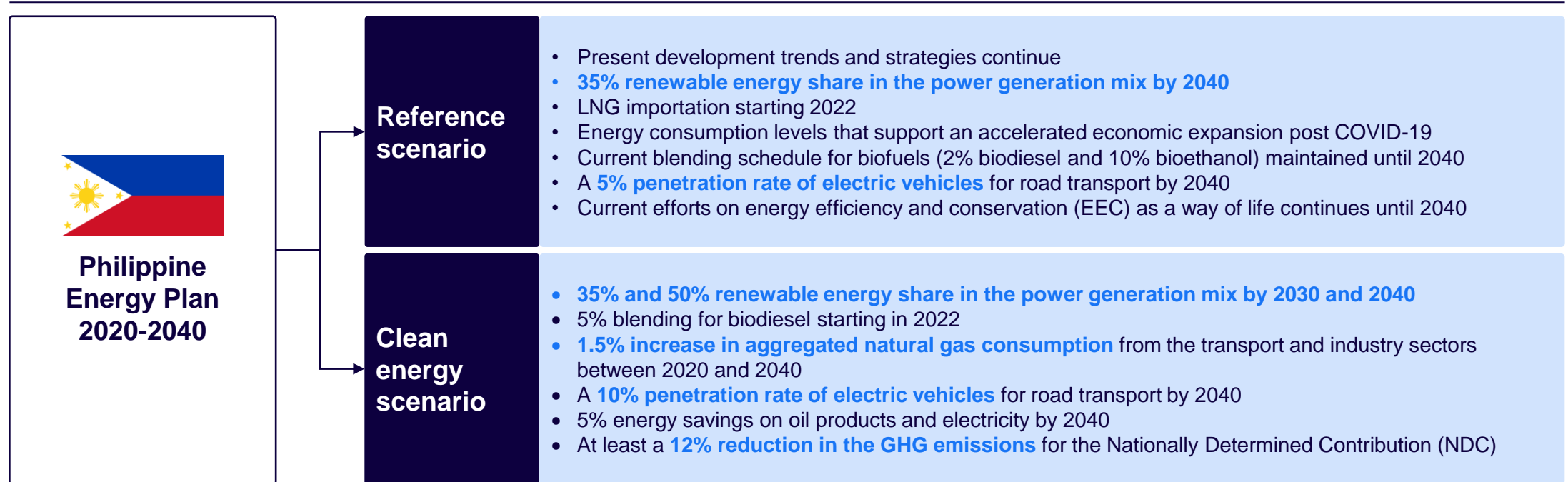
NON-EXHAUSTIVE

### Overview of sectoral roadmaps

Name	Summary of long-term targets (2023-2040)
Biofuels Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Revisit blending requirements and available feedstock</li> <li>• Conduct continuous research and development of feedstock sources</li> <li>• Pursue the development of biofuels (bio-diesel and bio-ethanol) in compliance with the Biofuels Act of 2006</li> </ul>
Alternative Fuels and Energy Technologies Roadmap 2017-2040	<ul style="list-style-type: none"> <li>• Deploy applicable AFET for transport and non-transport services</li> <li>• Collaborate with various private sector players to scale up the use of AFET and energy efficient technologies</li> </ul>
Energy Efficiency & Conservation Roadmap 2023-2050	<ul style="list-style-type: none"> <li>• Provide a national framework to institutionalize the Energy Efficiency and Conservation Act 2019</li> <li>• Support the certification and accreditation of individuals (energy managers, energy conservation officers, energy auditors) and entities (ESCOs)</li> <li>• Nudge energy-intensive organizations to develop energy efficiency plans and implement projects, and report their annual energy consumption to the DOE</li> <li>• Support the development of Minimum Energy Performance for Products (MEPP) for energy-consuming products, for household appliances, in the commercial, transport, and industrial sectors</li> </ul>

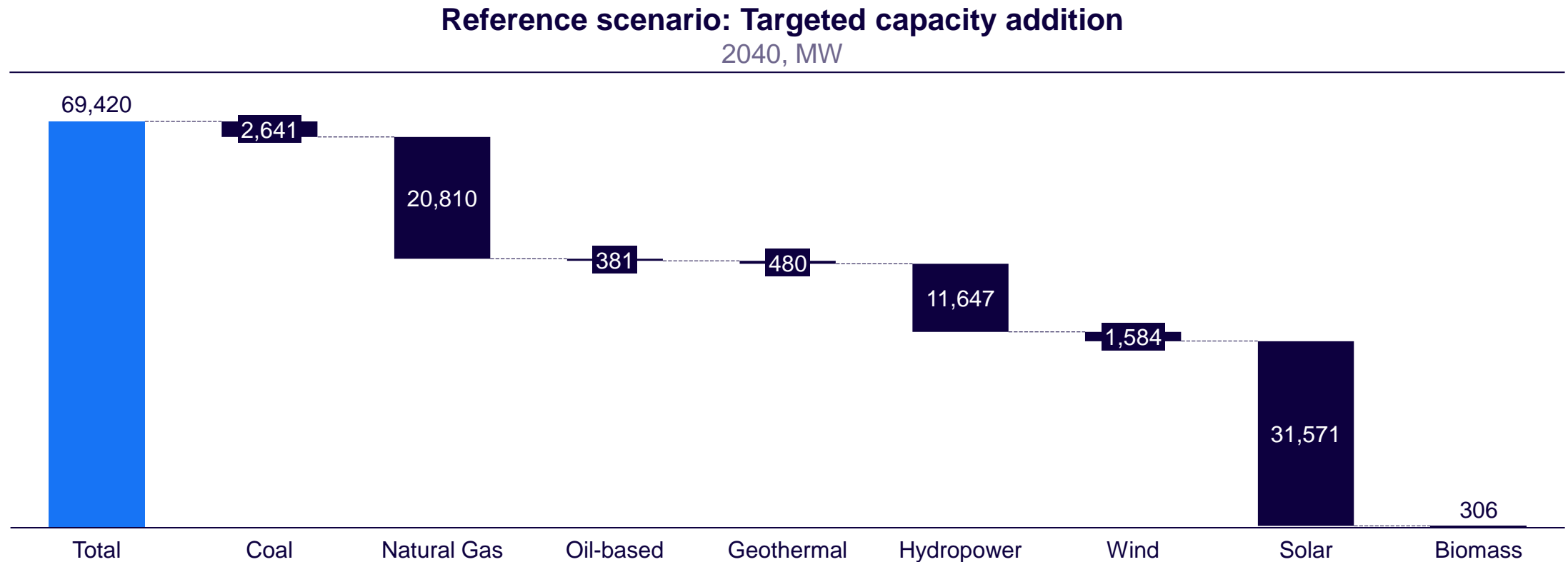
フィリピンの長期エネルギー計画では、シナリオに基づくアプローチをとっており、主に以下の2つのシナリオを想定

### Overview of the two possible energy scenarios



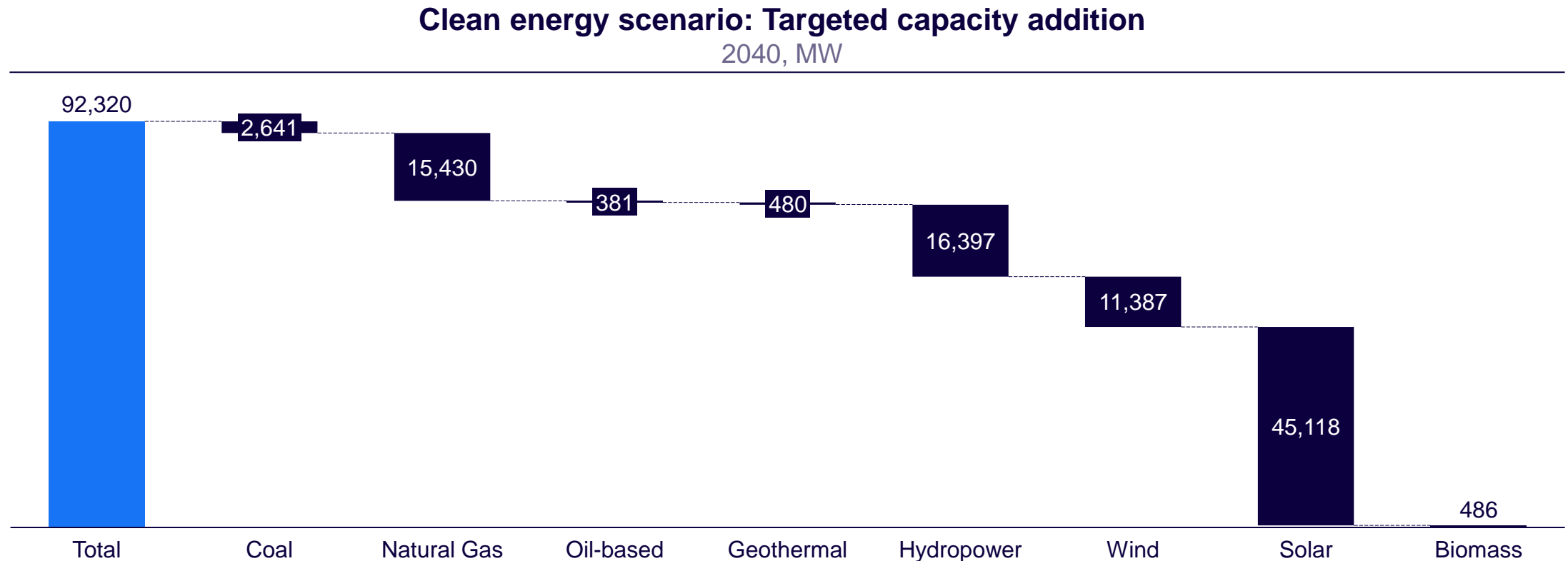
The share of renewable energy generation and allocation of required investment would **differ by scenario**

## どちらのシナリオにおいても天然ガスと太陽光が主に中心的エネルギーになると想定(1/2)



**Solar energy and natural gas** are the 2 major drivers in the reference scenario for the Philippines

## どちらのシナリオにおいても天然ガスと太陽光が主に中心的エネルギーになると想定(2/2)



**Solar energy, hydropower, and natural gas** will form the drivers in the clean energy scenario for the Philippines

## List of observed renewable energy regulations in the Philippines (1/2)

### Renewable energy regulations

1978 – 2014



#	Policy	Year	Status	Jurisdiction
1	Accelerating Household Electrification through Regulated Solar Home Systems	2014	In force	National
2	Implementation of the Household Electrification Programme	2014	In force	National
3	Rules Enabling Net Metering Program for Renewable Energy	2013	In force	National
4	Feed-In Tariff for Electricity Generated from Biomass, Ocean, Run-of-River Hydropower, Solar and Wind Energy Resources	2012	In force	National
5	Ensuring the adequacy and readiness of the Transmission System to accommodate new generating capacities from Renewable Energy (RE) Technologies	2011	In force	National
6	Mandatory use of biofuel blend	2011	In force	National
7	Resolution for Electricity Generation Rates and Subsidies for Off-Grid Areas	2011	In force	National
8	Utilization of Locally Produced Bioethanol in the Production of E-Gasoline Consistent With the Biofuels Act Of 2006	2011	In force	National
9	Feed-in Tariff Rules	2010	Ended	National
10	Steering Committee on Establishment of a Renewable Energy Market	2010	In force	National
11	Accreditation guidelines for renewable energy equipment suppliers	2009	In force	National

## List of observed renewable energy regulations in the Philippines (2/2)

### Renewable energy regulations

1978 – 2014



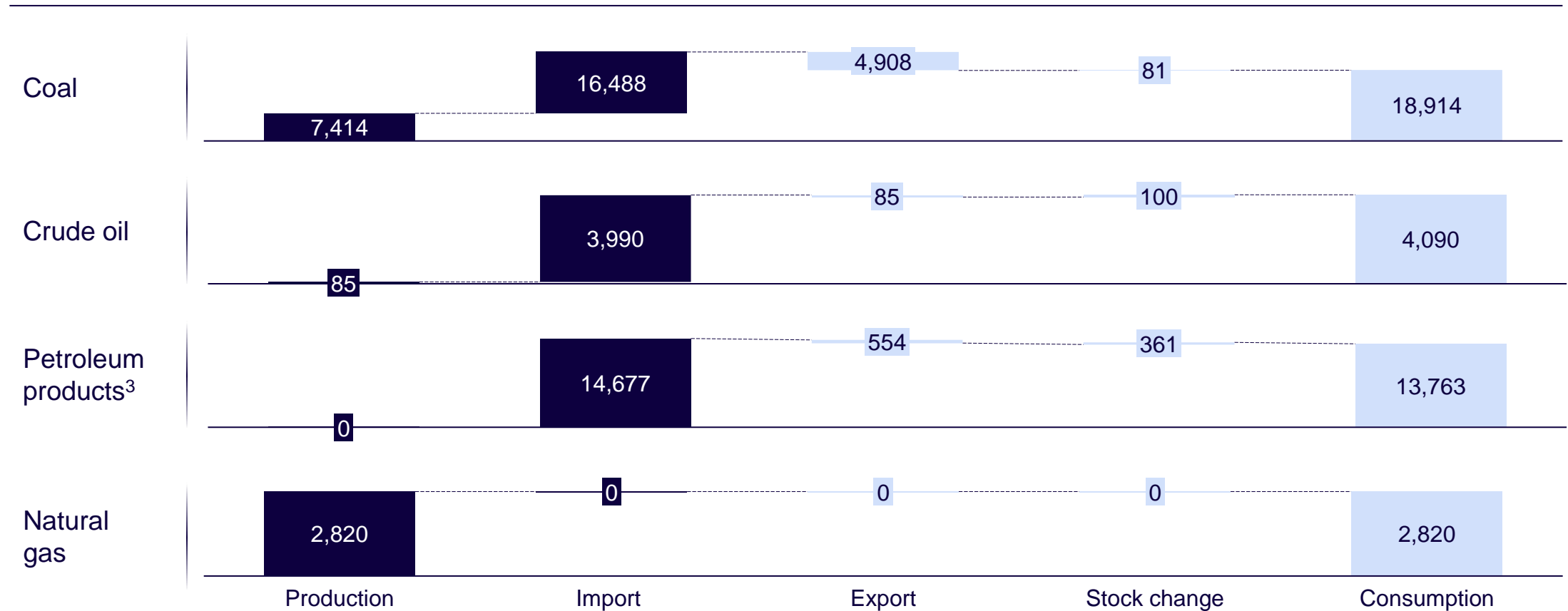
#	Policy	Year	Status	Jurisdiction
12	Guidelines for issuing renewable energy service & operating contracts	2009	In force	National
13	Rules and Regulations for Implementing the Renewable Energy Act	2009	In force	National
14	Guidelines governing the Biofuel feedstocks Production and Biofuels and biofuel blends production, distribution and sale	2008	In force	National
15	Renewable Energy Act	2008	In force	National
16	Biofuels Act	2007	In force	National
17	Investment Priorities Plan (IPP)	2002	In force	National
18	Rules and Regulations to Implement the Power Industry Reform Act	2002	In force	National
19	Act Ordaining Reforms In The Electric Power Industry, Amending For The Purpose Certain Laws And For Other Purposes	2001	In force	National
20	New and renewable energy programme (Exec. Order 462)	1997	In force	National
21	Act Creating the Department of Energy's Rationale for the Organization and Functions of Government Agencies Related to Energy and Other Related Purposes	1992	In force	National
22	Mini-Hydro Law	1991	In force	National
23	Act to Promote the Exploration and Development of Geothermal Resources	1978	In force	National

## 2 化石エネルギー

## 天然ガスを除き多くの燃料を輸入している

### Rate of domestic production and import/export of fossil fuel energy<sup>1</sup>

2021, ktoe<sup>2</sup>



Note: \*Includes quantities stores in international marine bunkers and civil aviation for oil products; 1) Slight discrepancies in volume may result from conversion of different units; 2) Kilo tons of oil equivalent; 3) Comprised of gasoline, kerosene, diesel, fuel oil, LPG, Jet A-1

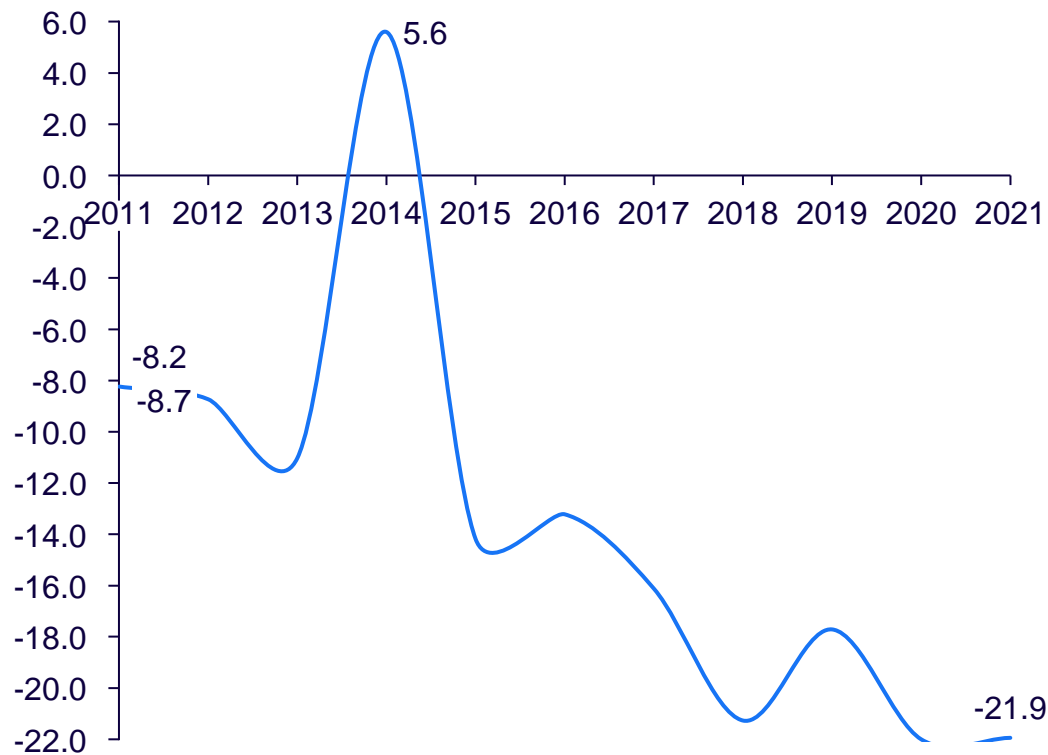
Source: Department of Energy 2022, Arthur D. Little analysis



## 石炭の消費の増加に合わせて、輸入・生産共に増加している

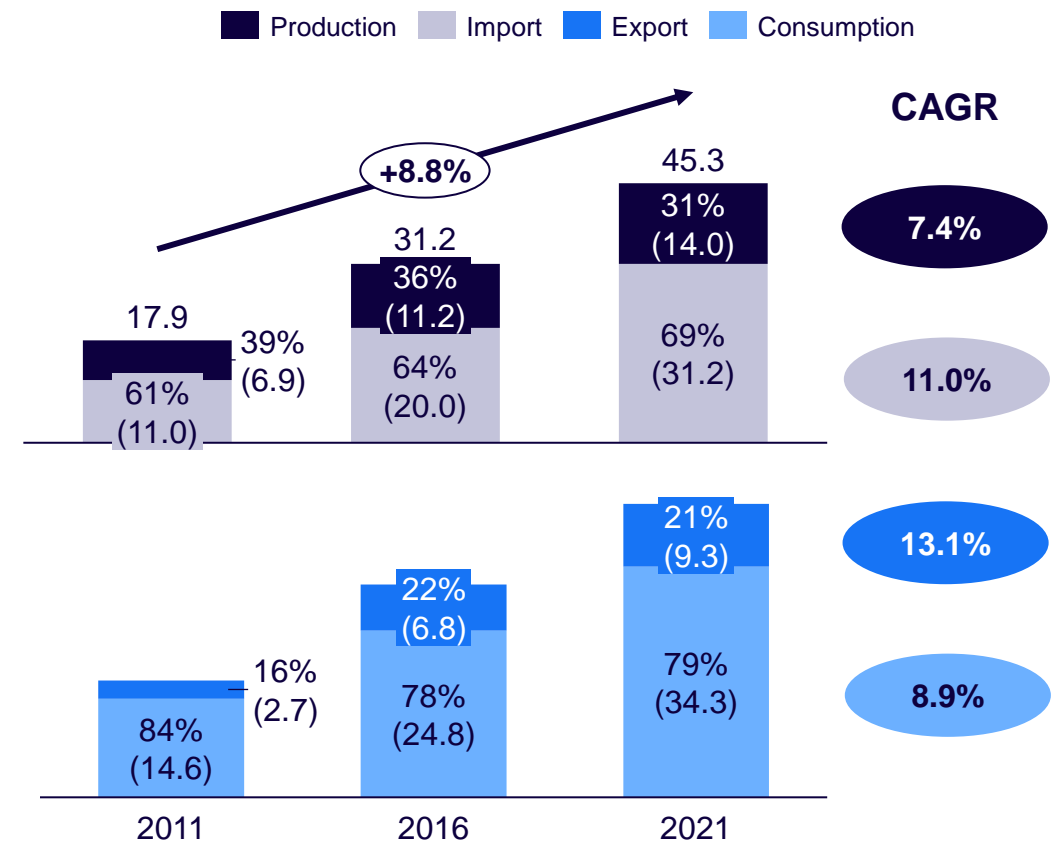
### Coal net export trend

2011 – 2021, Mt



### Coal key trends<sup>1</sup>

2011 – 2022, Mt

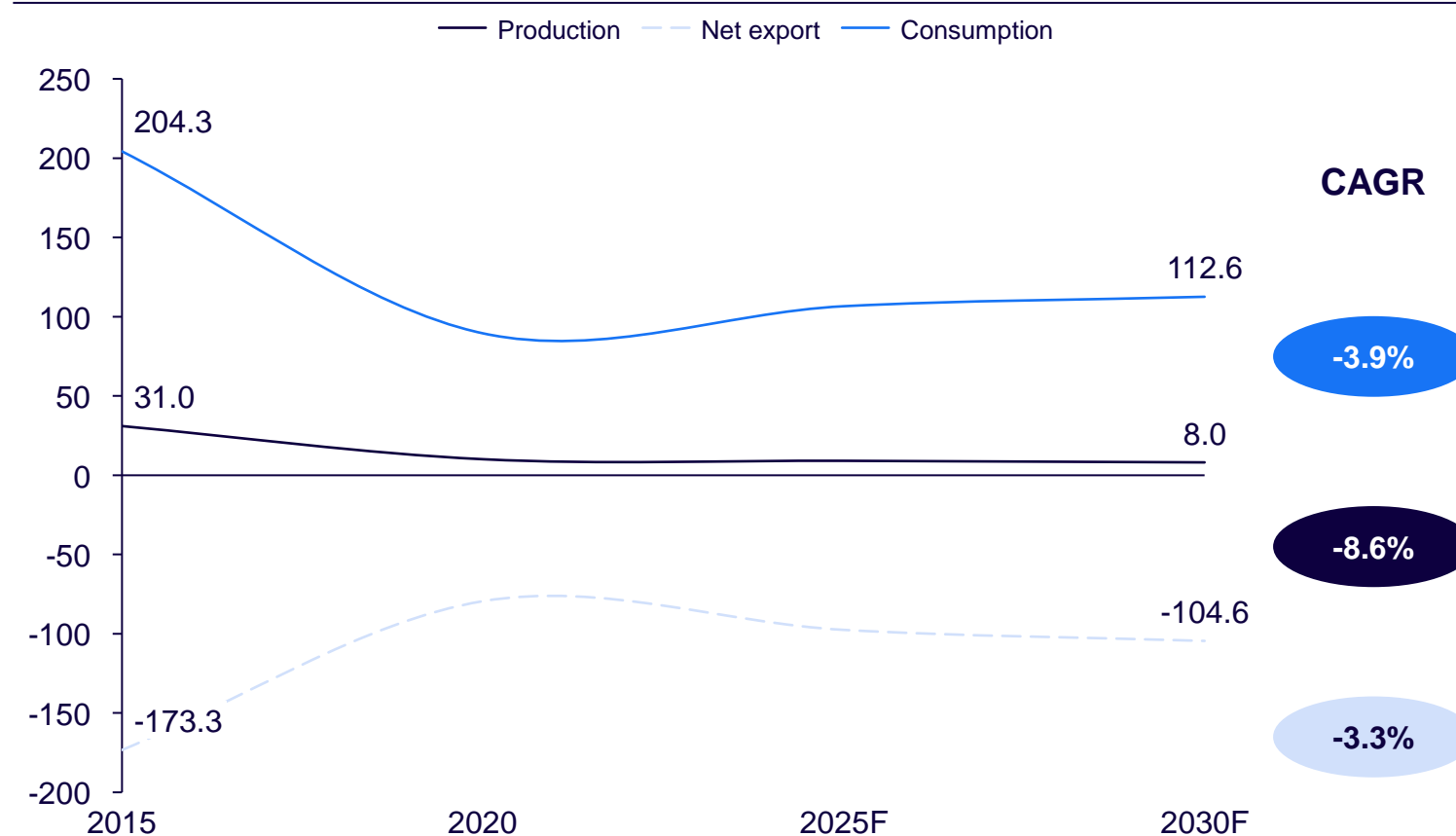


Note: 1) Stock changes have been included in the calculation of supply available for domestic consumption;  
Source: Department of Energy 2022, Arthur D. Little analysis

## 原油生産量は、現在の陸上・海上石油埋蔵量の枯渇を背景に減少する見込み

### Crude oil, NGPL & other liquids key trends

2015 – 2030, 000's bpd<sup>1</sup>



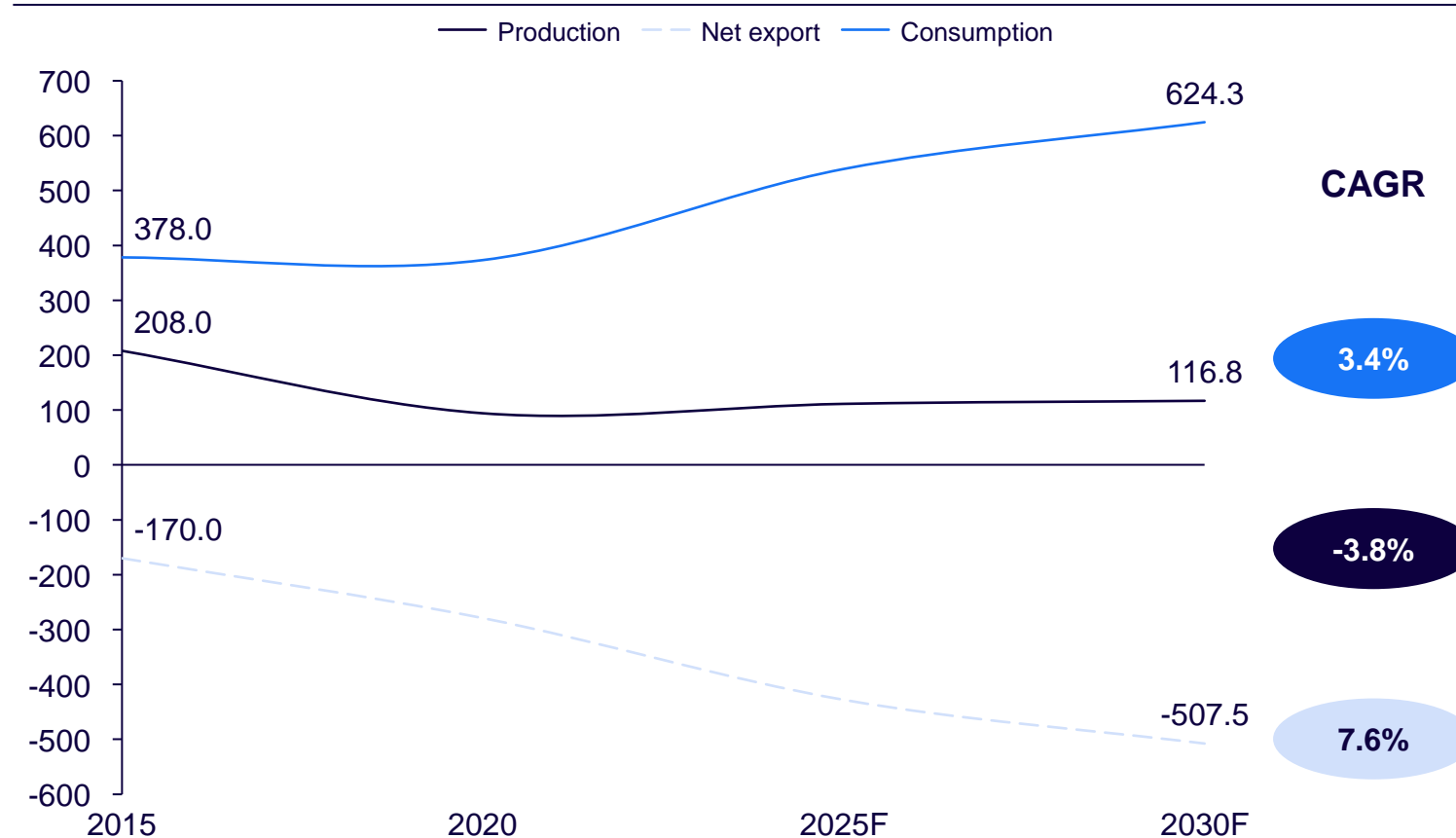
### COMMENTS



- Philippine's production is estimated to fall due to decreased drilling activities in the Galoc and Malampaya fields and limited success in new discoveries
  - This has cause production to crater at a rate of -8.6% YOY from 31,000 bpd in 2015 to 8,000 bpd in 2030
- Condensate production from Malampaya gas field, comprised of 77% of the country's total crude oil production in 2022
- Falling demand of 3.9% YOY from 2015 – 2030 has eased the burden on imports, cause net exports to drop by 3.3% YOY from -173,000 bpd exported to -105,000 bpd

## 輸入への依存を減らすために製油所を増加させる見込み

## Refined petroleum products key trends

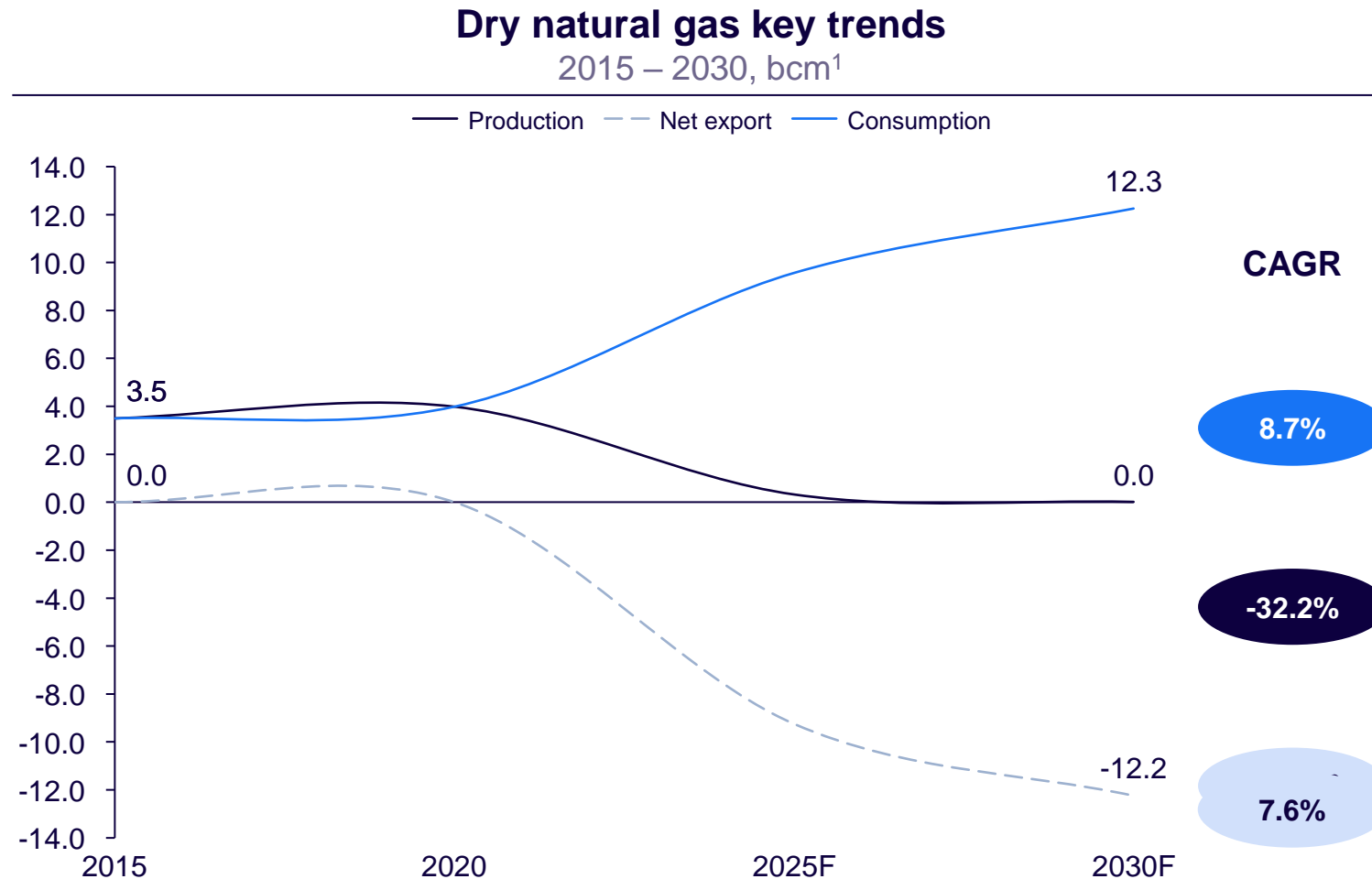
2015 – 2030, 000's bpd<sup>1</sup>

## COMMENTS



- Demand surged at a rate of 3.4% YOY from 2015 – 2030, driven by diesel and gasoline demand
- Further demand is impacted by prevalence of 2-wheelers to 4-wheelers and above and the increase of biofuel blend targets
- Low refinery utilization rate, is exacerbated by shell closing its refinery in 2020 to convert it into an import facility in 2021, leaving Petron as the only refining company left
  - Petron is increasing production to meet demand in its Bataan factory, to exceed current 80% in 2022
- Net exports have increased at a significant rate of 7.6% YOY on the back of stiff competition from 167 fuel importers and 157 bulk distributors who are free to set oil product prices and sell of smuggled fuels

## 天然ガス消費の拡大に合わせて、輸入への依存は今後大幅に増加



## COMMENTS

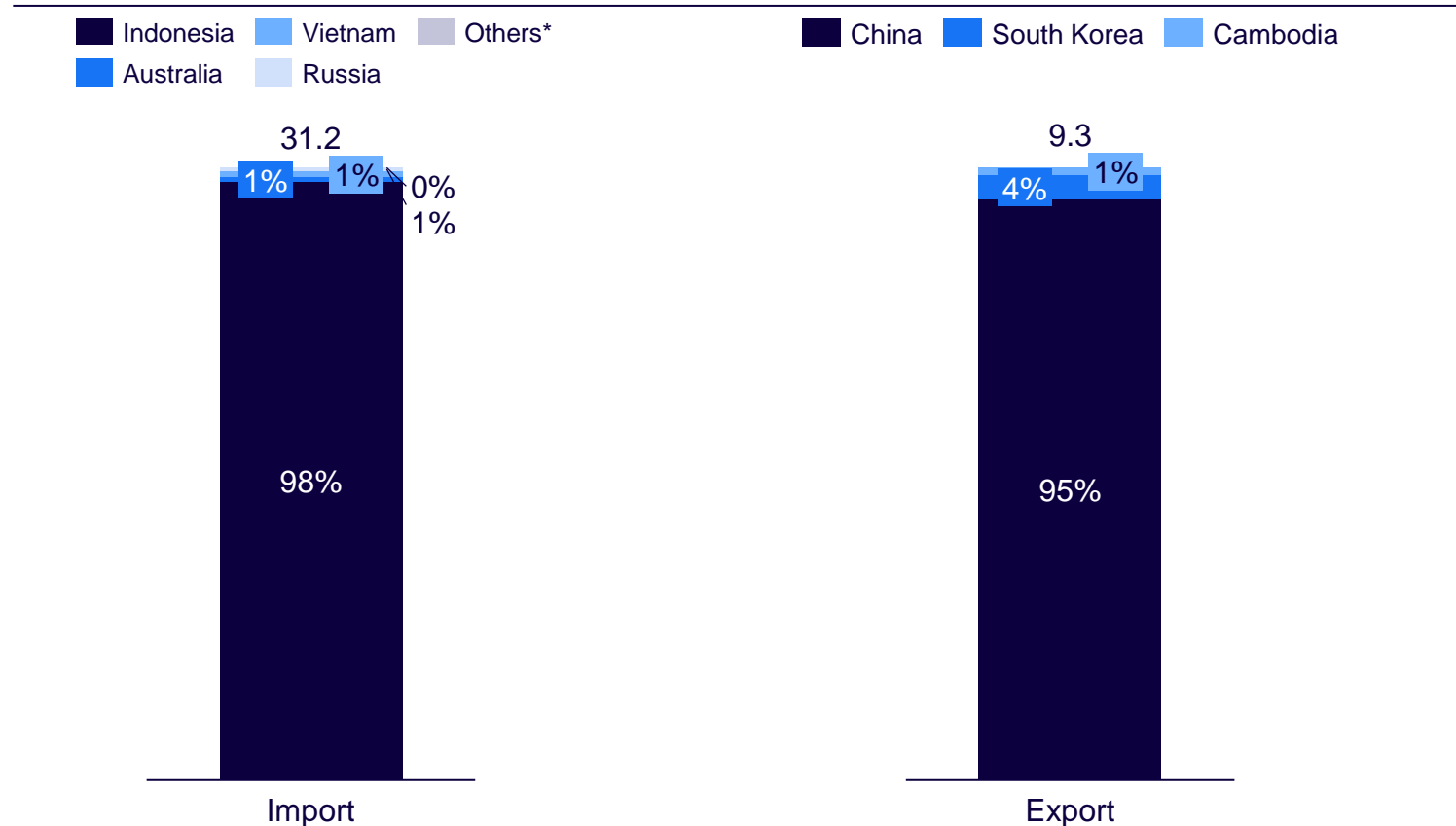


- The Malampaya deepwater gas field is expected to be **depleted in 2024**, resulting in the total stoppage of production capabilities
  - This is the base, despite the lifting of the moratorium on oil and gas activities in the western seas
- Despite current energy plan to spend PHP 350.4 bn, based off past efforts, this has been futile
  - Further tensions with China is preventing exploration in the South China sea which is resource-rich
- Consumption growth of 8.7% in the period 2015 – 2030 is set to be driven by government policy and the planned construction of LNG-fired PP
- Net skyrocketed at 21.7% for the 2015 – 2030 period, supported by expansion of LNG import infrastructures

## 石炭は主にインドネシアから輸入

### Coal major trade partners

2021, Mt



### COMMENTS



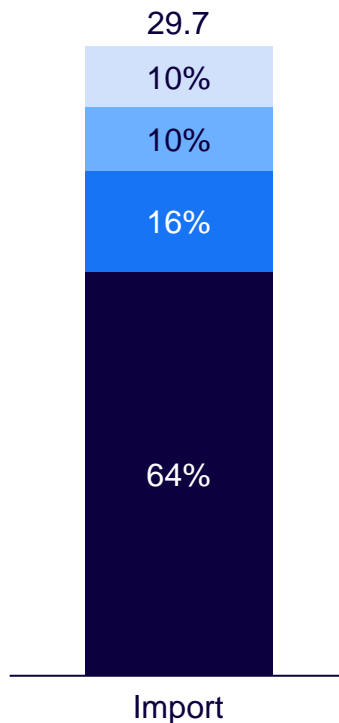
- Surprisingly for coal imports, the Philippines is greatly **dependent on Indonesia for its imports**, accounting for 98% of all imports
  - This over-reliance greatly impacted the Philippines coal needs when Indonesia imposed an export ban, resulting in the Philippines' energy secretary Alfonso Cusi to appeal to Indonesia to lift it
- Due to heavy reliance on coal for imports, the DOE is pursuing an Executive Order to suspend the current 7% import duty on coal
- Likewise for exports, China makes up 95% of all exports,
  - As of Jun 2023, the country's largest coal miner is attempting to export to Japan to reduce dependency on China

## 原油は中東から主に輸入している

## Crude oil major trade partners

2021, mn barrels

■ Saudi Arabia   ■ Oman  
■ UAE   ■ Others\*



## COMMENTS

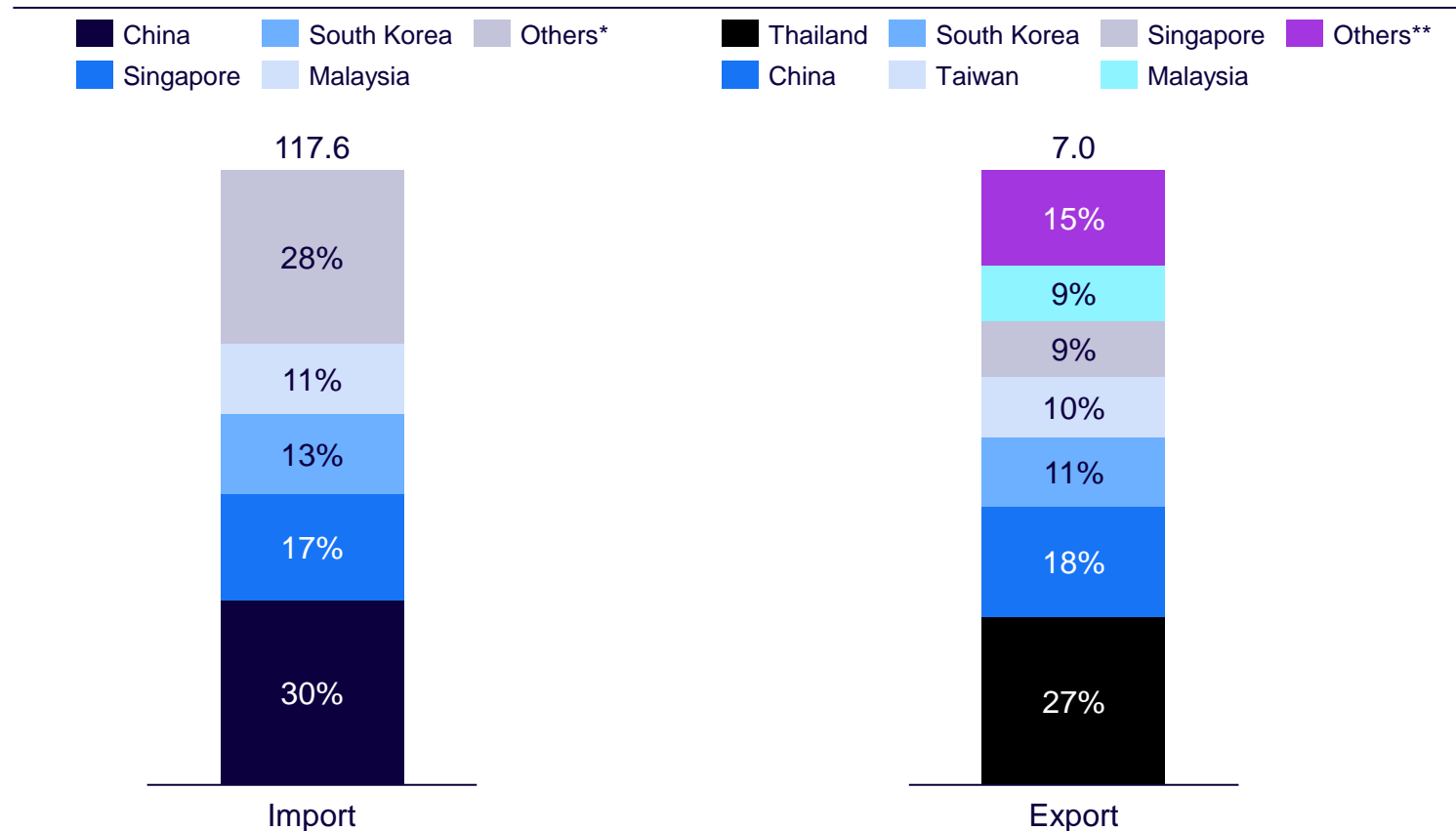


- Middle Eastern countries like Saudi Arabia, UAE and Oman comprise 90% of all crude oil imports
  - Saudi Arabia is the dominating country with over 64% market share of crude oil imports
- 2022 saw a largest dependence on the Middle Eastern countries for oil due to reduced reliance on Russian imports (~2%) together with Shell's exit from the refining sector after the closing of the Tabangao refinery
- In terms of condensates, the Philippines exclusively exports them to Asian markets, although the breakdown is not available

## 石油精製品においては、中国、韓国、シンガポールから主に輸入を実施

### Petroleum products major trade partners

2021, mn barrels



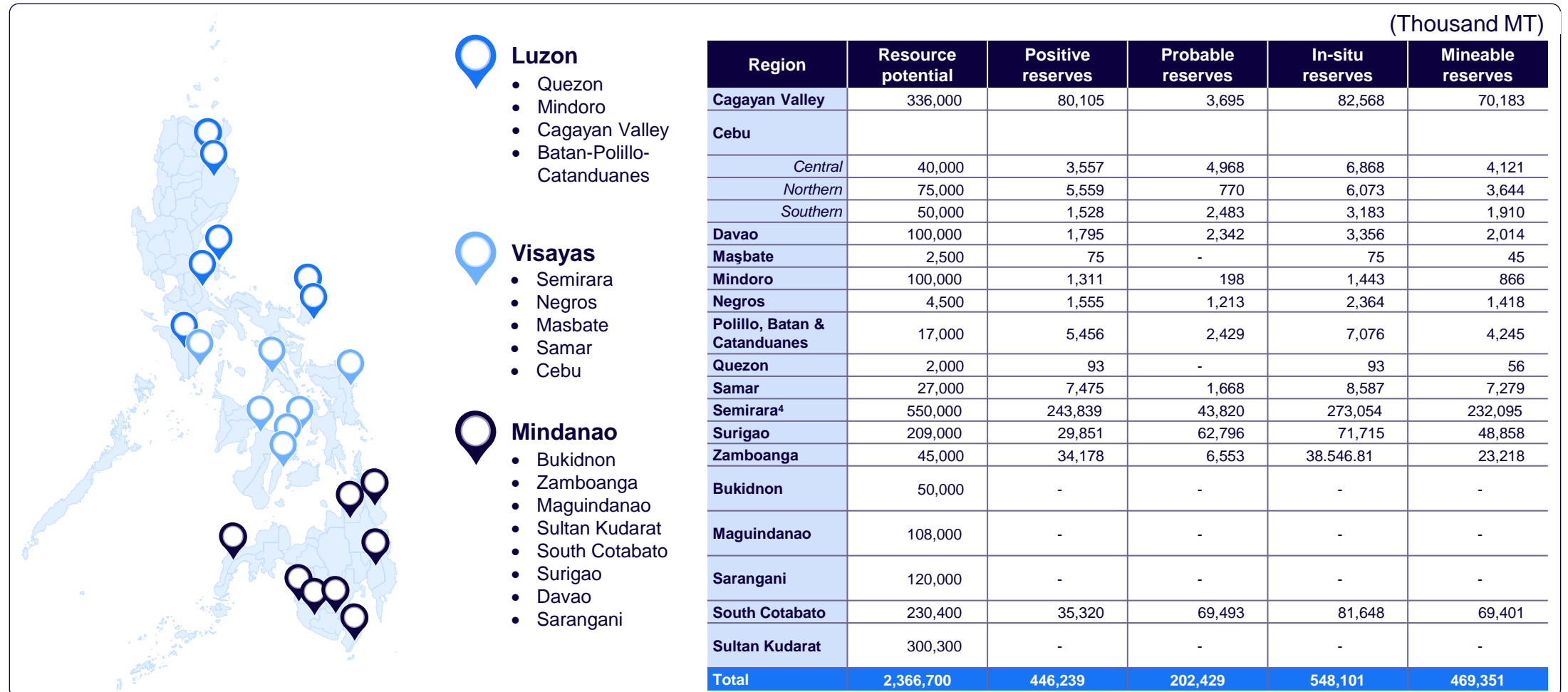
### COMMENTS

- Petroleum products are largely imported from Asian countries with the top four countries China (30%), Singapore (17%), South Korea (13%) and Malaysia (115) making up ~74% of all the imports
  - China's large share is on the back of aggressive exports to resolve a domestic glut
  - This grew China's market share from just 9% in 2015 to 30% in 2021, almost quadrupling
- Export partners are also largely Asian countries with Thailand (27%) taking the lead, followed by China (18%). And then South Korea, Taiwan, Singapore and Malaysia, which average around 9-10%
  - Exports are estimated to increase due to government plans to cut oil-fired generation capacity in the Philippine Energy Plan 2020-2040

Note: \*Inclusive of Bahrain, KSA, Kuwait, Qatar, UAE, Brunei, Thailand, Vietnam, India, Japan, Taiwan, Australia, Nigeria, Gabon, UK and Mexico; \*\*Includes Iraq, Brunei, Indonesia, Vietnam, India, Australia, Belgium, Guam, Saipan and USA

Source: Department of Energy Compendium 2022, Arthur D. Little analysis

## 石炭は中部と北部に中心的に埋蔵されている



Note: Map is illustrative and not drawn to scale

Source: Philippines Department of Energy 2020, Arthur D. Little analysis



## 地熱関連のマップは以下



Note: Map is illustrative and not drawn to scale

Source: Department of Energy 2022, World Geothermal Congress 2021, Arthur D. Little analysis

## 地熱関連のマップは以下

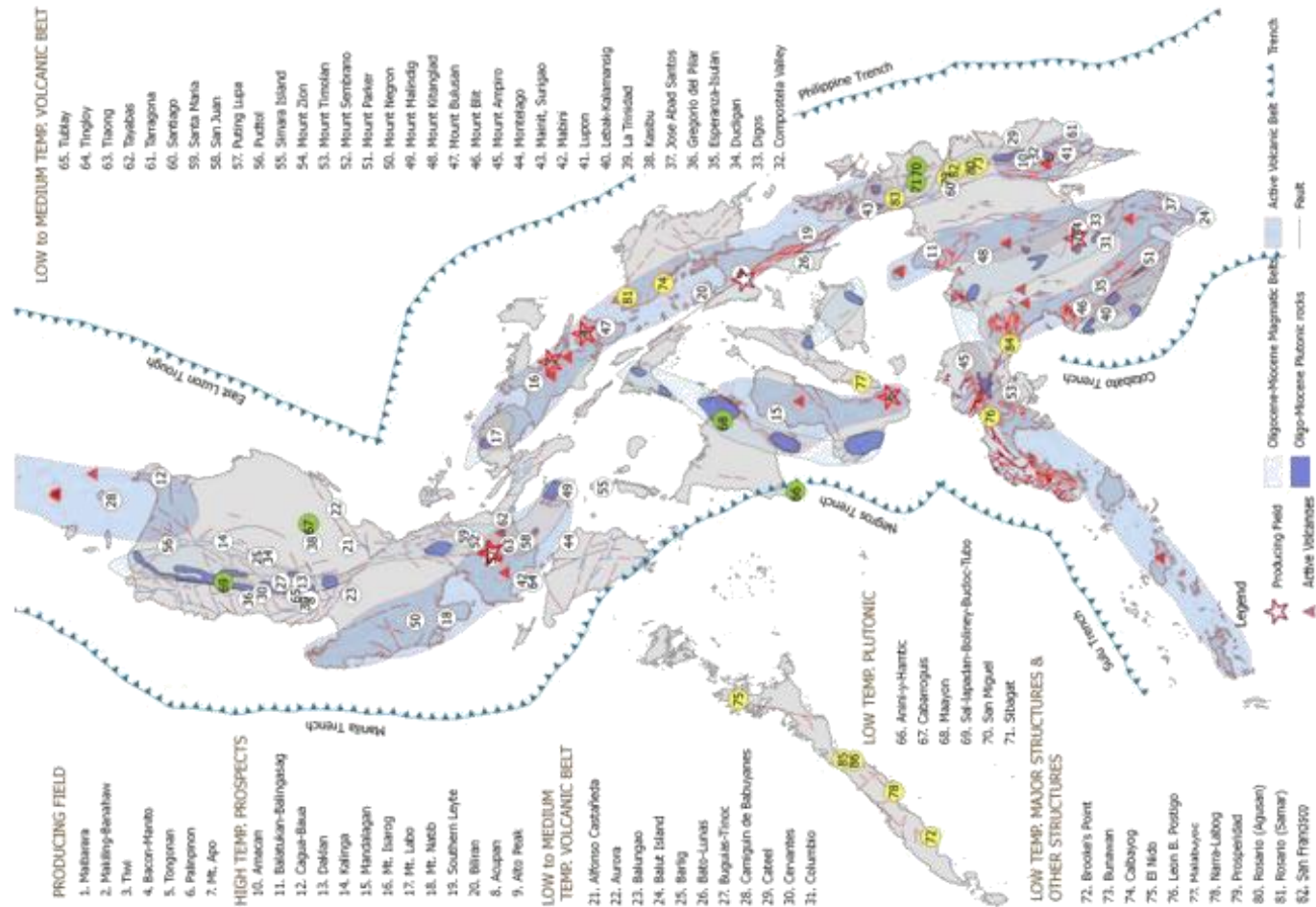


Figure 2: Location map of the distribution of the Philippines geothermal resources. The circles colored green, white and yellow represents the geothermal areas that are associated with plutonic occurrences, volcanic belt and non-active structures, respectively.

Note: Map is illustrative and not drawn to scale

Source: Department of Energy 2022, World Geothermal Congress 2021, Arthur D. Little analysis

## List of geothermal fields

Field	Field operator	Power plant operator	Installed capacity, MWe <sup>1</sup>
Tiwi	Chevron Geothermal Philippines Holding, Inc.	National Power Corporation	344
Mak-Ban	Chevron Geothermal Philippines Holding, Inc.	National Power Corporation	459
Tongonan	PNOC-Energy Development Corp.	National Power Corporation	113
Unified Leyte	PNOC-Energy Development Corp.	CALENERGY/ORMAT	610
Palinpinon I	PNOC-Energy Development Corp.	National Power Corporation	113
Palinpinon II	PNOC-Energy Development Corp.	National Power Corporation	80
Bacman I	PNOC-Energy Development Corp.	National Power Corporation	110
Bacman II	PNOC-Energy Development Corp.	National Power Corporation	40
Manito Lowlands	PNOC-Energy Development Corp.	PNOC-Energy Development Corp.	2
Mindanao I	PNOC-Energy Development Corp.	Marubeni	54
Mindanao II	PNOC-Energy Development Corp.	Marubeni	54
<b>Total</b>			<b>1979</b>

Note: 1) Rounded to nearest whole number

Source: Department of Energy 2022, World Geothermal Congress 2021, Arthur D. Little analysis

## List of geothermal power plants in operation (1/2)

Region	Name	Start-up date	# units	Type of units <sup>1</sup>	Total installed capacity, MWe <sup>2,3</sup>	Total running capacity, MWe <sup>4</sup>
Albay	Tiwi					
	Plant A	1979	2	1F	120	208
	Plant C	1981/1982	2	1F	114	
Laguna	Makban					
	Plant A	1979	2	2F	126	420
	Plant B	1980	2	2F	126	
	Plant C	1984	2	1F	110	
	Makban Modular					
	Plant D	1995	2	1F	40	
	Plant E	1996	2	1F	40	
	Makban Binary		1994	2	8	6
Sorsogon and Albay	Bacman I	1993	2	1F	120	120
	Bacman II	1994	1	1F	20	20
Cotabato	Mindanao I	1996	1	1F	54	100
	Mindanao II	1996	1	2F	Unknown	
Batangas	Maibarara	2014	1	1F	20	20
	Maibarara Unit 2	2018	1	1F	12	12

Note: 1) 1F = Single Flash, 2F = Double Flash, 3F=Triple Flash, D = Dry Steam, B-Binary (Rankine Cycle), H = Hybrid (explain), O-Other (please specify); 2)Electrical installed capacity in 201; 3) Values rounded to nearest whole number; 3) Electrical capacity up and running in 2019; 4) Actual total sum  
Source: Department of Energy 2022, World Geothermal Congress 2021, Arthur D. Little analysis

## List of geothermal power plants in operation (2/2)

Region	Name	Start-up date	# units	Type of units <sup>1</sup>	Total installed capacity, MWe <sup>2,3</sup>	Total running capacity, MWe <sup>4</sup>
Leyte	Tongonan I	1983	3	2F	113	107
	Upper Mahiro					
	GCCU (Main Plant)	1996	4	O	136	538
	OEC (Brine Plant)	1996	1	B	6	
	Malitbog	1996/1997	3	1F	233	
	Mahanagdong A	1997	2	1F	120	
	Mahanagdong B	1997	1	1F	60	
	Tongonan I – Topping	1997	3	O	20	538
	Mahanagdong A – Topping	1997	2	O	13	
	Mahanagdong B – Topping	1997	1	O	7	
	Malibog – Bottoming	1998	1	O	17	
Negros Oriental	Palinpinon I	1989	3	1F	113	172
	Palinpinon II					
	OKOY 5	1993	1	1F	20	172
	Sogongon	1995	2	1F	40	
	Nasulo	2014	Unknown	Unknown	49	48
Total			50		1,918 <sup>5</sup>	1,770

Note: 1) 1F = Single Flash, 2F = Double Flash, 3F=Triple Flash, D = Dry Steam, B-Binary (Rankine Cycle), H = Hybrid (explain), O-Other (please specify); 2)Electrical installed capacity in 201; 3)

Values rounded to nearest whole number; 3) Electrical capacity up and running in 2019; 4) Actual total sum

Source: Department of Energy 2022, World Geothermal Congress 2021, Arthur D. Little analysis

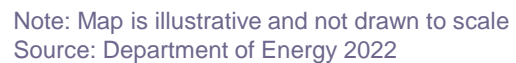
## 石油・天然ガスの埋蔵状況

Proven oil and gas reserves (2021 - 2026)						
Indicator	2021	2022e	2023f	2024f	2025f	2026f
Proven oil reserves. bn bbl	0.1	0.1	0.1	0.1	0.1	0.1
Proven oil reserves. mn bbl	138.5	138.2	137.9	137.6	137.4	137.2
Proven oil reserves. % y-o-y	38.5	-0.2	-0.2	-0.2	-0.2	-0.1
Reserves to production ratio (RPR), years	37.0	38.2	39.4	40.9	42.7	44.0
Natural gas proven reserves, tcm	0.1	0.1	0.1	0.1	0.1	0.1
Natural gas proven reserves, bcm	98.6	95.7	93.6	92.5	92.2	92.1
Natural gas proven reserves, % y-o-y	0.0	-2.9	-2.2	-1.1	-0.3	-0.1
Natural gas reserves-to-production ratio, years	28.7	33.6	43.8	86.7	288.0	719.0

Proven oil and gas reserves (2027 - 2032)						
Indicator	2027f	2028f	2029f	2030f	2031f	2032f
Proven oil reserves, bn bbl	0.1	0.1	0.1	0.1	0.1	0.1
Proven oil reserves, mn bbl	137.0	136.8	136.6	136.5	136.3	136.2
Proven Oil reserves, % y-o-y	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Natural gas proven reserves, tcm	0.1	0.1	0.1	0.1	0.1	0.1
Natural gas proven reserves, bcm	92.0	92.0	92.0	92.0	92.0	92.0
Natural gas proven reserves. % y-o-y	-0.1	0.0	0.0	0.0	0.0	0.0



Note: Map is illustrative and not drawn to scale  
Source: Department of Energy 2022



## List of main oil & gas projects (1/2)

Name	Field name	Companies	Status	Est. peak oil/ liquid range, bpd <sup>1</sup>	Est. peak gas output, bcm <sup>2</sup>	Fuel source
SC 50	Calautit	Phinma (10%)	Appraisal	-	-	Oil
SC 54, North West Palawan Basin	Block A, B	Kairiki Energy (30.1%), Nido Petroleum (42.4%), TVI Pacific Inc (12.5%), Trafigura Beheer (15%)	Appraisal	-	-	Oil
SC 44	Malolos	Gas2Grid (100%)	Discovery	-	-	Oil
SC 63, NW Palawan Basin	SC 63	Philippines National Oil Company (40%), Nido Petroleum (20%), Dragon Oil (40%)	Exploration	-	-	Oil
SC 72	Sampaguita	Apex Mining (30%), Forum Energy (70%)	Exploration	-	-	Gas
SC-55, Palawan Basin	SC-55	Otto Energy (68.18%), Phinma (6.8%), Red Emperor (15%)	Expansion	-	-	Oil & Gas
Service Contract 5B, NW Palawan Basin	Service Contract 5B	-	Exploration	-	-	Oil & Gas
Service Contract 6B, NW Palawan Basin	Service Contract 6B	-	Exploration	-	-	Oil & Gas
SC 14, Block A, Palawan Basin	Nido-A Nido-B	Forum Energy (8.5%), Nido Petroleum (22.48%), Philodrill Corporation (26.1%), Oriental Petroleum and Minerals(42.9%)	Production	42,000	-	Oil

Note: 1) Barrels per day; 2) Billion cubic metres

Source: Fitch Solutions Oil & Gas Report 2023, Arthur D. Little analysis



## List of main oil & gas projects (2/2)

Name	Field name	Companies	Status	Est. peak oil/ liquid range, bpd <sup>1</sup>	Est. peak gas output, bcm <sup>2</sup>	Fuel source
SC 14, Block B, Palawan Basin	Matinloc	Nido Petroleum (28.28%), Philodrill Corporation (41.6%), Forum Energy (12.4%), Oriental Petroleum and Minerals (17.7%)	Production	6,800	-	Oil
SC 14, Block C	Galoc	Nido Petroleum (55.8%), Galoc Production (26.8%), Forum Energy (2.28%), Philodrill Corporation (7.2%), Oriental Petroleum and Minerals (7.78%)	Production	14,500	-	Oil
SC 40	Libertad	Forum Energy (100%)	Production	-	-	Gas
SC 48	Malampaya	Philippines National Oil Company (10%), Udenna Corp (45%) Shell Philippines (45%)	Production	15,000	3.8	Gas & Condensate

Note: 1) Barrels per day; 2) Billion cubic metres

Source: Fitch Solutions Oil & Gas Report 2023, Arthur D. Little analysis

## List of oil refineries

Location	Province	Capacity, '000s bpd <sup>1</sup>	Owner	Status	Start-up year
Bataan	Lima	180	Petron	Active	1961
Bataan	Lima expansion	120	Petron	Postponed	<i>Unknown</i>
Batangas	Tabangao	110	Shell	Closed	1962

Note: 1) Barrels per day  
Source: Fitch Solutions Oil & Gas Report 2023, Arthur D. Little analysis

## List of LNG projects in the pipeline

Name	Capacity, mtpa <sup>1,2</sup>	Capacity, bcm <sup>2,3</sup>	Power generation capacity, MW	Status	Owner (s)	Start-up year
Philippines LNG	4	3	1,200	Approved	Atlantic Gulf & Pacific Company of Manila Inc. (AG&P)	2023
FGEN LNG Phase I	7	5	1,200	Approved	First Gen Corporation, Tokyo Gas	2023
Pagbilao LNG	4	3	650	Approved	Energy World Corporation	2023
Filipinas LNG I	6	4	850	Approved	Excelerate Energy	-
Shell FSRU	4	3	-	Approved	Shell	2026
Vires Energy FSRU	-	3	506	Approved	Vires Energy	2026
Filipinas LNG II	-	-	850	Approved	Excelerate Energy	2024
-	-	-	-	Proposed	New Fortress Energy	-
-	-	-	-	Proposed	PNOC, Llyod Energy	-
FGEN LNG Phase II	2	2	-	Proposed	First Gen Corporation, Tokyo Gas	-
Brunel-PNOC FSRU	-	-	300	Proposed	Petroleum National Brunel, PNOC	-
-	-	-	600	Proposed	SMC Global Power Holdings Corp.	2027 - 2028
<b>Total</b>	<b>27</b>	<b>23</b>	<b>6156</b>			

## List of gas pipelines planned

Location		Name	Length, km	Start-up year
Batangas, Laguna, Cavite	Metro Manila	BatMan-1 Pipeline	121	2016
Sucat	Fort Bonifacio	Sucat-Fort Bonifacio Pipeline	15	2017
Sucat	<i>Unknown</i>	Sucat-Malaya (Su-Ma) Pipeline	35	2017
Sucat	Quirino	Sucat-Quirino Pipeline	38	2020
Metro Manila	Epifanio de los Santos Avenue	Metro Manila/Edsa-Taft Pipeline	40	2020
Bataan, Pampanga, Zambales	Manila	Bataan-Manila (BatMan 2) Pipeline	140	2020
BatMan 2	Subic	Subic Pipeline	40	2021
BatMan 2	Clark	Clark Pipeline	25	2022
BatMan 1	BatMan 2	Bataan-Cavite (BatCave) Gas Pipeline	40	2022

## The Philippines has one supercritical coal power plant, with more on the horizon

### San Buenaventura supercritical coal-fired PP<sup>1</sup>

2019



- **Capacity:** 500 MW, HELE<sup>2</sup> technology
- **Commercial operation date:** 2019
- **Location:** Mauban, Quezon
- **Owner & Operator:** San Buenaventura Power (SBPL)
  - MGen (Meralco subsidiary) owns 51% of SBPL
  - New Growth (EGCO Group subsidiary) owns 49% of SBPL

### GNPower supercritical coal-fired PP<sup>1</sup>

2022



- **Capacity:** 2 x 668 MW
- **Commercial operation date:** 2022
- **Location:** Mariveles, Bataan
- **Owner & Operator:** GNPower Dinginin Ltd. Co.
- **Current status:** Only Unit 1 has been issued a Certificate of Compliance, while the other 668 MW Unit 2 is under construction

## 過去10年のガソリン価格の推移は以下

Average gasoline price  
2014 – 2023, USD/litre



## 2023年7月時点のマニラ首都圏における石油製品の価格は以下

## Retail prices of petroleum products in NCR

Jul 2023

	PRODUCT	PETRON	SHELL	CALTEX	PHOENIX	TOTAL	FLYING V	UNIOIL	SEOIL	PTT	INDEPENDENT	OVERALL RANGE	COMMON PRICE										
Cities	NATIONAL CAPITAL REGION																						
Caloocan City	RON 100	65.83	65.83									65.83 – 65.83	#N/A										
	RON 97			72.65	72.65							58.20 – 72.65	72.65										
	RON 95	59.50	62.50	66.60	68.30	64.11	65.90	59.90	60.60			53.99 – 68.30	67.25										
	RON 91	58.50	61.00	60.03	63.42	62.00	63.00	58.80	59.47			53.49 – 63.42	62.84										
	DIESEL	53.45	55.80	53.78	56.20	57.20	57.85	53.65	54.25			49.50 – 57.85	57.85										
	DIESEL PLUS	56.90	57.80	57.98	64.03							56.90 – 64.03	#N/A										
	KEROSENE	67.44	69.27									67.44 – 69.27	#N/A										
Quezon City	RON 100	64.26	66.78									64.26 – 66.78	#N/A										
	RON 97			71.02	73.15					67.20	67.20	59.70	61.15	58.75	58.75	58.75 – 73.15	#N/A						
	RON 95	57.95	61.90	66.52	68.65	61.60	66.35	59.80	63.30	64.65	64.65	57.55	60.45	62.40	62.45	59.70	61.15	58.55	58.55	56.30	57.75	56.30 – 68.65	#N/A
	RON 91	56.49	60.40	59.70	63.37	60.60	63.84	58.55	62.85	63.65	63.65	56.55	57.95	59.65	59.95	59.20	59.75	57.90	57.90	55.60	55.60	55.60 – 63.84	59.65
	DIESEL	52.95	54.90	55.80	58.25	55.80	57.95	53.45	57.35	57.55	57.55	52.10	54.15	54.50	54.50	53.35	55.65	54.10	54.10	49.90	52.00	49.90 – 58.25	55.80
	DIESEL PLUS	54.25	56.90	63.25	69.45					67.00	67.00											54.25 – 69.45	#N/A
	KEROSENE	68.89	70.47			75.60	75.60															68.89 – 75.60	#N/A
Manila	RON 100	66.07	67.83																			66.07 – 67.83	#N/A
	RON 97			72.10	76.50											59.79	61.95					59.79 – 76.50	72.10
	RON 95	61.05	64.35	67.45	71.16	60.99	61.49			62.45	62.45			62.30	62.35					56.80	58.14	56.80 – 71.16	67.45
	RON 91	59.95	63.25	62.35	65.65	59.99	60.39			61.45	61.45			60.05	61.45	59.20	60.95			56.30	57.14	56.30 – 65.65	62.35
	DIESEL	54.45	57.80	56.70	59.59	54.25	56.99			55.55	55.55			57.45	58.20	53.65	57.75			50.70	50.99	50.70 – 59.59	56.99
	DIESEL PLUS	56.46	59.90	64.35	68.25					57.55	57.55											56.46 – 68.25	64.35
	KEROSENE	68.21	68.72																			68.21 – 68.72	#N/A
Pasig City	RON 100	65.58	66.70																			65.58 – 66.70	#N/A
	RON 97			72.21	75.30									66.41	66.41	58.40	59.70					58.40 – 75.30	#N/A
	RON 95	59.15	62.50	67.71	70.50	58.80	68.45	59.15	64.15			59.85	59.85	62.69	63.20					58.40	59.90	58.40 – 70.50	59.15
	RON 91	58.15	60.90	61.41	64.30	57.80	63.23	58.15	62.65	62.65	62.65	59.35	59.35	60.65	60.85	57.90	59.20			57.90	59.40	57.80 – 64.30	58.15
	DIESEL	52.55	56.65	55.30	60.95	52.55	58.33	52.95	58.80	58.80	58.80	55.20	55.20	54.70	54.95	53.25	53.90			51.40	51.45	51.40 – 60.95	52.55
	DIESEL PLUS	54.55	58.75	66.35	66.93																	54.55 – 66.93	66.35
	KEROSENE	68.78	68.78																	68.95	68.95	68.78 – 68.95	#N/A
Taguig City	RON 100	69.00	69.50																			69.00 – 69.50	69.00
	RON 97			73.11	78.30											61.35	61.35					61.35 – 78.30	73.11
	RON 95	65.39	66.50	68.12	73.80	61.85	68.45													65.44	65.99	61.85 – 73.80	66.00
	RON 91	64.00	64.90	64.83	66.94	60.95	65.55									60.25	60.25			55.59	63.94	55.59 – 66.94	64.40
	DIESEL	56.60	60.10	57.50	61.18	55.25	58.24									56.48	56.48			57.78	57.99	55.25 – 61.18	56.60
	DIESEL PLUS	58.70	62.20	65.60	71.10																	58.70 – 71.10	58.70
	KEROSENE					77.04	79.75															77.04 – 79.75	#N/A

## 以下がエネルギー関連の関係省庁

NON-EXHAUSTIVE




Entity	Department	Responsibilities
Department of Energy	Energy Policy & Planning Bureau	<ul style="list-style-type: none"> <li>Formulates, updates, monitors and evaluates national and local energy plans, policies, programs and projects, and provides a comprehensive assessment of demand scenarios and supply options</li> <li>Studies the impacts of international commitments on energy policies, economy and impacts of international commitments on energy policies, economy and environment</li> </ul>
	Petroleum Resources Development Division	<ul style="list-style-type: none"> <li>Formulates and implements policies, plans, programs and regulations relating to the exploration and development of petroleum resources</li> <li>Covers petroleum geology, petroleum geophysics, and petroleum engineering functions</li> </ul>
	Coal & Nuclear Minerals Division	<ul style="list-style-type: none"> <li>Formulate and implement policies, plans, programs and regulations relating to exploration, development, production, utilization and resource management of coal and nuclear mineral resources</li> <li>Covers exploration and geoscience research, as well as development and production functions</li> </ul>
	Oil Industry Management Bureau	<ul style="list-style-type: none"> <li>Formulates and implements policies, plans, programs and regulations on the downstream oil industry, including the importation, exportation, stockpiling, storage, shipping, transportation, refining, processing, marketing and distribution of petroleum crude oils, products and by-products, and monitors developments in the downstream oil industry</li> <li>Divisions include oil industry standards and monitoring, competition, natural gas management, and retail market monitoring</li> </ul>
Philippine National Oil Company (PNOC)		<ul style="list-style-type: none"> <li>Subsidiary PNOC Exploration Corporation is mandated by the government through the Department of Energy (DOE) to take the lead in the exploration, development and production of the country's oil, gas and coal resources</li> </ul>



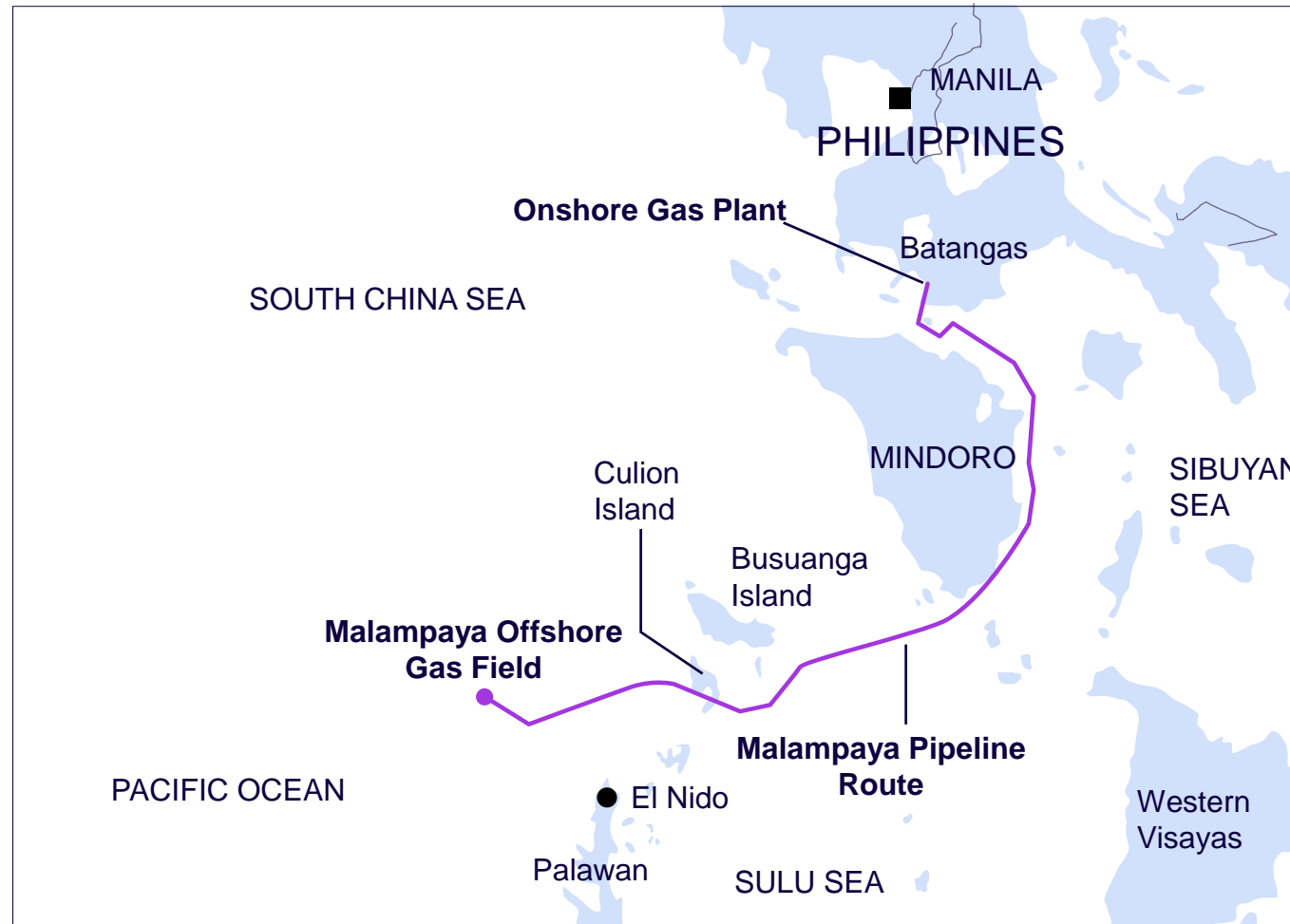
### 3 パイプライン（ガス・石油）

## エネルギー省がフィリピンのパイプライン開発に関する品質基準を公表しているが、参考または自主基準の位置づけ

### Quality standards regarding fossil fuel pipelines

   <b>Department of Energy</b>		<table> <tr> <th>Name</th> <th>Overview of coverage<sup>1</sup></th> <th>Year introduced</th> </tr> <tr> <td> PNS/DOE FS 8:2013   Transportation of Petroleum Product by Pipeline </td> <td> <ul style="list-style-type: none"> <li>This standard covers operation and maintenance, reporting requirements and other applicable provisions in the on-shore transportation via pipeline (as defined hereafter) of liquid petroleum products for white (such as but not limited to gasoline, diesel, kerosene and jet A-1) and (such as but not limited to) black (bunker fuel)</li> </ul> </td> <td>2013</td> </tr> <tr> <td> PNS/DOE FS 4:2007   Liquid Petroleum Product Depot </td> <td> <ul style="list-style-type: none"> <li>This standard covers the design and construction of depots and associated facilities involved in marketing/redistribution of liquid petroleum product.</li> <li>Liquid petroleum products refers to gasoline, diesel, kerosene and bunker fuel, with products received, blended, and/or distributed by pipeline</li> </ul> </td> <td>2007</td> </tr> </table>	Name	Overview of coverage <sup>1</sup>	Year introduced	PNS/DOE FS 8:2013  Transportation of Petroleum Product by Pipeline	<ul style="list-style-type: none"> <li>This standard covers operation and maintenance, reporting requirements and other applicable provisions in the on-shore transportation via pipeline (as defined hereafter) of liquid petroleum products for white (such as but not limited to gasoline, diesel, kerosene and jet A-1) and (such as but not limited to) black (bunker fuel)</li> </ul>	2013	PNS/DOE FS 4:2007  Liquid Petroleum Product Depot	<ul style="list-style-type: none"> <li>This standard covers the design and construction of depots and associated facilities involved in marketing/redistribution of liquid petroleum product.</li> <li>Liquid petroleum products refers to gasoline, diesel, kerosene and bunker fuel, with products received, blended, and/or distributed by pipeline</li> </ul>	2007
Name	Overview of coverage <sup>1</sup>	Year introduced									
PNS/DOE FS 8:2013  Transportation of Petroleum Product by Pipeline	<ul style="list-style-type: none"> <li>This standard covers operation and maintenance, reporting requirements and other applicable provisions in the on-shore transportation via pipeline (as defined hereafter) of liquid petroleum products for white (such as but not limited to gasoline, diesel, kerosene and jet A-1) and (such as but not limited to) black (bunker fuel)</li> </ul>	2013									
PNS/DOE FS 4:2007  Liquid Petroleum Product Depot	<ul style="list-style-type: none"> <li>This standard covers the design and construction of depots and associated facilities involved in marketing/redistribution of liquid petroleum product.</li> <li>Liquid petroleum products refers to gasoline, diesel, kerosene and bunker fuel, with products received, blended, and/or distributed by pipeline</li> </ul>	2007									

## フィリピンの主要な天然ガスパイプラインは、パラワン州北部のマランパヤ・ガス田とルソン島のバタンガスとを結んでいる



### COMMENTS

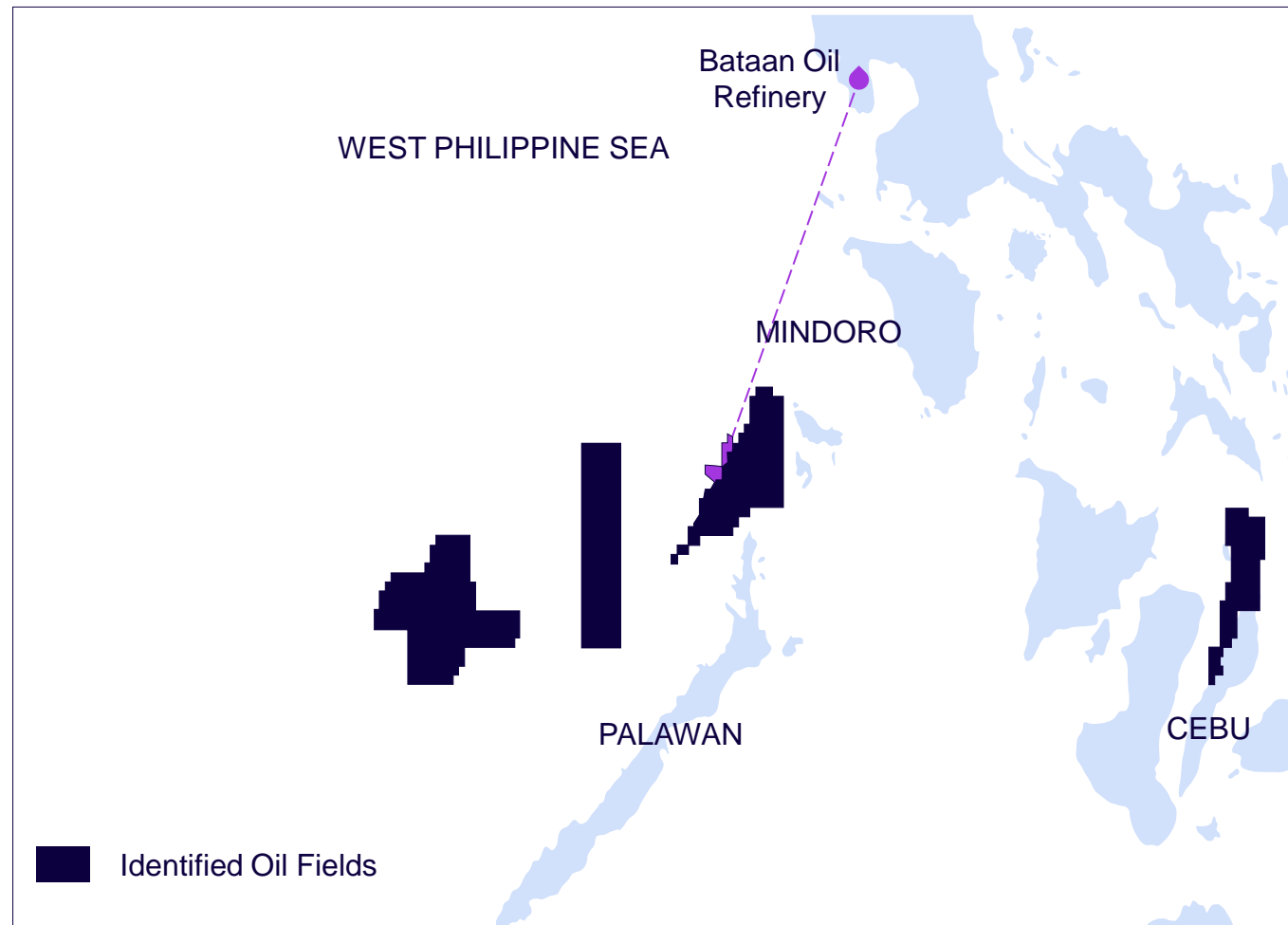


- A **consortium** of Shell Philippines Exploration BV, Chevron-Texaco Philippines, Inc., and the Philippine National Oil Company Exploration Corporation initially developed the gas field
- The venture included the construction and operation of a **504-kilometer deep-water pipeline** that transports the gas to an onshore gas processing plant in Tabangao, Batangas
- Udenna Corporation bought out Chevron and Shell's stakes in 2019 and 2021, respectively

Note: Map is illustrative and not drawn to scale

Source: Department of Energy 2023, Financial Times 2022, S&P Global 2018, Arthur D. Little analysis

## パラワン島北部のガロック油田はフィリピンの主要な原油油田



### COMMENTS



- A schematic of crude oil pipelines in the Philippines is not available, with **crude oil not considered to be a primary power source**. Instead, **coal** contributes to >50% of gross power generation
- The archipelagic nature of the country poses **challenges for overall pipeline construction**
- Most service contracts for **crude oil production are located north of Palawan**, with the country's **sole remaining oil refinery** observed in Bataan, operated by the Petron Corporation

Note: Map is illustrative and not drawn to scale

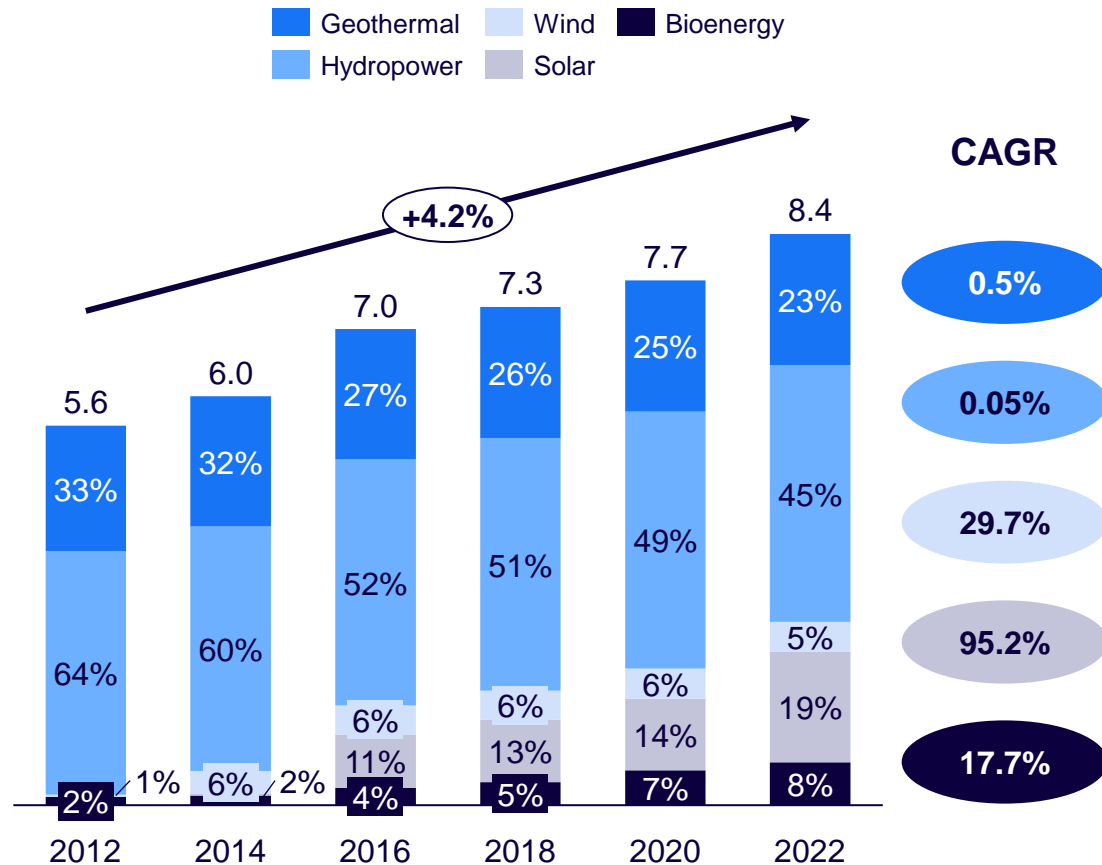
Source: Department of Energy 2023, Reuters 2022, Arthur D. Little analysis

## 4 次世代・再生可能エネルギー

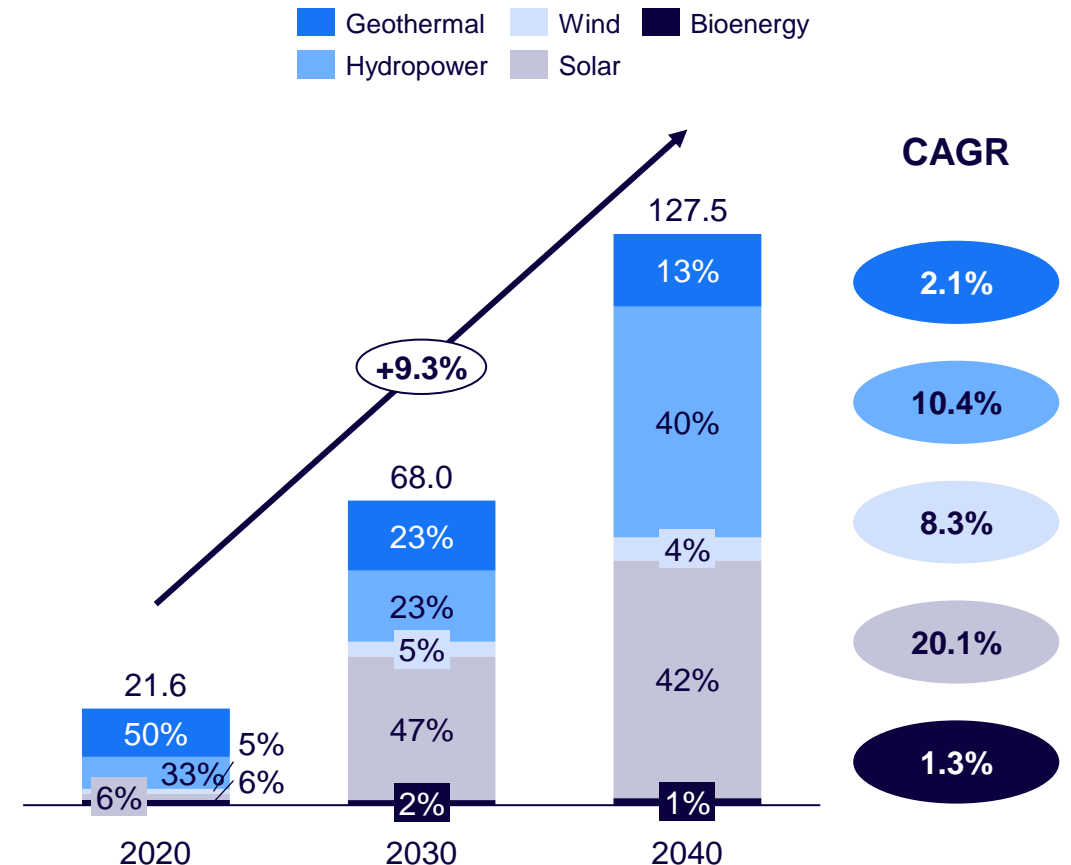
## 水力発電が中心的だが、2030年までに太陽光発電の設備容量が追い越す見込み

## Renewable energy installed capacity

2012 – 2022, GW



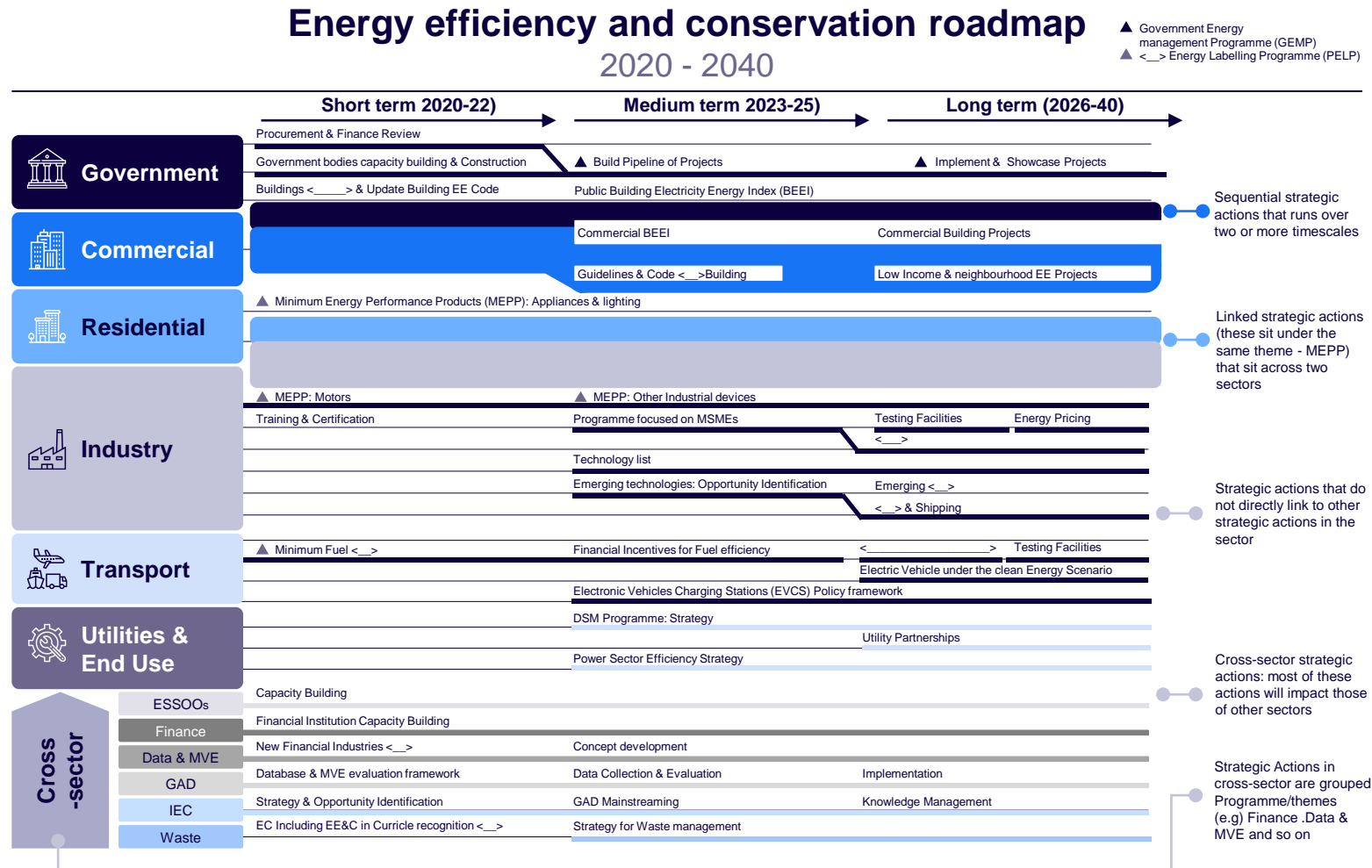
## Renewable energy target power generation

2020, 2030 & 2040, TWh<sup>1</sup>

Note: Renewable energy power generation as a % of total generation for 2020 is 21.24%, 2030 is 35.01% and 2040 is 35.00%; 1) Terawatt hour

Source: International Renewable Energy Agency 2023, Philippine Energy Plan 2020 – 2040, Arthur D. Little analysis

## エネルギー効率節約法は、政府のエネルギー効率節約の指針を規定



### COMMENTS

- The objective is to enact Energy Efficiency and Conservation (EE&C) act of 2019 via existing EE&C programs and other initiatives
- The roadmap is split into short, medium and long-term time horizons in sectors spanning:
  - Government: Policy and frameworks, energy efficient (EE) buildings
  - Commercial: EE buildings
  - Residential: EE buildings, housing projects and appliances
  - Industry: Certifications, R&D on equipment, testing facilities
  - Transport: Fuel efficiency ratings, EV infrastructure, testing facilities
  - Utilities & End-use: load management, reduction of system losses, impacting end-user behaviour via data

# Hydropower projects in the Philippines

NON-EXHAUSTIVE

## Energy Service Contract (ESC) applications As of Jan 2023

Island	Region	Province	Name	Owner	Potential capacity, MW <sup>1</sup>
Luzon	II	Isabela	Bintacan	King Energy Generation Inc.	4
	V	Camarines Norte	Tuo	DMI Konstruct Albay Renewable	4
	CAR	Kalinga	Mabaca 2	JBD Water Power Inc.	45
Luzon Total					53
Mindanao	X	Bukidnon	Upper Atugan	Mindanao Energy Systems, Inc.	2
	XI	Davao de Oro	Uduan -Tagima	Oro Energy Resources Corp.	3
			Manay	King Energy Generation Inc.	5
	XIII	Surigao del Norte	Rasa/Dinagat (OEP)	Envirotek Asia Power Generation, Inc.	10
Mindanao Total					20
Total					73

Note: 1) Rounded to nearest whole number  
Source: Department of Energy 2023, Arthur D. Little Analysis



## List of hydropower projects in operation (1/3)

NON-EXHAUSTIVE

### Hydropower projects grid-connected, by region

As of Jun 2023

Power plant		Capacity, MW¹		# of units	Location	Region	Operator	Owner / IPPA	FiT approved (for RE)	Owner type	Type of contract	Commissioned year
Name	Subtype	Installed	Depen-able		Municipality / Province							
Luzon Grid												
Hydroelectric total		2,498	2,378									
Large Hydroelectric Plants		2,409	2,307									
Ambuklao	Dam - type HEPP	105	105	3	Baragay Ambucclao, Bokud,Benguet	CAR	SN Aboitiz Power (SNAP) Benguet Inc.	SN Aboitiz Power (SNAP) Benguet Inc.	No	NON-NPC / IPP		Dec 1956
Angat Main	Dam - type HEPP	200	200	4	Baragay San Lorenzo, Nozagaray, Bulacan	3	Angat Hydro Power Corporation (AHPC)	Angat Hydro Power Corporation (AHPC)	No	NON-NPC / IPP		Oct 1967
Angat Alix	Dam - type HEPP	18	18	3	Baragay San Lorenzo, Nozagaray, Bulacan	3			No	NON-NPC / IPP		Jun 1966
Bakun Ac	Run - of - river type HEPP	75	59	2	Brgy, Amlongan ,Alem, Ilocos Sur	1	Luzon Hydro Corporation	Luzon Hydro Corporation	No	NON-NPC / IPP	BOT - PPA	Unit 1 – Nov 2000 Unit 2 – Feb 2001
Binga	Dam - type HEPP	140	138	4	Brgy, Tinongdan,Itogon, Benguet	CAR	SN Aboitiz Power (SNAP) Benguet Inc.	SN Aboitiz Power (SNAP) Benguet Inc.	No	NON-NPC / IPP	BOT - PPA	Jan 1960
Caliraya	Dam - type HEPP	39	35	2	Caliraya, Lumban, Laguna	4.A	Calraya – Botocan - Kalayaan Power Company Ltd.	Power Sector Assets and Liabilities Management Corporation (PSALM)	No	NON-NPC / IPP	BOT - PPA	Oct 2002
Casecnan (NIA)	Run - of - river type HEPP	168	150	2	Sitio Pauan, Brgy, Villarica, Pantabangan ,Nueva Edja	3	Fresh River Corporation	Fresh River Corporation	No	NON-NPC / IPP	BOT - PPA	Apr 2002
Kalayaan PSPP	Dam - type HEPP	736	736	4	San Juan, Kalayaan,Laguna	4.A	Calraya – Botocan - Kalayaan Power Company Ltd.	Power Sector Assets and Liabilities Management Corporation (PSALM)	No	NON-NPC / IPP	BOT - PPA	Units 1 & 2 – Aug 1982 Units 3 & 4 – May 2004

Rounded to nearest whole number. Total might vary due to rounding

Source: Department of Energy 2023, Arthur D. Little Analysis

## List of hydropower projects in operation (2/3)

NON-EXHAUSTIVE

### Hydropower projects grid-connected, by region As of Jun 2023

Power plant		Capacity, MW¹		# of units	Location	Region	Operator	Owner / IPPA	FIT approved (for RE)	Owner type	Type of contract	Commissioned year
Name	Subtype	Installed	Depen-able		Municipality / Province							
Visayas Grid												
Hydroelectric total		35	24									
Small Hydroelectric Plants		29	22									
Janopol HEPP	Run - of - river type HEPP	5	0.0	2	Sto. Niño, Balilihan, Bohol	7	Bohal Electric Corporation Inc (BCHECO I)	Bohal Electric Corporation Inc (BCHECO I)	No	NON-NPC / IPP	Unknown	May 1992
Villisiga HEPP	Run - of - river type HEPP	8	6	3	Barangay Igsoro, Bugasong, Antique	6	Sunwest Water and Electric Company Inc. (SUWECO)	Sunwest Water and Electric Company Inc. (SUWECO)	Yes	NON-NPC / IPP	Unknown	Apr 2018
Tubig HEPP	Run - of - river type HEPP	16	15	3	Taft, Eastern Samar & Hinabangan, Samar	8	Taft Hydroenergy Corporation	Taft Hydroenergy Corporation	On-Process	NON-NPC / IPP	Unknown	Oct 2022
Mini Hydroelectric Plants		5	1									
Loboc HEPP	Run - of - river type HEPP	1	1	3	Barangay Gotozon, Loboc, Bohol	7	Sta. Clara Power Corporation	Sta. Clara Power Corporation	No	NON-NPC / IPP	Unknown	Apr 1968
Loboc HEPP 2	Run - of - river type HEPP	1	0	1	Barangay Gotozon, Loboc, Bohol	7	Sta. Clara Power Corporation	Sta. Clara Power Corporation	Yes	NON-NPC / IPP	Unknown	Dec 2019
Sevilla HEPP	Run - of - river type HEPP	2	0	2	Barangay Ewon, Sevilla, Bohol	7	Bohal Electric Corporation Inc (BCHECO I)	Bohal Electric Corporation Inc (BCHECO I)	No	NON-NPC / IPP	Unknown	Nov 1961
Micro Hydroelectric Plants		1	1									
Alman HEPP	Run - of - river type HEPP	1	1	3	Sitio Pasalan, Barangay Silab, Amlan, Negros Oriental	7	ICS Renewables Inc.	ICS Renewables Inc.	No	NON-NPC / IPP	Unknown	May 1961

Note: 1) Rounded to nearest whole number. Total might vary due to rounding  
Source: Department of Energy 2023, Arthur D. Little Analysis

List of hydropower projects in operation (3/3)

NON-EXHAUSTIVE

Hydropower projects grid-connected, by region  
As of Jun 2023

Power plant		Capacity, MW¹		# of units	Location	Region	Operator	Owner / IPPA	FIT approved (for RE)	Owner type	Type of contract	Commissioned year
Name	Subtype	Installed	Depen-able		Municipality / Province							
Mindanao Grid												
Hydroelectric total		1,083	521									
Large Hydroelectric Plants		1,075	913									
Manolo Fortich U1	Run - of - river type HEPP	46	43	4	Barangay Santiago, Manolo Fortich, Bukidnon	10	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Yes	NON-NPC / IPP	Unknown	Jul 2018
Manolo Fortich U2	Run - of - river type HEPP	22	25	4	Barangay Damilag, Santiago, Manolo Fortich, Bukidnon	10	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Yes	NON-NPC / IPP	Unknown	Nov 2018
Small Hydroelectric Plants		8	8									
Udaya 2	Run - of - river type HEPP	8	8	2	Barangay Sibulan, Sta. Cruz, Davao del Sur	11	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Hydro Electric Development Corp. (HEDCOR) Bukidnon, Inc.	Yes	NON-NPC / IPP	Unknown	May 2014

## List of hydropower projects in operation (1/2)

NON-EXHAUSTIVE

### Hydropower projects grid embedded, by region

As of Jun 2023

Power plant		Capacity, MW <sup>1</sup>		# of units	Location	Region	Operator	Owner / IPPA	FIT approved (for RE)	Owner type	Type of contract	Commissioned year
Name	Subtype	Installed	Depen-able		Municipality / Province							
Luzon Grid												
Hydroelectric total		44	38									
Small Hydroelectric Plants		23	22									
BOTOCAN	Run-of-River type HEPP	23	22	3	Botocan, Majayjay, Laguna	4-A	Caliraya-Botocan-Kalayaan Power Company Ltd.	Power Sector Assets and liabilities Management Corporation (PSALM)	NO	NPC-IPP	BROT-PPA	Unit 1 – 1900 Units 2 & 3 - 1947
Mini Hydroelectric Plants		17	13									
Agua-Grande	Run-of-River type HEPP	2	2	2	Brgy Pandan, Pagudpod, Ilocos Norte	1	Llocos Norte Electric Cooperative, Inc. (INEC)	Llosos Norte Electric Cooperative, Inc. (INEC)	NO	NON-NPC/IPP		1983
BALUGBOG	Run-of-River type HEPP	1	1	3	Brgy, Palna, Nagcarian, Laguna	4A	Philippine Power and Development Company (PHLPODECO)	Philippine Power and Development Company (PHLPODECO)	YES	NON-NPC/IPP		Jul 2018
Barit 1	Run-of-River type HEPP	2	2	1	Sta, Justina, Buhi, Camarines Sur	5	People's Energy Services, Inc. (PESI)	People's Energy Services, Inc. (PESI)	NO	NON-NPC/IPP		Sep 1957
Visayas Grid												
Hydroelectric total		2	1									
Micro Hydroelectric Plants		2	1									
BASAK	Run-of-River type HEPP	1	1	2	Bitoon, Dumanjug, Cebu	7	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	NO	NON-NPC/IPP		Sep 1966
MANTAYAYUPAN	Run-of-River type HEPP	1	1	2	Barili, Cebu	7	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	NO	NON-NPC/IPP		Aug 1985
MATUTINAO	Run-of-River type HEPP	1	0	3	Alegria, Cebu	7	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	Cebu 1 Electric Cooperative, Ins. (CEBECO 1)	NO	NON-NPC/IPP		1983

List of hydropower projects in operation (2/2)

NON-EXHAUSTIVE

Hydropower projects grid embedded, by region  
As of Jun 2023

Power plant		Capacity, MW <sup>1</sup>		# of units	Location	Region	Operator	Owner / IPPA	FIT approved (for RE)	Owner type	Type of contract	Commissioned year
Name	Subtype	Installed	Depen-able		Municipality / Province							
Mindanao Grid												
HYDROELECTRIC		108	109									
Large Hydroelectric Plants		43	43									
SIBILLAN A	Run-of-River type HEPP	16	16		Santa Cruz, Davao del Sur	11	Hydro Electric Development Corporation (HEDCOR) Solution Inc.	Hydro Electric Development Corporation (HEDCOR) Solution Inc.	NO	NON-NPC/IPP		Mar-2010
SIBILLAN A	Run-of-River type HEPP	26	26		Santa Cruz, Davao del Sur	11	Hydro Electric Development Corporation (HEDCOR) Solution Inc.	Hydro Electric Development Corporation (HEDCOR) Solution Inc.	NO	NON-NPC/IPP		Mar-2010
Small Hydroelectric Plants		54	54									
BUBUNAWAN	Run-of-River type HEPP	7	7	1	Baungon, Bukidnon	10	Bubunawan Power Company, Inc. (BPC)	Bubunawan Power Company, Inc. (BPC)	NO	NON-NPC/IPP		Sep 2001
TUDAYA 1	Run-of-River type HEPP	7	7	1	Santa Cruz, Davao del Sur	11	Hydro Electric Development Corporation (HEDCOR) Tudaya Inc.	Hydro Electric Development Corporation (HEDCOR) Tudaya Inc.	NO	NON-NPC/IPP		May 2014
ASIGA	Run-of-River type HEPP	6	6	1	Agusan Del Norte, Santiago	13	Asiga Green Energy Corporation (ACEC)	Asiga Green Energy Corporation (ACEC)	NO	NON-NPC/IPP		May 2013
LAKE MAINTI	Run-of-River type HEPP	25	25		Kitcharao, Agusan Del Norte	11	Electric Power Development Co., Ltd. (J-POWER)	Electric Power Development Co., Ltd. (J-POWER)	NO	NON-NPC/IPP		Mar 2023

Rounded to nearest whole number. Total might vary due to rounding  
Source: Department of Energy 2023, Arthur D. Little Analysis

## The Department of Energy has engaged in multi-agency cooperation to push for greater uptake in varied solar projects

### PNOC-Renewables

- Building on DOE's "Installation of Solar Photovoltaic (PV) Facilities for Own-Use by Private Academic Institutions" project in 2014, PNOC-RE started its own Rooftop Solar PV installations for government agencies in 2015
- Total capacity of projects: 2,750 kWp<sup>1</sup>
- # Government agencies: 10
- Electricity generated: 12 GWh
- CO2 saved: 6,821 mn tons
- Proposed projects (non-exhaustive):
  - TESDA – 100 kWp
  - SSS – 175 kWp
  - MMSU – 200 kWp
  - GSIS – 400 kWp
  - DBM – 430 kWp
  - BSP – 1,835 kWp
  - DPWH – 2,710 kWp

### National Electrification Administration

- Solar PV Mainstreaming Program:
  - Implementation completed in 2020
  - SHS to provide electricity to houses in remote and off-grid regions
  - 2 windows available
    - Window 1: 10,000 households
    - Window 2: 30,500 households
  - EC's<sup>3</sup> to operate and maintain under a fixed approved monthly tariff
- Rural Network Solar
  - Development of small-grid connected solar PP near EC's distribution substations
  - EC's<sup>3</sup> to bear 30% as Equity and secure the Certificate of Registration for their own use

### National Power Corporation

- NPC's<sup>2</sup> role is to ensure electrification is carried out in the most rural of places in Philippines as mandated by the Electric Power Industry Reform Act of 2001
- Solar hybridization of SPUG diesel PP<sup>4</sup> program, combines a diesel generator to a solar PV and battery system
- Pilot hybridization project: 2019 in Limasawa, synced to the Limasawa diesel PP in Feb 2020
  - Cost savings of PHP 1.75 mn/year (estimated)
- Projects underway (total capacity of 595 kWp<sup>1</sup>):
  - Cuaming, Bohol – 55 kWp<sup>1</sup>
  - Palumbanes, Catanduanes – 40 kWp<sup>1</sup>
  - Sabtang, Batanes – 250 kWp<sup>1</sup>
  - Itbayat, Batanes – 250 kWp<sup>1</sup>

Note: 1) kilowatt peak; 2) National Power Corporation; 3) Electric cooperatives who are private, not-for-profit company whose purpose is to safely deliver electricity to its consumers or members at the most affordable price possible; 4) Power plant

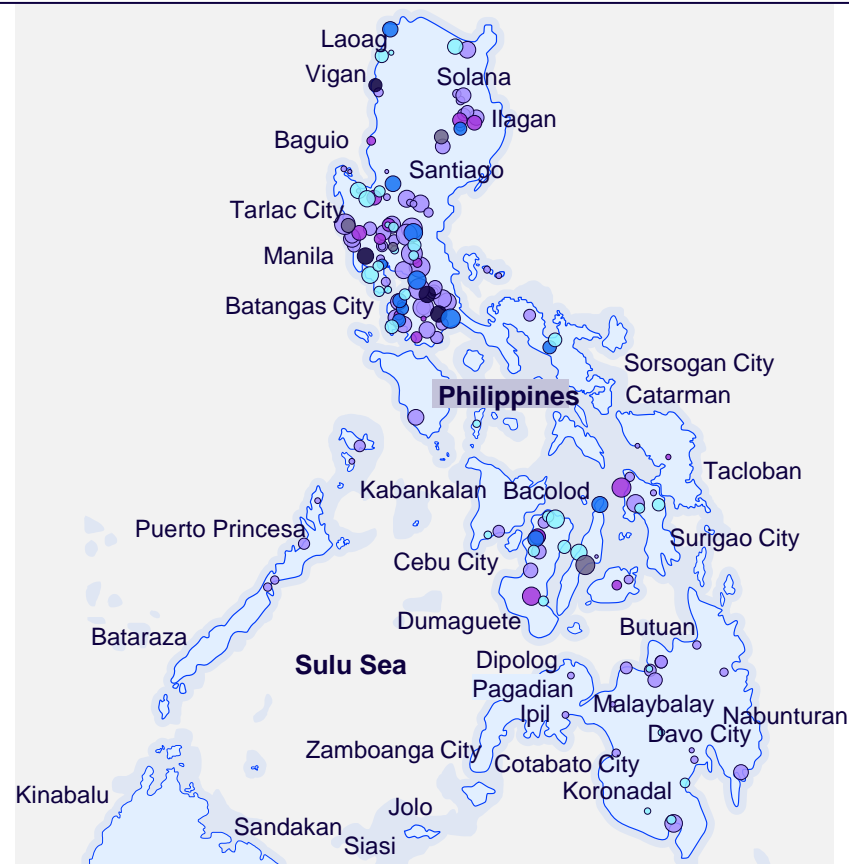
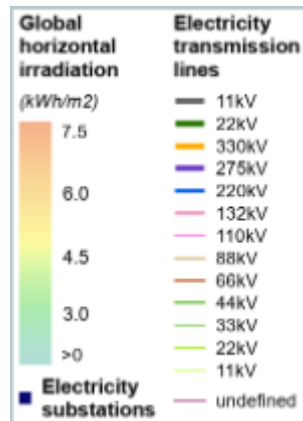
Source: World Bank 2023, International Energy Agency 2023, Multiple new sources, Arthur D. Little analysis

## Map of solar projects

NON-EXHAUSTIVE

### Solar power projects, by status

2014 - 2040



#### Development status (as of current year)



## List of solar projects in operation (1/2)

NON-EXHAUSTIVE

### Solar power projects, by region

2014 - 2022

#	Province	Name	Capacity <sup>1</sup>	Developer	Status	Start-up year
1	Western Visayas	SACASOL 1-A	14	Bronzeoak	Operating	2014
2	Western Visayas	SACASOL 1-B	10	Bronzeoak	Operating	2014
3	Ilocos	Burgos Solar Power - Phase 1	4	Energy Development	Operating	2015
4	Calabarzon	Cavite Economic Zone Solar Power	48	Majestics Energy	Operating	2015
5	Northern Mindanao	Kirahon Solar Power	12	Alternergy	Operating	2015
6	Eastern Visayas	Ormoc Solar - Ironman	29	Soleq	Operating	2015
7	Central Luzon	Pampanga Solar Power - Phase I	10	RASLAG	Operating	2015
8	Central Luzon	Pampanga Solar Power - Phase II	13	RASLAG	Operating	2015
9	Western Visayas	SACASOL 1-C&D	24	Bronzeoak	Operating	2015
10	Soccsksargen	Surallah - Centrala Photovoltaic PP	6	nv Vogt	Operating	2015
11	Central Luzon	Armenia Solar Power	9	nv Vogt	Operating	2016
12	Central Luzon	Bataan Solar Power Mariveles	19	Unknown	Operating	2016
13	Central Luzon	Bulacan 3 Solar Power	14	Cleantech	Operating	2016
14	Ilocos	Burgos Solar Power - Phase 2	3	Energy Development	Operating	2016
15	Central Luzon	Cabanatuan Solar Power A	11	First Cabanatuan	Operating	2016
16	Western Visayas	Cadiz SPP - Pollo	130	Soleq	Operating	2016
17	Calabarzon	Calatagan Solar	60	Solar Philippines	Operating	2016



## List of solar projects in operation (2/2)

NON-EXHAUSTIVE

### Solar power projects, by region

2014 - 2022

#	Province	Name	Capacity <sup>1</sup>	Developer	Status	Start-up year
18	National Capital Region	Valenzuela Solar Power	8	Valenzuela Solar Energy	Operating	2016
19	Northern Mindanao	Zorro - Kibawe	10	Soleq	Operating	2016
20	Central Luzon	Sta. Rita Solar Power	35	Emerging Power	Operating	2017
21	Central Visayas	Toledo Solar Power	59	SunAsia Energy	Operating	2017
22	Soccsksargen	Santos Solar Power	25	Astronergy	Operating	2019
23	Central Luzon	Tarlac Solar Power Project Phase II	20	Unknown	Operating	2019
24	Central Luzon	Concepcion 1 - Phase 1	91	Solar Philippines	Operating	2020
25	Calabarzon	Alaminos Solar	107	Unknown	Operating	2021
26	Central Luzon	Gigasol3 Palauig Solar	66	Gigasol 3	Operating	2021
27	Mimaropa	Palawan Solar Power Project B	1	Unknown	Operating	2021
28	Central Luzon	San Miguel Solar Power a	68	Powersource First	Operating	2021
29	Ilocos	Sarrat Solar Power	1	Bosung Powertec	Operating	2021
30	Mimaropa	Tumingad Island Solar Power Project	7	Unknown	Operating	2021
31	Central Luzon	Arayat-Mexico Solar	62	Unknown	Operating	2022
32	Central Luzon	RE Tech Hub - Solar	9	Bataan Solar Energy	Operating	2022
33	Ilocos	Sta. Barbara Solar Power Project	20	Unknown	Operating	2022
34	Central Luzon	Sta. Rita Solar Power phase II	74	Emerging Power	Operating	2022

## List of solar projects in the Philippines (1/2)

NON-EXHAUSTIVE

### Solar power projects, by region

2023 - 2049

#	Province	Name	Capacity <sup>1</sup>	Developer	Status	Start-up year
1	Calabarzon	Sabang Solar Power	50	GAPMEC	Financial Close	2023
2	Central Luzon	Arayat-Mexico Solar - Phase 2	36	Unknown	Construction	2023
3	Central Luzon	Giga Ace 8 - Palauig	75	AC Energy	Construction	2023
4	Calabarzon	Maragondon 2 Solar Power Project	140	Unknown	Construction	2023
5	Central Luzon	Nueva Ecija Solar Farm 1	225	Solar Philippines	Construction	2023
6	Eastern Visayas	1MW SAMELCO II - Paranas SPP	1	Unknown	Approved	2023
7	Calabarzon	50 MW Mabacong Solar Power Project	50	Unknown	Approved	2023
8	Central Luzon	Palauig Solar Power Project- Shizen	50	Unknown	Approved	2023
9	Calabarzon	Talim Floating Solar Phase 1 PP	120	Unknown	Approved	2023
10	Central Luzon	Hermosa Solar Power - II	25	Solana Solar Alpha	Financial Close	2024
11	Central Visayas	Medellin Solar Power	100	Solar Philippines	Financial Close	2024
12	Western Visayas	Negros Solar	150	Nexif Energy	Financial Close	2024
13	Calabarzon	Batangas A - Citicore	408	Unknown	Construction	2024
14	Calabarzon	Batangas B - Citicore	408	Unknown	Construction	2024
15	Ilocos	Laoag 2 Solar Power Project	86	PV Sinag Power	Construction	2024
16	Central Visayas	Naga Solar Power	1440	MRI Allied	Construction	2024
17	Central Luzon	Floridablanca Solar Power Project	11	Sinag Naraw Power Inc.	Concept	2024

## List of solar projects in the Philippines (2/2)

NON-EXHAUSTIVE

### Solar power projects, by region

2023 - 2049

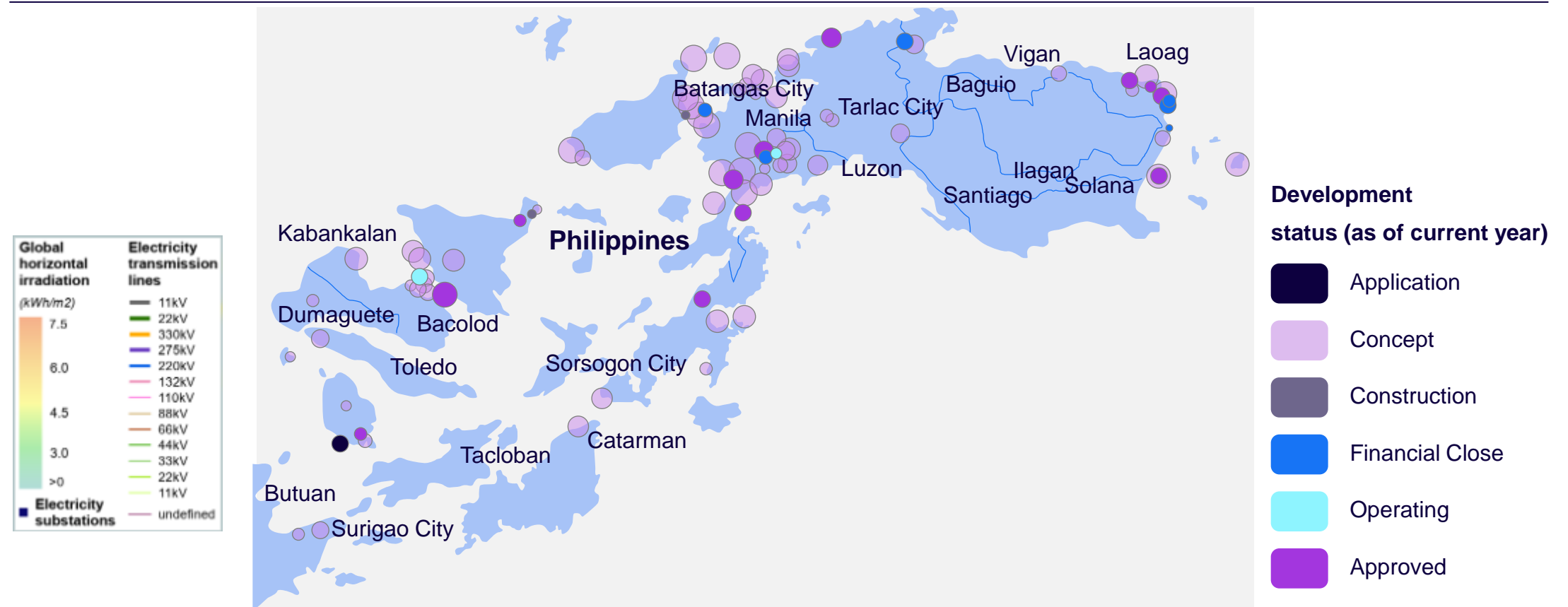
#	Province	Name	Capacity <sup>1</sup>	Developer	Status	Start-up year
18	Ilocos	San Manuel 1 Solar Power	70	Pilipinas	Concept	2034
19	Calabarzon	Baras Solar Power	3	Green Atom	Concept	2035
20	Central Luzon	Iba-Palauig 2 Solar Power Project	1200	Solar Philippines	Concept	2035
21	Calabarzon	Laguna Bay	150	UPC Renewables	Concept	2035
22	Calabarzon	Pililla Solar Power Project a	20	Green Atom	Concept	2035
23	Central Luzon	Terra Solar PV - Phase 3	2650	Terra Solar	Concept	2035
24	Central Luzon	Capas Solar Power	28	Sindicatum	Concept	2036
25	Central Luzon	Iba-Palauig Solar Power	1200	Solar Philippines	Concept	2036
26	Northern Mindanao	Laguindingan Solar Power Project	40	Centro Solar Energy	Concept	2040
27	Central Luzon	RASLAG IV Solar Power Project	29	RASLAG Corp.	Concept	2040
28	South China Sea	Palawan Solar Power Project	100	Solar Philippines	Concept	2042
29	Calabarzon	Pinugay Solar Power Plant	81	H&WB Asia Pacific	Concept	2043
30	Soccsksargen	50 MW Gen. Santos SPP	50	Centro Solar Energy	Concept	2044
31	Ilocos	Infanta 1 Solar Power Project	169	Tera Renewables 3 Corp.	Concept	2045
32	Ilocos	Bugallon Solar Power Project	637	3 Barracuda Energy Corp.	Concept	2050
33	Calabarzon	Rizal Solar Power Project	360	AC Subic Solar, Inc.	Concept	2050
34	Central Luzon	TITAN I Solar Power Project	576	Apolaki Two Inc.	Concept	2050

## Map of wind projects

NON-EXHAUSTIVE

### Wind power projects, by status

2008 - 2039



## List of wind<sup>1</sup> projects in operation

NON-EXHAUSTIVE

### Wind power projects, by region

2008 - 2023

#	Province	Name	Capacity	Developer	Status	Start-up year
1	Ilocos	NorthWind - Phase 1&2	33	NorthWind Power Dev.	Operating	2008
2	Ilocos	Burgos Wind Power	150	Energy Dev.	Operating	2014
3	Ilocos	North Luzon Renewables	81	North Luzon Renewable Energy	Operating	2014
4	Ilocos	NorthWind - Phase 3	19	NorthWind Power Dev.	Operating	2014
5	Western Visayas	Guimaras Wind	54	Phinma Renewable Energy	Operating	2014
6	Calabarzon	Pililla Wind	54	Alternergy	Operating	2015
7	Western Visayas	Nabas 1 Wind	36	PetroWind	Operating	2015
8	Mimaropa	Puerto Galera Wind	16	Philippine Hybrid Energy	Operating	2019
9	Central Visayas	Bohol 1 p1 Wind	25	Triconti ECC Windkraft Group	Operating	2023
10	Ilocos	Balaoi and Caunayan Wind	160	AC Energy, UPC Renewables	Operating	2023

## List of wind<sup>1</sup> projects in the pipeline (1/2)

NON-EXHAUSTIVE

### Wind power projects, by region

2023 - 2050

#	Province	Name	Capacity	Developer	Status	Start-up year
1	Cagayan Valley	Claveria Wind	15	FirstMaxpower Intl.	Financial Close	2023
2	Calabarzon	Kalayaan 2 Wind	100	The Blue Circle	Financial Close	2023
3	Ilocos	Aguilar Wind Power	99	Amihan Energy	Financial Close	2023
4	Mimaropa	Puerto Galera Expansion	10	Berkeley Energy	Financial Close	2023
5	Western Visayas	Aklan 1 Wind	24.8	WPD	Financial Close	2023
6	Ilocos	Pasuquin WPP	50	Energy Dev.	Approved	2023
7	Calabarzon	Mabini Wind	50	Mabini Energy	Financial Close	2024
8	Ilocos	Burgos 3 Wind	60	Energy Dev.	Financial Close	2024
9	Calabarzon	Alabat	99	Alternergy	Approved	2024
10	Central Luzon	Zambales Wind Plant	200	Gigawind1	Approved	2024
11	Ilocos	132 MW Wind project	132	Energy Logics Philippines	Approved	2024
12	Ilocos	Banguì Bay 4 Wind	150	NorthWind Power Dev.	Approved	2024
13	Western Visayas	Nabas 2 Wind	14	PetroWind	Construction	2025
14	Bicol	Presentacion Wind	42	Amihan Energy	Concept	2025
15	Calabarzon	Calatagan Wind	30	Currimao Solar Energy	Concept	2025
16	Calabarzon	Real Ace Wind Power Project	175	Giga Ace 5, Inc.	Concept	2025
17	Calabarzon	Talim Wind power	198	Island Wind	Concept	2025

## List of wind<sup>1</sup> projects in the pipeline (2/2)

NON-EXHAUSTIVE

### Wind power projects, by region

2023 - 2050

#	Province	Name	Capacity	Developer	Status	Start-up year
18	Western Visayas	Negros 2 Wind Power Project	500	wpd Philippines, Inc.	Concept	2039
19	Philippine Sea	Calatagan Wind Farm	1400	Domhain Earth Corp.	Concept	2041
20	Western Visayas	Negros Wind Power Project	500	wpd Philippines, Inc.	Concept	2042
21	Cagayan Valley	Claveria Wind Farm	1600	Domhain Earth Corp.	Concept	2043
22	Philippine Sea	Aurora Wind Power Project	600	1 Barracuda Energy Corp.	Concept	2043
23	Ilocos	Burgos 4 <sup>2</sup>	100	Energy Dev.	Concept	2044
24	South China Sea	Cagayan West Wind Power Project	1024	Giga Ace 12, Inc.	Concept	2044
25	South China Sea	Frontera II Wind Power Project	600	Gumaca Windkraft Corp.	Concept	2044
26	South China Sea	Mariveles Wind Farm	1500	Domhain Earth Corp.	Concept	2044
27	Sulu Sea	Guimaras 1 Wind Power Project	582	Energy Dev. Corp. (EDC)	Concept	2044
28	South China Sea	Bulalacao Wind Farm Project	3100	Domhain Earth Corp.	Concept	2045
29	Sulu Sea	GS2 Wind Power Project	500	Vind Energy	Concept	2045
30	Sulu Sea	Guimaras UGS-2 Wind Power Project	630	Citicore Wind Cagayan	Concept	2045
31	Sulu Sea	Iloilo-Guimaras Wind Power Project	1000	Energy Dev. Corp. (EDC)	Concept	2045
32	Western Visayas	Guimaras UGS-1 Wind Power Project	460	Citicore Wind Cagayan	Concept	2045
33	Calabarzon	250 MW Real Wind Power Project <sup>2</sup>	250	Real Wind Energy, Inc.	Concept	2049
34	Calabarzon	Banahaw Wind Power Project <sup>2</sup>	170	Gigawind4, Inc.	Concept	2049

Note: 1) Offshore wind (unless otherwise stated); 2) Onshore wind

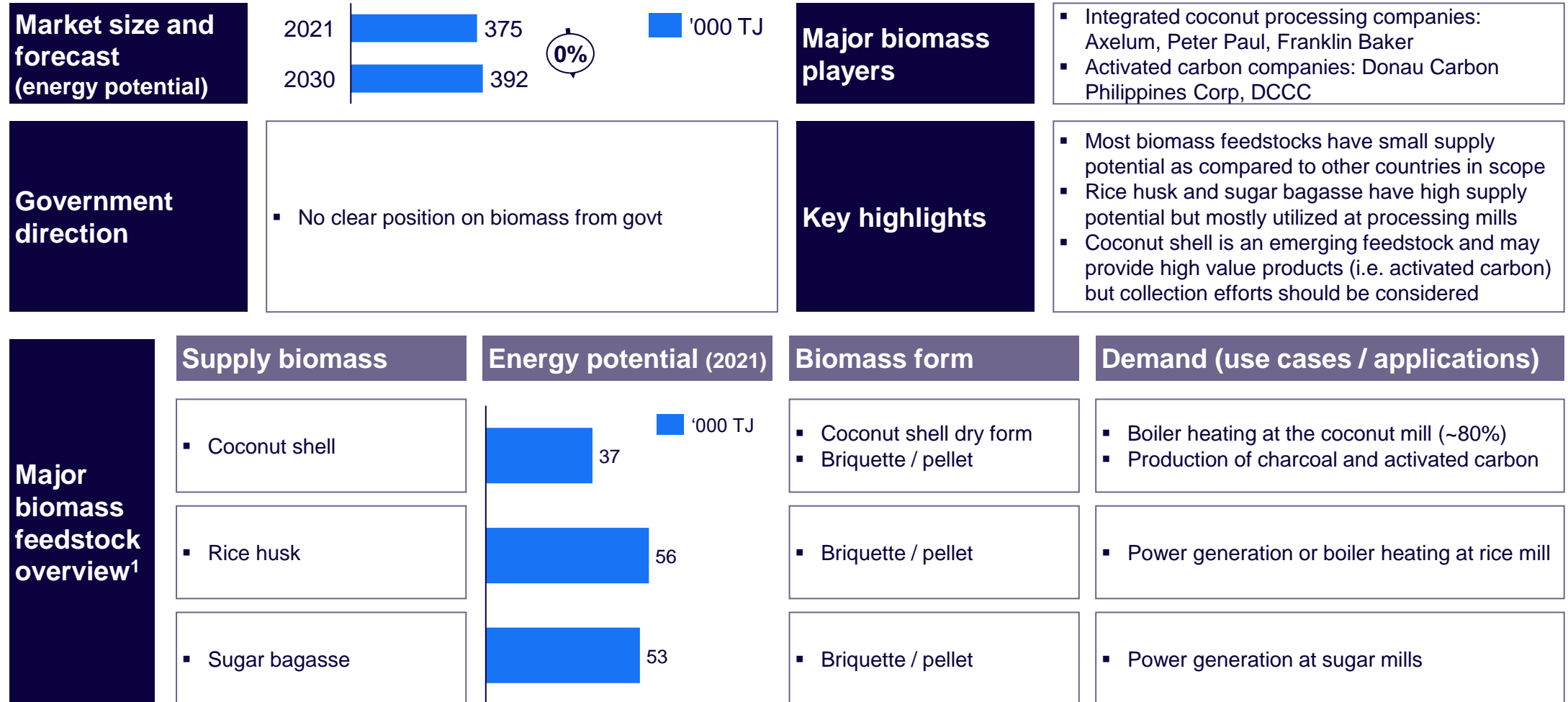
Source: Rystad Energy 2023

## Biomass energy service contract (BEOC) applications as of 30 September 2022

Island	Region	Location	Name	Company	Potential capacity, MW
Luzon	IV-A	Brgy. Labangan Poblacion , San Jose, Occidental Mindoro	MW Biomass Power Point Plant	Pag-Asa Grain Center, Inc	3
Visayas	VII	Brgy. Bugay, Bayawan City, Negros Oriental.	Biomass CoGen Plant Project	HDJ Bayawan Agri Ventures, Inc.	3
<b>Total</b>					<b>6</b>



## フィリピンのバイオマスエネルギーポテンシャルは、約39万TJに達する見込みであり、コナッツ殻、籾殻、砂糖バガスが現在の主たるエネルギー原料



政府は輸送セクターにおけるバイオ燃料の混合率を引き上げる意欲的な目標を設定

Biofuel provisions for transportation sector  
2016 - 2050

		2020	2025	2040
Biodiesel	Blend rate (%)	10	20	20
	Volume (mn liter)	707.90	885.55	1,285.55
Bioethanol	Blend rate (%)	20	20/85 <sup>1</sup>	20/85 <sup>1</sup>
	Volume (mn liter)	425.50	519.50	919.50

Blend mandate	Date mandated and policy	Date implemented
Bioethanol		
E5	Feb 2009, DC 2009-02-0002	Feb 2009
E10	Feb 2011, DC 2007-02-001	Feb 2012
Biodiesel		
B1	May 2007, DC 2007-05-006	Sep 2007
B2	Feb 2009, DC 2009-02-0002	Feb 2009

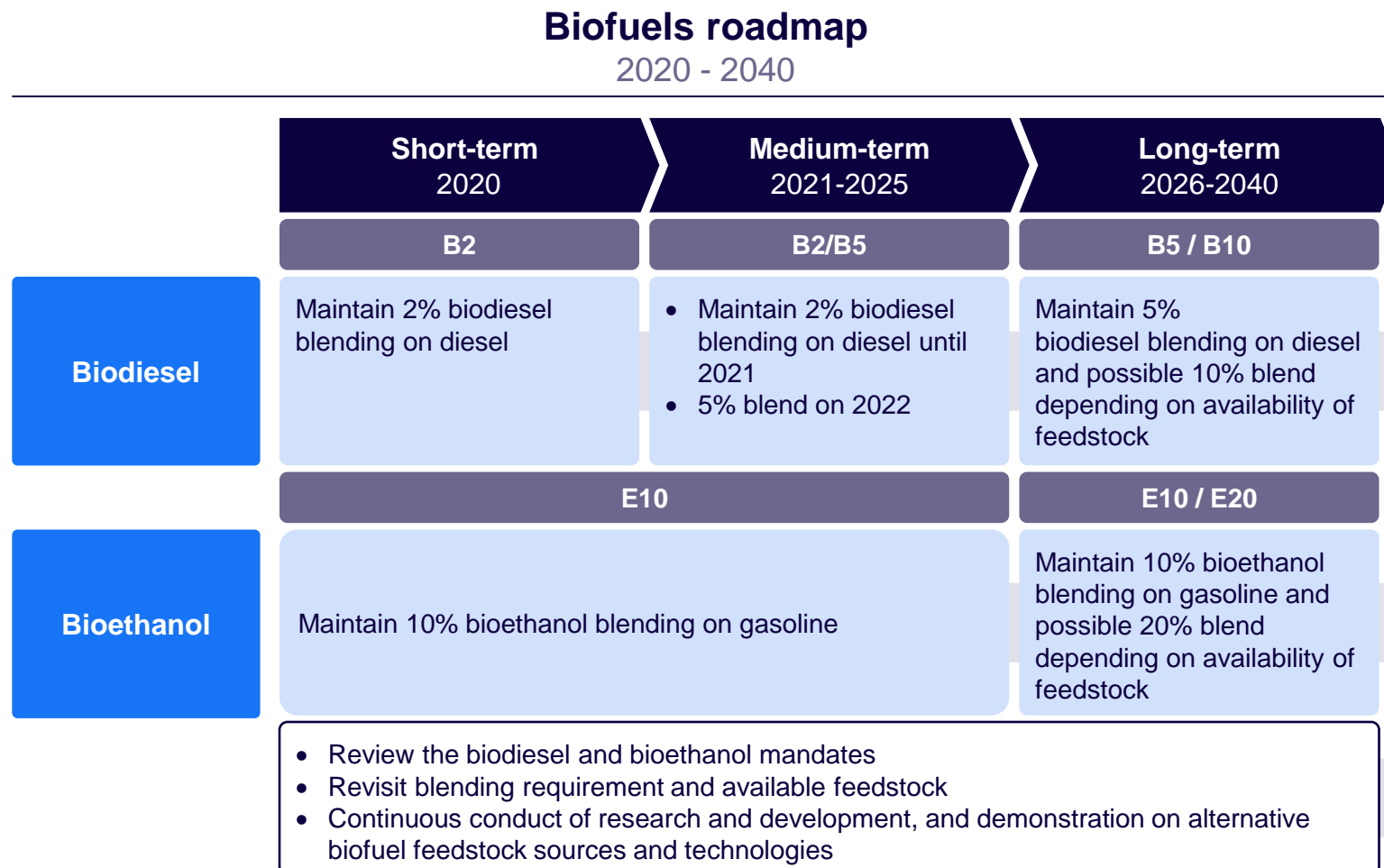
COMMENTS



- The National Biofuels Board (NBB) is the multi-government body oversight board that determines the biofuel blend mandate
- Despite setting higher eventual blend targets for biodiesel and bioethanol, the mandated blends have remained at B2 and E10 due to higher targets not being met
- In 2020, the DOE began studies to increase the biodiesel blend mandate from B3 to B20 and the bioethanol blend mandate from E15 to E20
  - However, as of 2023, there are currently no plans to increase the current targets

Note: 1) Expected to be achieved voluntarily  
Source: USDA GAIN Philippines Biofuel Annual Report 2022 and 2023, Arthur D. Little analysis

## 2006 年バイオ燃料法に準拠してバイオ燃料の開発を行うためのロードマップを策定



### COMMENTS



- The overall objective is to **pursue the development of biofuels** in compliance with the Biofuels Act of 2006
- Apr 2022: DOE's Technical Committee on Petroleum Products and Additives (TCPPA) started coordination with oil companies and local car manufacturers on increasing the Philippine National Standard (PNS) in terms of higher blends of E15 and E20
- Upon issuance of new PNS, engine tests on higher blended fuel will be conducted on existing and new vehicles
- Priority is given for the feasibility in old vehicles as the automotives in the provinces are old, with not current incentives to encourage switching to newer vehicles

## バイオ燃料の需要は、燃料消費の増加を背景に増加すると予想

### Bioethanol outlook

2023 – 2026, mn litres

Year	Gasoline demand, mn litres	Bioethanol blend (target)	Supply requirement, mn litres	Estimated equivalent feedstock requirement, Mt	
				Sugarcane	Molasses
2023	7,625	10%	763	3.81	2.02
		20%	1,525	7.63	4.05
2024	8,200	10%	820	4.10	2.18
		15%	1,230	6.15	3.26
		20%	1,640	8.20	4.35
2025	8,818	10%	882	4.41	2.34
		15%	1,323	6.61	3.51
		20%	1,764	8.82	4.68
2026	9,483	10%	948	4.74	2.52
		15%	1,422	7.11	3.77
		20%	1,897	9.48	5.03

### Biodiesel outlook

2023 – 2026, mn litres

Year	Diesel demand mn litres	Bioethanol blend (target)	Supply requirement, mn litres	Estimated equivalent feedstock requirement,	
				CNO, kt	# Nut, Bn
2023	13,650	2%	230	213,083	1,567
		3%	346	319,625	2,350
		4%	461	426,166	3,134
		5%	576	532,708	3,917
2024	14,342	2%	243	224,757	1,653
		3%	364	337,135	2,479
		4%	486	449,513	3,305
		5%	607	561,891	4,132
2025	14,907	2%	256	237,041	1,743
		3%	384	355,561	2,614
		4%	513	474,081	3,486
		5%	641	592,601	4,357
2026	15,543	2%	270	250,009	1,838
		3%	405	375,014	2,757
		4%	541	500,018	3,676
		5%	676	625,023	4,596

輸入は、国内需要を満たすための生産を補う上で重要な役割を果たしている

Bioethanol<sup>1</sup> key metrics  
2013 – 2023f, mn litres

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f
Beginning stocks	N.A	N.A	N.A	N.A	N.A	N.A	25	14	14	10	18
Production	N.A	N.A	N.A	N.A	N.A	N.A	375	344	400	402	402
Imports	N.A	N.A	N.A	339	322	347	341	322	355	375	375
Exports	0	0	0	0	0	0	0	2	4	0	0
Consumption	N.A	N.A	N.A	N.A	N.A	N.A	727	644	785	792	820
Ending stocks	N.A	N.A	N.A	N.A	N.A	25	14	14	10	18	10

Note: f = forecast; 1) Including ethanol used as fuel and other industrial chemicals but excluding beverage ethanol  
Source: USDA GAIN Philippines Biofuel Annual Report 2022 and 2023, Arthur D. Little analysis

# フィリピンのバイオディーゼル利用は現在地産地消

**Biodiesel key metrics**  
2013 – 2023f, mn litres

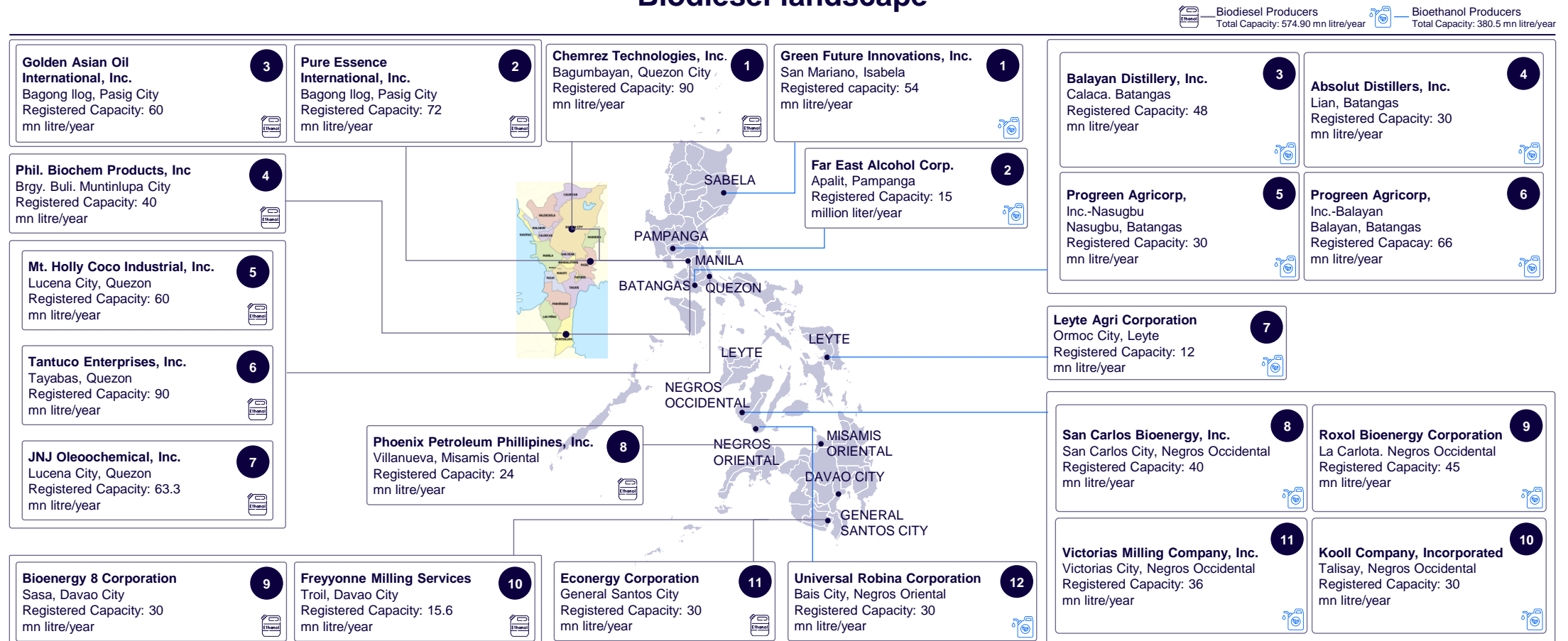
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023f
Beginning stocks	18	20	29	32	41	57	53	64	56	47	48
Production	155	172	204	227	220	220	242	188	198	203	220
Imports	0	0	0	0	0	0	0	0	0	0	0
Exports	0	0	0	0	0	0	0	0	0	0	0
Consumption	153	163	201	218	204	224	231	196	207	202	230
Ending stocks	29	29	32	41	57	53	64	56	47	48	38

Note: f = forecast  
Source: USDA GAIN Philippines Biofuel Annual Report 2022 and 2023, Arthur D. Little analysis

## バイオ燃料生産者は地理的に全国に広がっているが、北部地域に最も集中

NON-EXHAUSTIVE

### Biodiesel landscape



Note: Map not drawn to scale and is non-exhaustive

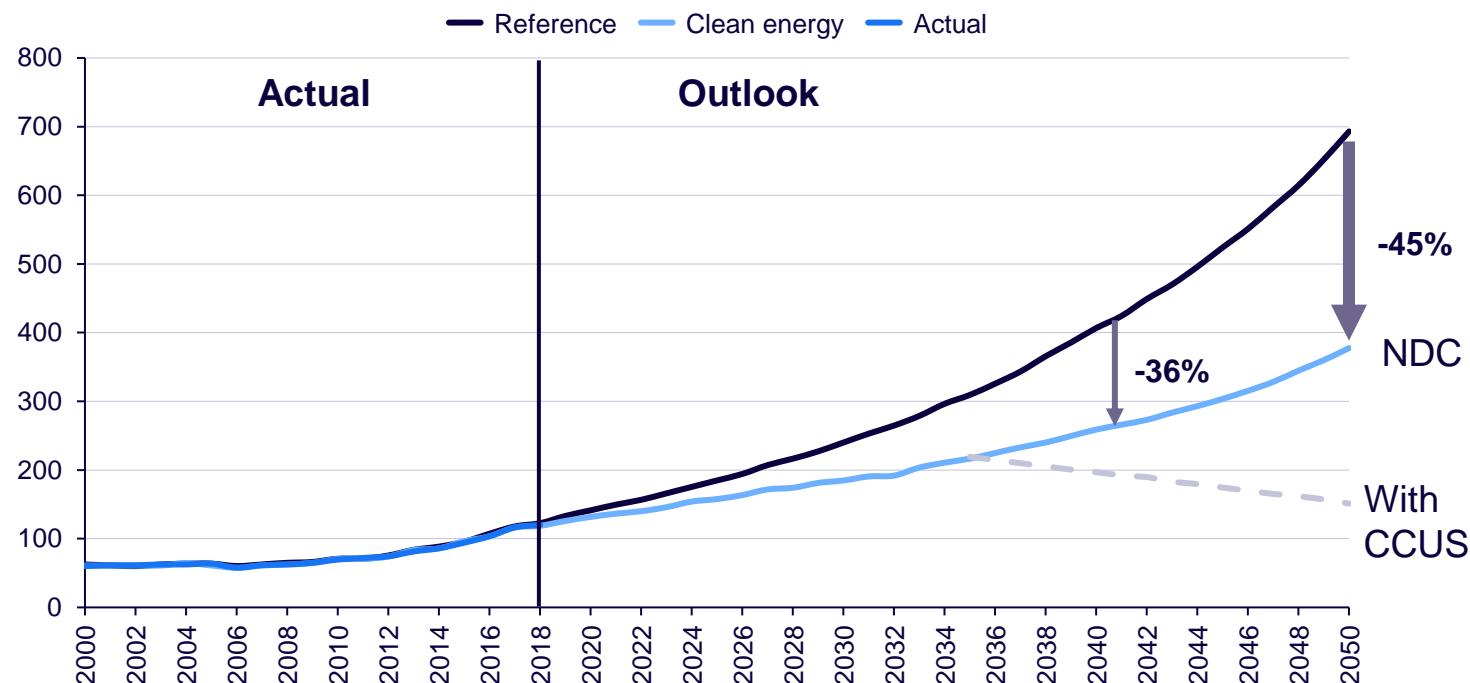
Source: USDA GAIN Philippines Biofuel Annual Report 2022 and 2023, Arthur D. Little analysis

## CCUSプロジェクトは観測されていないが、脱炭素の一環として議論中

### Potential of CCUS for emissions reduction<sup>1</sup>

2000 – 2050, MTCO<sub>2</sub>e<sup>2</sup>

CCUS can potentially play a significant role in ensuring **energy sector GHG emissions reduction** under the **Nationally Determined Contribution**



### COMMENTS



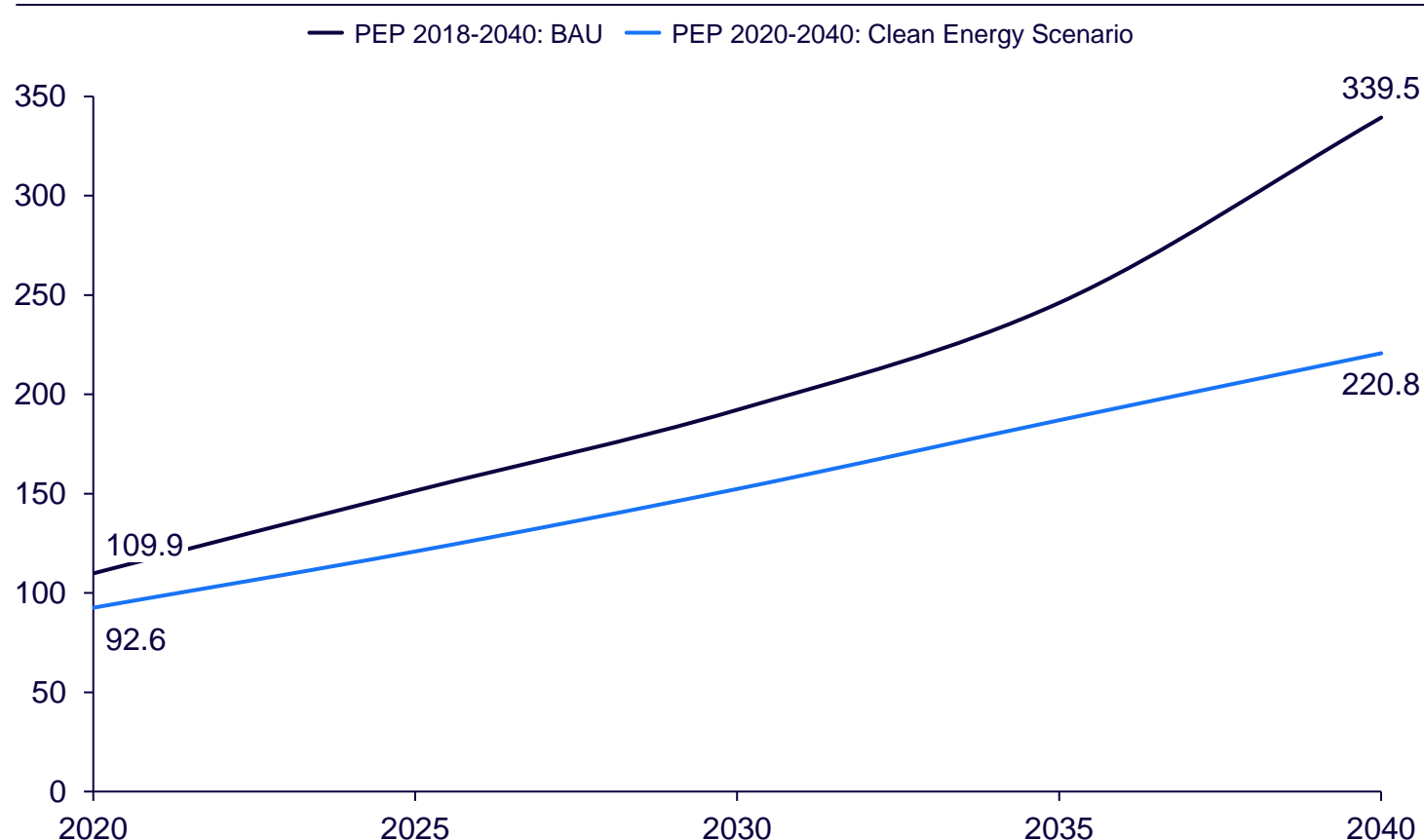
- There are **no observed CCUS projects** in The Philippines as of H1 2023
- As The Philippines' power sector is highly liberalized, the government's main task will be to **encourage CCUS development through policy support**, such as fiscal incentives for likely investors
- In 2023, First Gen Corporation indicated the firm's **potential interest in deploying CCUS technologies** in the future, after they reach maturity and have more affordable price points



## フィリピンエネルギー計画2020-2040のクリーンエネルギーシナリオに基づき、発電部門は国の温室効果ガス排出削減目標を支援する重点分野

### NDC targets for selected highlighted years (energy sector)<sup>1</sup>

2020 - 2040 , MtCO<sub>2</sub>e<sup>2</sup>



### COMMENTS



- The **largest driver** of overall GHG emissions in the Philippines are **CO<sub>2</sub> emissions from fuel combustion**
- Energy-related CO<sub>2</sub> emissions by sector:
  - **Energy: 53%**
  - Transport: 26%
  - Building: 7%
  - Industrial: 13%
  - Agriculture 1%

Note: 1) References emissions from energy consumption in the transformation, industry, and other sectors, revised in 2023. Total national GHG reduction targets would be higher, after the inclusion of contributions from other sectors, such as transportation and agriculture; 2) million tons of carbon dioxide equivalent  
Source: Philippine Energy Plan 2020-2040, Climate Transparency 2020, Arthur D. Little analysis

## フィリピンは、排出削減目標を達成するためにいくつかのイニシアチブを発表

GHG Target Action			Detail (The Philippines)
アメの政策	助成金	<ul style="list-style-type: none"> <li>Subsidy is provided to alternative energy sector to boost adoption and usage</li> </ul>	<ul style="list-style-type: none"> <li><b>No outright subsidies</b> for RE projects observed</li> <li>Green Energy Auction Program launched for RE projects, to encourage investment, as a replacement for the FiT programme</li> </ul>
	税制優遇措置	<ul style="list-style-type: none"> <li>Tax related incentives such as reduced overall tax or tax holiday boosting overall financial viability</li> </ul>	<ul style="list-style-type: none"> <li>A seven-year <b>corporate income tax holiday</b> for RE projects</li> <li>A <b>reduced 10% corporate income tax rate</b> upon expiration of the tax holiday for RE projects in The Philippines</li> </ul>
ムチの政策	排出権取引制度 (ETS)	<ul style="list-style-type: none"> <li>Carbon credit trading system to meet carbon credit/emission related criteria</li> </ul>	<ul style="list-style-type: none"> <li><b>No ETS observed as of H1 2023</b>, but the topic has been discussed</li> <li>In 2021, the Department of Finance (DoF) announced its preference for the adoption of an intensity-based carbon emissions trading scheme (ETS), over an outright carbon tax</li> </ul>
	罰則	<ul style="list-style-type: none"> <li>Penalty imposed via higher taxes or other measures to disincentivize usage</li> </ul>	<ul style="list-style-type: none"> <li><b>None observed as of H1 2023</b></li> <li>In 2023, the Department of Finance (DoF) indicated that it was <b>studying the feasibility</b> of implementing a carbon tax for The Philippines</li> </ul>
	規制	<ul style="list-style-type: none"> <li>Mandates to increase alternative energy source</li> <li>Encouraging the development of RE projects</li> </ul>	<ul style="list-style-type: none"> <li><b>Foreign investors can now hold 100% equity</b> in the exploration, development, and utilization of solar, wind, hydro, and ocean or tidal energy resources</li> <li>Amended in 2022, from up to 40% foreign ownership previously</li> </ul>

## 林業と農業の分野でいくつかの脱炭素イニシアティブが導入されているが、明確な目標はなし

産業別		CN目標	政策方針の概要
非エネルギー起源	森林・土地利用	<ul style="list-style-type: none"><li>No explicitly declared target observed, but recent initiatives have been introduced</li></ul>	<ul style="list-style-type: none"><li>The forestry sector has not been included as an emitting sector because the Philippines has claimed to be a “net sink”</li><li>In March 2023, the Philippines’ House of Representatives voted to approve <b>House Bill 8204</b><ul style="list-style-type: none"><li>Seeks to enhance the <b>conservation and restoration of peatlands</b></li><li>Tasks the Department of Environment and Natural Resources (DENR), through the Biodiversity Management Bureau, to develop a National Peatland Conservation and Restoration Program</li><li>The bill also prohibits the drainage, deforestation, clearing, dumping of waste and introduction of invasive alien species in peatlands</li></ul></li></ul>
	農業	<ul style="list-style-type: none"><li>No explicit target set, given concerns over the impact to livelihoods<sup>1</sup>. However, initiatives have recently been introduced to promote decarbonization</li></ul>	<ul style="list-style-type: none"><li>In 2023, the funding proposal on “Adapting Philippine Agriculture to Climate Change” was approved by the Green Climate Fund, with support from the Food and Agriculture Organization (FAO) of the United Nations, Philippines Department of Agriculture (DA), and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)<ul style="list-style-type: none"><li>Under <b>USD 39.2 Mn, seven-year initiative</b>, the parties will work together to enhance the resiliency of climate-vulnerable rural farmers by raising their awareness of climate risks and risk-reduction measures</li><li>Through the application of <b>climate-resilient agriculture practices and more efficient land use</b>, the initiative also expects a <b>reduction of 1.86 MtCO<sub>2</sub>e over 20 years</b></li></ul></li></ul>

Note: 1) In the country’s Nationally Determined Contributions (NDCs) submitted to the United Nations Framework Convention on Climate Change (UNFCCC), the Philippines’ target covers emissions from energy, transport, waste, forestry and the industry sectors – while excluding agriculture on the grounds that this would have adverse effects on livelihoods.

Source: United Nations Development Programme 2023, Philippine News Agency 2023, United States Department of Agriculture 2023, International Center for Tropical Agriculture 2021,

## フィリピンのエネルギー部門は、2040年までに総設備容量の50%以上を再生可能エネルギーとし、2020年から2001年の間にGHG排出量を約19%削減することを目標とする

産業別	CN目標	政策方針の概要
エネルギー起源	<ul style="list-style-type: none"> <li>Based on computed GHG, <b>the energy sector targets a ~19% reduction</b> from 2020-2030, equivalent to <b>GHG emissions reduction of about 316.8 MtCO<sub>2</sub>e<sup>1</sup></b></li> <li>Achieve the following <b>shares of renewables by total installed capacity</b> by 2040: <ul style="list-style-type: none"> <li>Geothermal: 2.52% (2,408 MW)</li> <li>Hydropower: 16.12% (15,426 MW)</li> <li>Wind: 2.12% (2,027 MW)</li> <li>Solar: 34.07% (32,590 MW)</li> <li>Biomass: 0.79% (753 MW)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Enhance energy efficiency and resiliency of power line distribution systems and facilities and establish cross-sectoral energy performance and consumption monitoring systems – to achieve a <b>measurable reduction in energy intensity and consumption per year</b> versus a business-as-usual (BAU) scenario</li> <li>The <b>National Renewable Energy Program (NREP) 2020-2040</b> sets an aspiration to achieve at least 35% RE percent share of the total generation mix by 2030 and looking further at achieving a minimum 50% percent share by 2040</li> <li>Between 2020 and 2030, the Philippines will also focus on the rehabilitation, expansion and development of new <b>substations, transmission backbone projects and island interconnection projects</b></li> <li>The introduction of RA 11285 (or the <b>Energy Efficiency Act of 2019</b>) has attracted “green investments” into the Philippines <ul style="list-style-type: none"> <li>As of April 2021, ~USD 300 Mn of investments was made possible through the projects of designated establishments (DEs) and energy service companies (ESCOs)</li> <li>Technologies include efficient lighting, water-cooled packaged A/C system and high efficiency motors</li> </ul> </li> </ul>

## ブルーカーボン、E-fuelの取り組みは以下。特にE-fuelは限定的

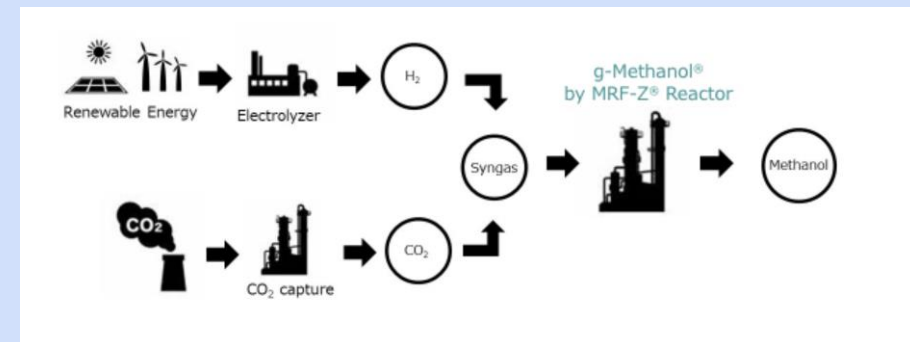
### Blue Carbon

- The **Philippines, Indonesia, and Japan have collaborated** to boost blue carbon ecosystem conservation, under the Japan International Cooperation Agency's (JICA) "Comprehensive Assessment and Conservation of Blue Carbon (BC) Ecosystems and their Services in the Coral Triangle" or **BlueCARES initiative**
- In the Philippines, the project's main sites are Palawan, Northern and Eastern Panay Coast including Aklan, and Eastern Samar, with Bolinao and Boracay Island as sub-sites



### E-Fuel/E-Methanol

- **No domestic development projects have been observed** in the Philippines
- However, **A.P. Moller-Maersk** has started training its Filipino crew for the operation of its upcoming fleet of methanol-enabled shipping vessels, based out of Subic Bay

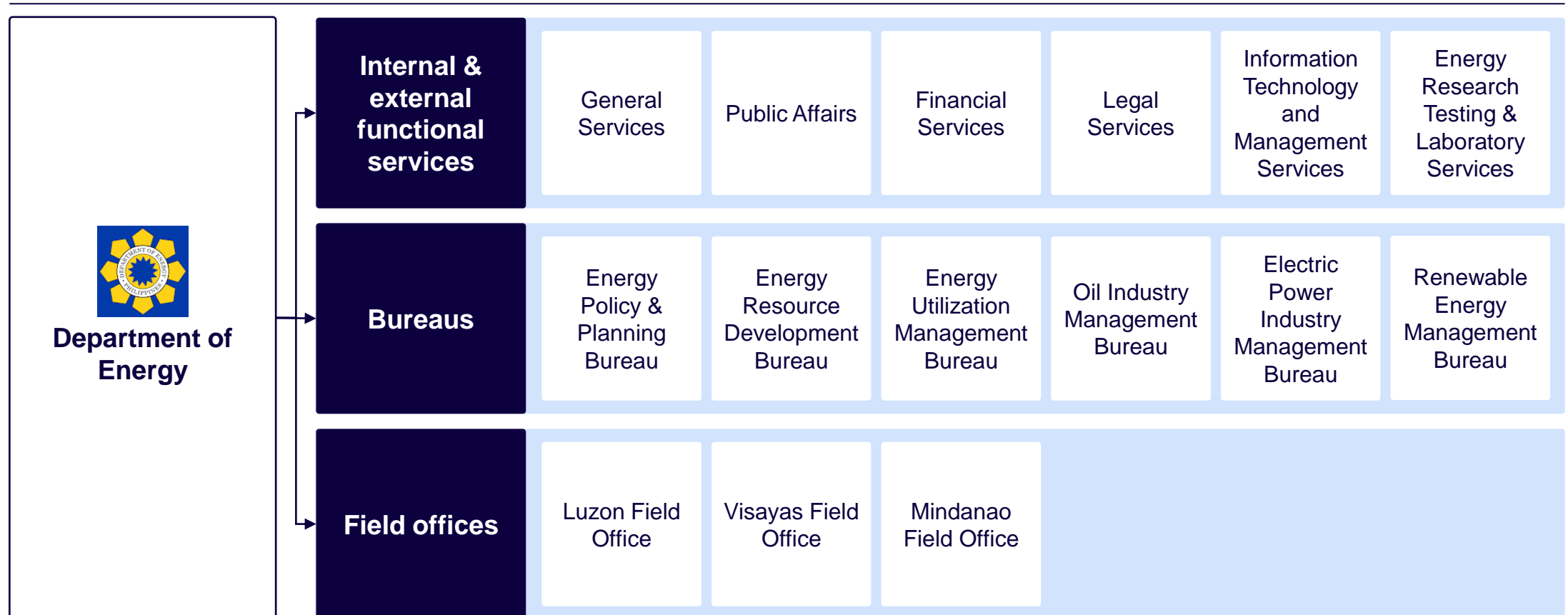


## 5 発電事業者

## エネルギー省は、フィリピン全土のエネルギー関連の計画やプロジェクトを統括

NON-EXHAUSTIVE

### Organizational structure of the Department of Energy



# エネルギー規制委員会（ERC）は、利害関係者の利益を公平に促進・保護する独立した機関として機能

NON-EXHAUSTIVE

## Mandate of the Energy Regulatory Commission

**Energy Regulatory Commission**

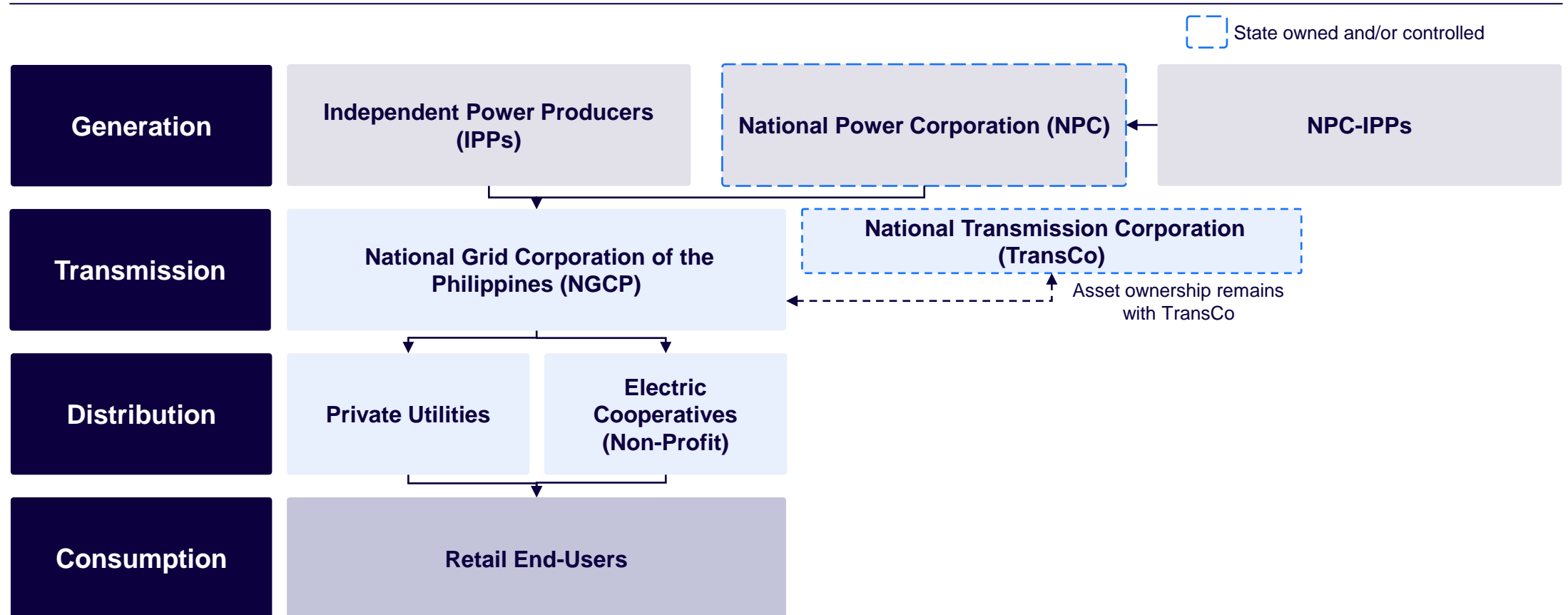
*Electric Power Industry Reform Act (EPIRA) of 2001*

Category	Details
Consumer protection	<ul style="list-style-type: none"><li>Handle consumer complaints and ensure promotion of consumer interests</li><li>Set a <b>Lifeline Rate</b> for the Marginalized End-Users</li><li>Determine the electricity end-users comprising the Contestable and Captive Markets</li></ul>
Setting of licensing requirements for generation	<ul style="list-style-type: none"><li>Approve applications for, issue, grant, revoke, review and modify Certificate of Public Convenience and Necessity (CPCN), Certificate of Compliance (COC), as well as <b>licenses and/or permits of electric industry participants</b></li><li>Promulgate and enforce a <b>national Grid Code and a Distribution Code</b> that shall include <b>performance standards and the minimum financial capability standards</b> and other terms and conditions for access to and use of the transmission and distribution facilities</li></ul>
Electricity transmission and distribution rates	<ul style="list-style-type: none"><li><b>Determine, fix and approve</b>, after due notice and hearing, Transmission and Distribution Wheeling Charges, and Retail Rates through an ERC established and enforced rate-setting methodology that will promote efficiency and non-discrimination</li><li>Review <b>power purchase contracts</b> between the Independent Power Producers (IPPs) and NPC, including the distribution utilities</li></ul>



## フィリピンにおける発電事業者は独立系発電事業者（IPP）と国営電力公社（NPC）に分けられる

### Domestic electricity supply chain



## 国営電力公社（NPC）の全体像

NON-EXHAUSTIVE

### Core business operations

1

#### Missionary electrification

- **Energize far-flung, off-grid areas and islands** through its power generation facilities, called Small Power Utilities Group (SPUG) plants. At present, the corporation operates 275 SPUG power plants across 34 provinces

2

#### Management of remaining state-owned power assets

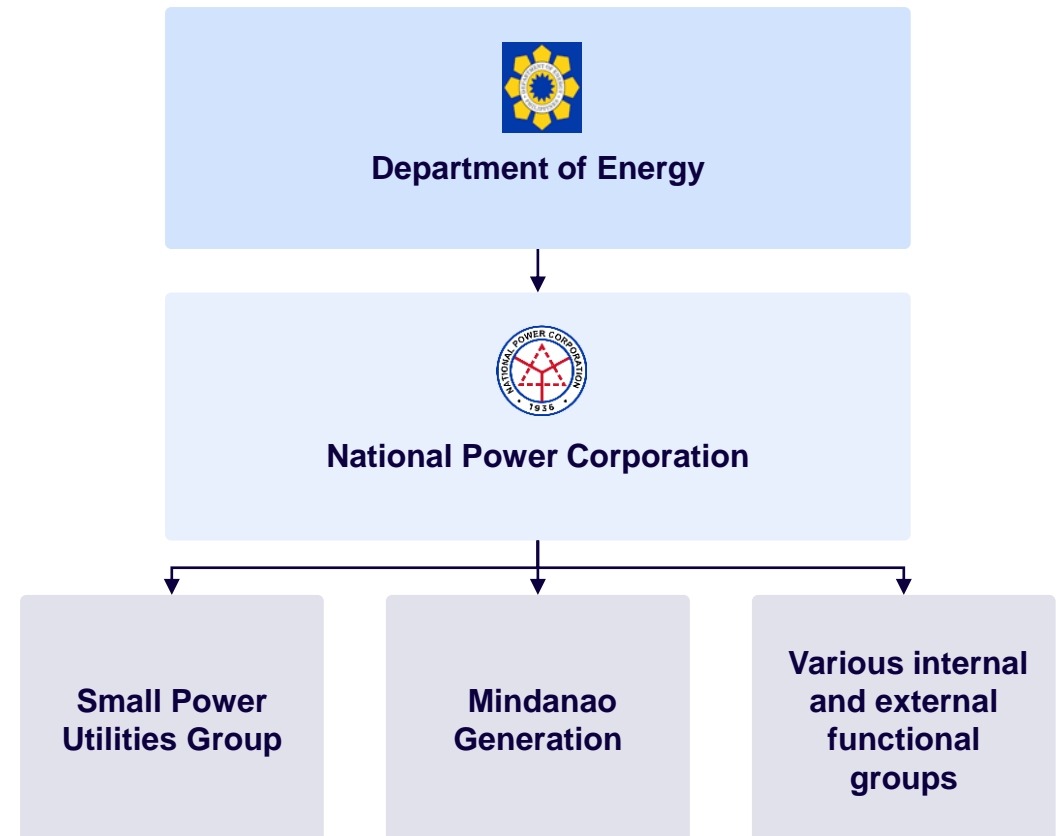
- Such as the 981 MW Agus and Pulangi Hydroelectric Power Plants in **Mindanao**

3

#### Management of watershed areas and dams

- Management of **11 watershed areas and 22 dams** in the country that support power generation
- Perform watershed rehabilitation and protection programs for a total area of ~485,199 hectares

### Overview of corporate structure



発電プロジェクトには適合証明書が必要であるが、最近、再生可能エネルギーについては完全な外資所有を許可された

NON-EXHAUSTIVE

### General qualifying criteria for power generation companies



Department of Energy and  
Energy Regulatory  
Commission

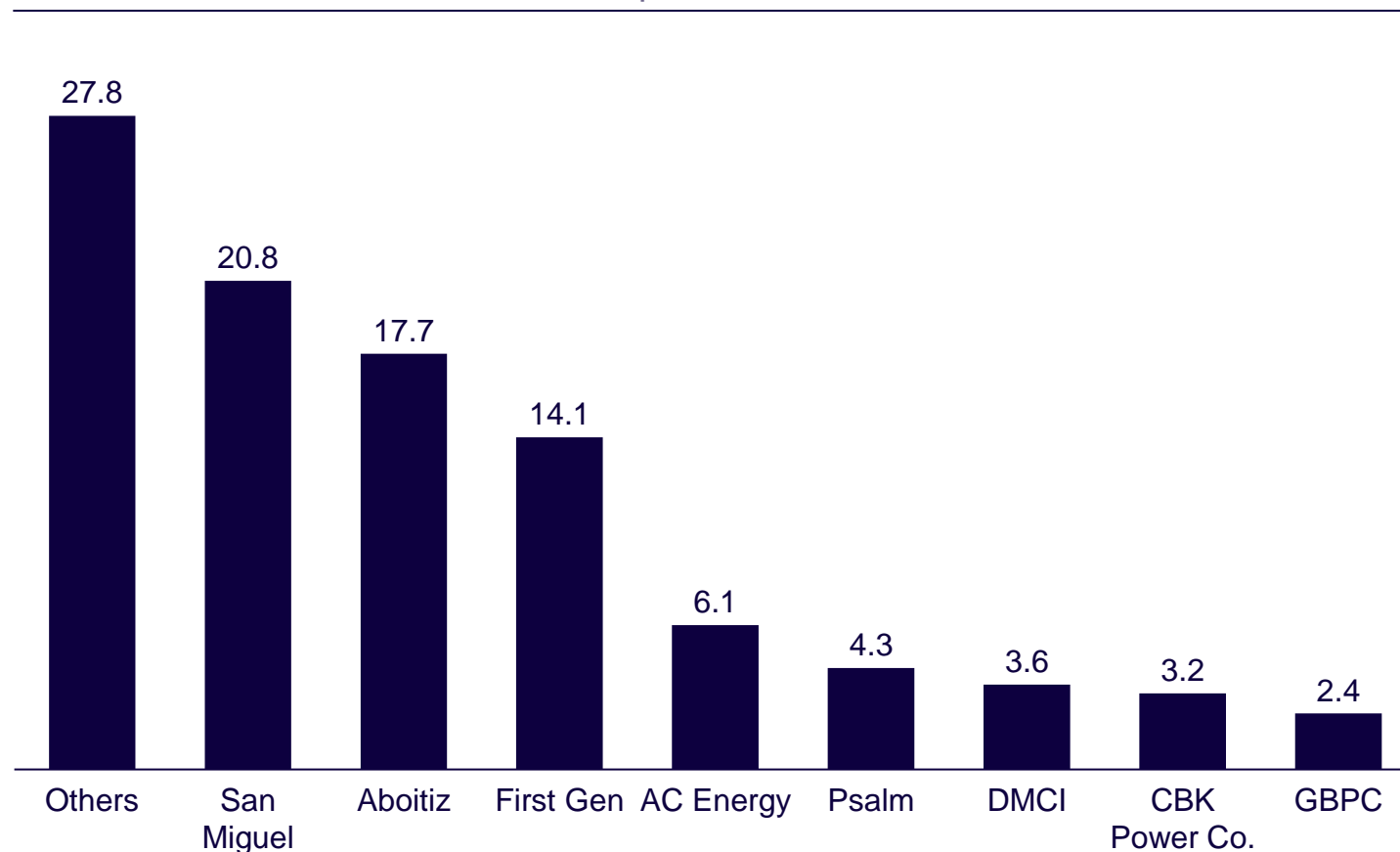


Category	Details
Certificate of Compliance	<ul style="list-style-type: none"> <li>The generation of electric power, a business affected with public interest, shall be <b>competitive and open to all qualified Generation Companies</b>. Generation shall not be considered a public utility operation</li> <li>No Person may engage in the generation of electricity as a new Generation Company unless such Person has received a <b>Certificate of Compliance from the Energy Regulatory Commission (ERC)</b> to operate facilities used in the generation of electricity</li> </ul>
Foreign ownership criteria	<ul style="list-style-type: none"> <li><b>Foreign investors can now hold 100% equity</b> in the exploration, development, and utilization of solar, wind, hydro, and ocean or tidal energy resources</li> <li>Amended in 2022, from up to 40% foreign ownership previously</li> </ul>
Other operating requirements	<p>A Generation Company shall ensure that all its facilities:</p> <ul style="list-style-type: none"> <li>Meet the <b>technical design criteria</b> of the Grid Code and Distribution Code promulgated by the ERC</li> <li>Conform to the <b>financial standards</b> provided in the Grid Code</li> <li>Comply with all applicable <b>environmental laws</b>, rules and regulations</li> </ul>

## フィリピンの発電は、独立系発電事業者（IPP）グループが中心

### Market share of leading power companies

Apr 2022, %



### COMMENTS

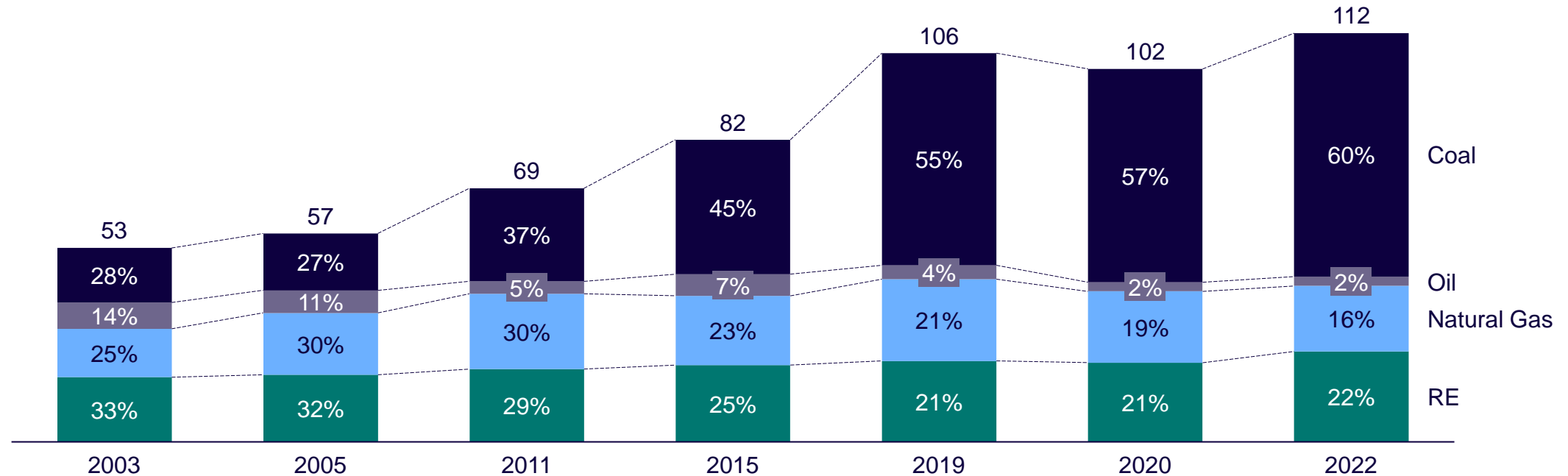


- The **3 largest IPPs (San Miguel, Aboitiz, and First Gen)** account for **>50% of the market share**, and operate as the power generation units of major conglomerates in the Philippines
- The **state-owned National Power Corporation (NPC)** focuses its efforts on **“missionary electrification”**, under its mandate to provide energy to far-flung, off-grid areas and islands
- To ensure that there will be no monopoly in power generation, a **cap of 25% market share** of the national installed generating capacity is implemented

## フィリピンの総発電量は増加、発電は石炭に大きく依存

### Gross power generation by source

2003 to 2022, TWh<sup>1</sup>

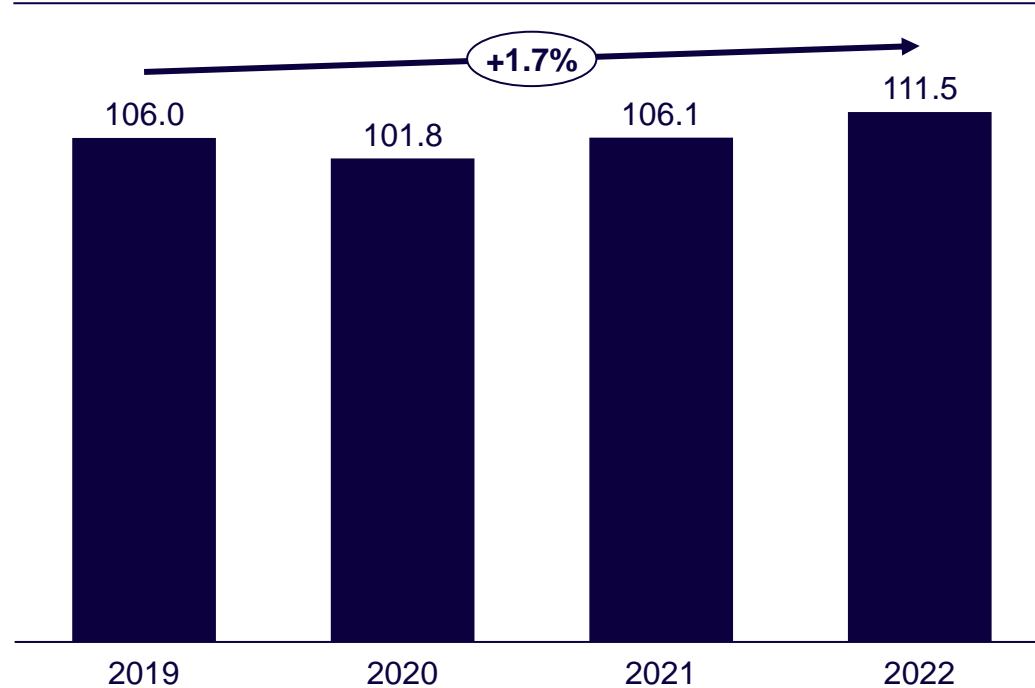


**Coal is the main driver** of power generation in the Philippines, with increased use observed over the past 3 years. The **natural gas use has fallen** across the last 3 years, while **total power generation from renewables has risen**

## フィリピンでは現在、家庭部門が最大の電力消費基盤

### Total electricity consumption<sup>1</sup>

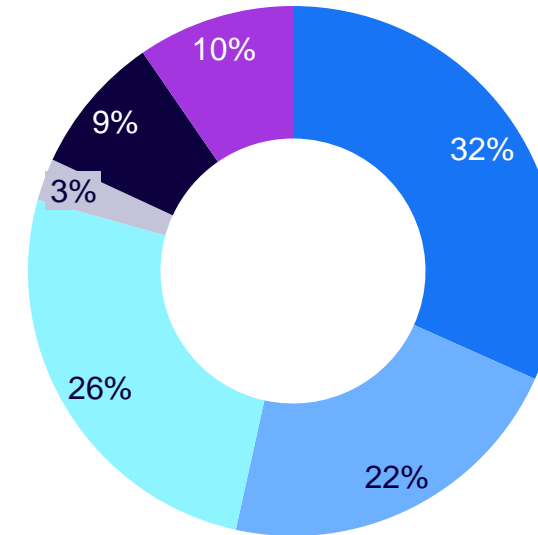
2019 to 2022, TWh<sup>1</sup>



### Electricity consumption by sector

2022, %

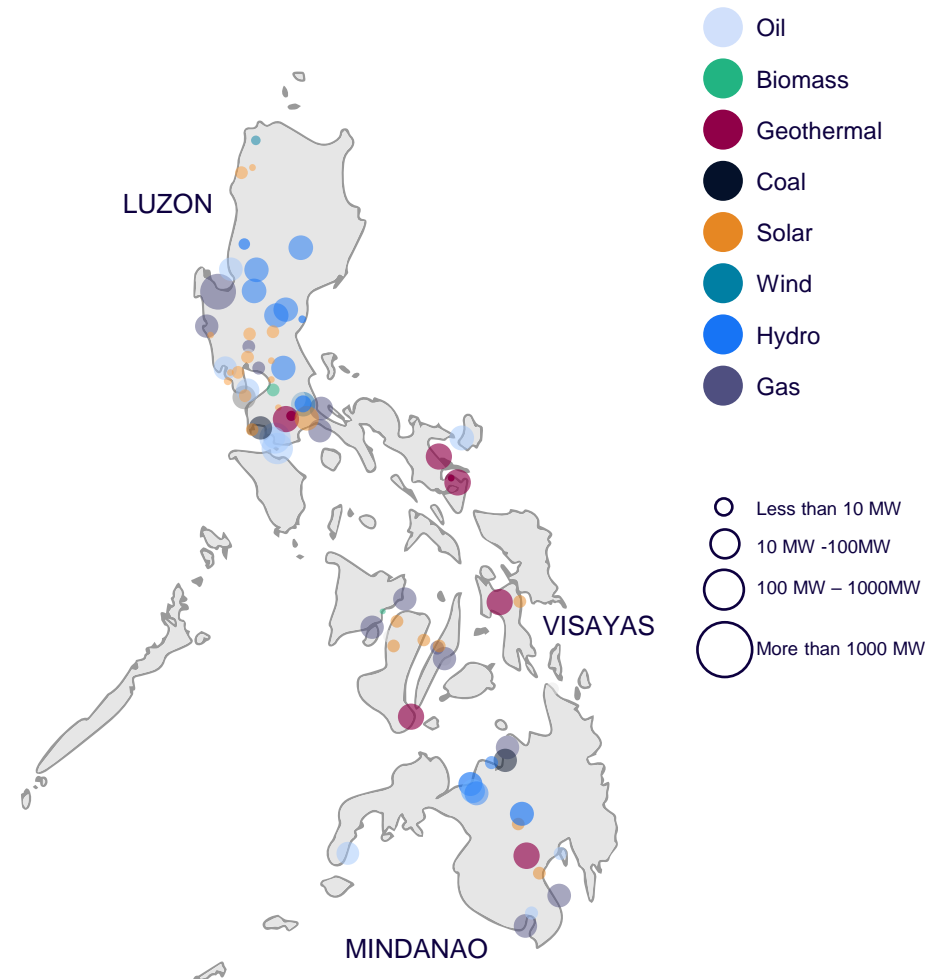
Residential Industrial Utilities own use  
Commercial Others System losses



**Electricity consumption has generally risen** year-on-year, with the residential and industrial sector forming the top 2 consumption bases. Notably, **system losses appear significant**, at 10%

## 6 発電所

## Map of power generation plants in the Philippines



### COMMENTS



- The majority of power plants in the Philippines appear clustered in **Luzon**
- Geothermal, solar, and hydropower projects are observed to be relatively more distributed across the country
- **Remote regions** are likely to be served by **off-grid power plants**, rather than being connected to the grid



## List of approved Independent Power Producers (IPPs) in the Philippines (1/3)

*NON-EXHAUSTIVE*

#	Name	Address	Capacity, MW
1	Agusan HEPP	3F Benpres Bldg. Exchange Road Pasig	2
2	Angeles Electric Corporation Petersville Power Plant	Don Juan-Doña Teresa Avenue, Nepo Mart Complex, An	9
3	Angeles Electric Corporation Petersville Power Plant	Don Juan-Doña Teresa Avenue, Nepo Mart Complex, An	7
4	Angeles Power Inc.	Rm. 1905 Robinsons Equitable Tower, ADB Avenue	30
5	Angeles Power Inc.	Rm. 1905 Robinsons Equitable Tower, ADB Avenue	31
6	Bantayan Island Power Corporation	A.S. Fortuna Street Bakilid Mandaue City, Cebu	100
7	Basak Mini-hydroelectric power plant	Bitoon, Dumanjug, Cebu	500
8	BOHECO I - Bilangbilangan Diesel Power Plant	Macas-as, Tubigon, Bohol	25
9	BOHECO I - Cuaming Diesel Power Plant	Macas-as, Tubigon, Bohol	86
10	BOHECO I - Hambongan Diesel Power Plant	Macas-as, Tubigon, Bohol	25
11	Bohol I Electric Cooperative, Inc.-Janopol Mini-Hy	Maca-as, Tubigon, Bohol	5
12	Bubunawan Power Company	8th Flr. Strata 100 Bldg., Emerald Avenue Ortigas	7
13	Cagayan Electric Power and Light Company	Brgy. Indahag, Cagayan de Oro City	1
14	Capiz Sugar Central, Inc.	21 P. Arroyo St., Iloilo City	6
15	CBK Power Co. Ltd. - Kalayaan	CBK Complex Barangay San Juan Kalayaan Laguna	367
16	Cotabato Light and Power Company, Inc.	Sinsuat Avenue, Cotabato City	10
17	Diesel Power Barge 101	Quezon Avenue, cor. BIR Road, Diliman, Quezon City	400
18	EEI Power Corporation	12 Manggahan St., Bagumbayan Quezon City	1
19	FGP Corporation - San Lorenzo	Brgy. Sta. Rita Aplaya and Sta. Rita Karsada, Bata	508
20	First Cabanatuan Ventures Corporation	Sitio Mampulog, Bgy. Bitas Cabanatuan City, Nueva E	26
21	First Farmers Holding Corporation	Bo. Dos Hermanas, Talisay City, Negros Occidental	6

Note: List consists of IPPs that have been issued with a Certificate of Compliance for operations  
Source: Philippines Energy Regulatory Commission 2023, Arthur D. Little analysis

## List of approved Independent Power Producers (IPPs) in the Philippines (2/3)

NON-EXHAUSTIVE

#	Name	Address	Capacity, MW
22	First Gen Hydro Power Corporation (Masiway)	Unknown	12
23	First Gen Hydro Power Corporation (Pantabangan)	Pantabangan, Nueva Ecija	320
24	Green Core Geothermal, Inc.	Energy Merritt Road, Fort Bonifacio, Taguig	193
25	Hacienda Bio-Energy Corp. (Celevy Farm)	Brgy. Anupol, Bamban, Tarlac	75
26	Hacienda Bio-Energy Corp. (Ever Fortune)	Brgy. Baculong, Victoria, Tarlac	75
27	Hacienda Bio-Energy Corp. (Golden Harvest)	Brgy. Baras Baras, Tarlac City	100
28	Hacienda Bio-Energy Corp. (Liberty Agro)	Kalayaan, Gerona, Tarlac	100
29	Hacienda Bio-Energy Corp. (Sta. Luisita Farm)	Brgy. Ungot, Tarlac City	100
30	Ilocos Norte Electric Cooperative, Inc.	Suyo Dingras, Ilocos Norte	2
31	Junmar Electric Power Service	Guindacpan, Talibon, Bohol	16
32	KEPCO Ilijan Corporation	Arenas Point, Ilijan, Batangas City	1278
33	Kepco Phils. Corporation	Bo. Malaya, Pililia, Rizal	650
34	Lazard Power Corporation	#8499 Ilugin Street, Sandoval Avenue, Brgy. Pinagbu	8
35	Lazard Power Corporation	#8499 Ilugin Street, Sandoval Avenue, Brgy. Pinagbu	12
36	Limay Combined Cycle Power Plant	Corner Quezon Avenue and Agham Road, Diliman, Quez	600
37	Linberg Philippines, Inc. - Philips Semiconductors	20/F Rufino Pacific Tower 6784 Ayala Ave. Makati C	18
38	Magellan Cogeneration Inc.	Phase II, Cavite Economic Zone, Rosario Cavite	63
39	Matutinao Mini-hydroelectric power plant	Bito-On, Dumanjug, Cebu Mini-Hydro Plant Barili/ B	720
40	Monde Energy Co-Generation, Incorporated	Monde Nissin Corporation Compound, Felix Reyes St.	8
41	NorthWind Power Development Corporation	3rd Avenue cor. 26th St., Bangui Bay, Ilocos Norte	25
42	NPC - Iligan DPP II	Solid House, 2285 Pasong Tamo Extension	98

Note: List consists of IPPs that have been issued with a Certificate of Compliance for operations  
Source: Philippines Energy Regulatory Commission 2023, Arthur D. Little analysis

## List of approved Independent Power Producers (IPPs) in the Philippines (3/3)

NON-EXHAUSTIVE

#	Name	Address	Capacity, MW
43	Panay Power Corp. (Nabas Diesel PP)	Brgy. Mabilo, New Washingtgn, Aklan	5
44	Philippine Power and Development Company	Balugbog HEPP - Nagcarlan, Laguna; Palakpakin HEPP	1
45	PowerSource Philippines, Inc.	121 Paseo de Roxas, Makati City	420
46	PSALM - Agus 1 Hydroelectric Power Plant	Diliman, Quezon City	80
47	PSALM - Agus 2 Hydroelectric Power Plant	Diliman, Quezon City	180
48	PSALM - Agus 6 Hydroelectric Power Plant	Diliman, Quezon City	200

## List of operational grid-connected power plants in Luzon – Coal (1/2)

NON-EXHAUSTIVE

#	Name	Location	Owner	Capacity, MW
1	ANDA	TECO Industrial Park, Bo. Bundagul, Mabalacat, Pampanga	Anda Power Corporation	84
2	APEC	Teco- Special Economic Zone, Brgy. Mabalacat, Pampanga	Asia Pacific Power Corporation	52
3	CALACA U1	Barangay San Rafael, Calaca, Batangas	SEM-Calaca Power Corporation (SCPC)	300
4	CALACA U2	Barangay San Rafael, Calaca, Batangas	SEM-Calaca Power Corporation (SCPC)	300
5	DINGININ U1	Sitio Dinginin, Barangay Alasasin, Mariveles, Bataan	GNPower Dinginin Ltd. Co.	725
6	DINGININ U2	Sitio Dinginin, Barangay Alasasin, Mariveles, Bataan	GNPower Dinginin Ltd. Co.	725
7	MARIVELES U1	Barangay Alasasin, Mariveles, Bataan	GNPower Mariveles Energy Center Ltd.Co	326
8	MARIVELES U2	Barangay Alasasin, Mariveles, Bataan	GNPower Mariveles Energy Center Ltd.Co	326
9	MASINLOC U1	Barangay Bani, Masinloc, Zambales	Masinloc Power Partners Co. Ltd. (MPPCL)	330
10	MASINLOC U2	Barangay Bani, Masinloc, Zambales	Masinloc Power Partners Co. Ltd. (MPPCL)	344
11	MASINLOC U3	Barangay Bani, Masinloc, Zambales	Masinloc Power Partners Co. Ltd. (MPPCL)	352
12	PAGBILAO U1	Barangay Ibabang Polo, Pagbilao, Quezon	Therma Luzon Inc. (TLI)	382
13	PAGBILAO U2	Barangay Ibabang Polo, Pagbilao, Quezon	Therma Luzon Inc. (TLI)	382
14	PAGBILAO U3	Barangay Ibabang Polo, Pagbilao, Quezon	Therma Luzon Inc. (TLI) TeaM Energy (Philippines) Corporation	420
15	QUEZON POWER PLANT	Barangay Cagsiay I, Mauban, Quezon	Quezon Power (Philippines) Limited Co.	538
16	SBPL	Barangay Cagsiay I, Mauban, Quezon	San Buenaventura Power Ltd. Co	528
17	LPI U1 (SMC LIMAY U1)	Roman Highway, Barangay Lamao, Limay, Bataan	Limay Power Inc.	150
18	LPI U2 (SMC LIMAY U2)	Roman Highway, Barangay Lamao, Limay, Bataan	Limay Power Inc.	150
19	LPI U3 (SMC LIMAY U3)	Roman Highway, Barangay Lamao, Limay, Bataan	Limay Power Inc.	150
20	LPI U4 (SMC LIMAY U4)	Roman Highway, Barangay Lamao, Limay, Bataan	Limay Power Inc.	150
21	SLPGC U1	Barangay San Rafael, Calaca, Batangas	Southwest Luzon Power Generation Corporation (SLPGC)	150

Note: Data as of December 2022

Source: Department of Energy 2023, Arthur D. Little analysis

## List of operational grid-connected power plants in Luzon – Coal (2/2)

*NON-EXHAUSTIVE*

#	Name	Location	Owner	Capacity, MW
22	SLPGC U2	Barangay San Rafael, Calaca, Batangas	Southwest Luzon Power Generation Corporation (SLPGC)	150
23	SLTEC PUTING BATO U1	Barangay Puting Bato West, Calaca, Batangas	South Luzon Thermal Energy Corporation (SLTEC)	135
24	SLTEC PUTING BATO U2	Barangay Puting Bato West, Calaca, Batangas	South Luzon Thermal Energy Corporation (SLTEC)	135
25	SPI U1	Barangay Pangascasan, Sual, Pangasinan	Sual Power Inc.	647
26	SPI U2	Barangay Pangascasan, Sual, Pangasinan	Sual Power Inc.	647
27	UPPC	Barangay Iba-Este, Calumpit, Bulacan	United Pulp & Paper Co., Inc. (UPPC)	30

## List of operational grid-connected power plants in Luzon – Diesel

*NON-EXHAUSTIVE*

#	Name	Location	Owner	Capacity, MW
1	BAUANG DPP	Barangay Payocpoc Sur, Bauang, La Union	Provincial Government of La Union (PGLU)	235
2	CIP II	Brgy. Quirino, Bacnotan, La Union	CIP II Power Corporation	21
3	RCBMI	Barangay Mapulo, Taysan, Batangas	Republic Cement and Building Materials Inc. (RCBMI)	12
4	SUBIC DPP	Subic Bay Freeport Zone, Olongapo, Zambales	One Subic Power Generation Corporation	120
5	BPGC	Brgy. Matictic, Norzagaray, Bulacan	Bulacan Power Generation Corporation	55
6	INGRID	Pililla National Highway, Brgy., Malaya, Pililla, Rizal	Ingrid Power Holdings, Inc. (IPHI)	180

## List of operational grid-connected power plants in Luzon – Natural gas

*NON-EXHAUSTIVE*

#	Name	Location	Owner	Capacity, MW
1	AVION	Brgy. Bolbok, Batangas City, Batangas	Prime Meridian Powergen Corporation (PMPC)	131
2	ILIJAN	Brgy. Ilijan, Batangas City, Batangas	South Premiere Power Corporation	1437
3	SAN GABRIEL	Brgy. Sta. Rita, Batangas City, Batangas	First NatGas Power Corp (FNPC)	443
4	SAN LORENZO	Brgy. Sta. Rita, Batangas City, Batangas	FGP Corporation	587
5	SANTA RITA	Brgy. Sta. Rita, Batangas City, Batangas	First Gas Power Corporation (FGPC)	1134

## List of operational grid-connected power plants in Visayas – Coal

NON-EXHAUSTIVE

#	Name	Location	Owner	Capacity, MW
1	CEDC U1	Barangay Daanglusod, Toledo City, Cebu	Global Business Power Corporation - Cebu Energy Development Corporation (GBPC-CEDC)	84
2	CEDC U2	Barangay Daanglusod, Toledo City, Cebu	Global Business Power Corporation - Cebu Energy Development Corporation	84
3	CEDC U3	Barangay Daanglusod, Toledo City, Cebu	Global Business Power Corporation - Cebu Energy Development Corporation	84
4	KSPC U1	Barangay Colon, Naga City, Cebu	KEPCO - Salcon Power Corporation (KSPC)	111
5	KSPC U2	Barangay Colon, Naga City, Cebu	KEPCO - Salcon Power Corporation (KSPC)	111
6	PEDC U1	Barangay Ingore, La Paz, Iloilo City, Iloilo	Global Business Power Corporation - Panay Energy Development Corporation (GBPC-PEDC)	84
7	PEDC U2	Barangay Ingore, La Paz, Iloilo City, Iloilo	Global Business Power Corporation - Panay Energy Development Corporation	84
8	PEDC U3	Barangay Ingore, La Paz, Iloilo City, Iloilo	Global Business Power Corporation - Panay Energy Development Corporation	150
9	PCPC U1	Sitio Puntales, Barangay Nipa, Concepcion, Iloilo	Palm Concepcion Power Corporation (PCPC)	135
10	TPC TG4 (Sangi Station)	Barangay Daang-lusod, Toledo City, Cebu	Global Business Power Corporation - Toledo Power Corporation (GBPC-TPC)	26
11	TPC TG5 (Sangi Station)	Barangay Daang-lusod, Toledo City, Cebu	Global Business Power Corporation - Toledo Power Corporation	40
12	TPC 1A Expansion	Barangay Daang-lusod, Toledo City, Cebu	Global Business Power Corporation - Toledo Power Corporation	84
13	TVI U1	Sitio Looc, Barangay Bato, Toledo City, Cebu	Therma Visayas, Inc. (TVI)	169
14	TVI U2	Sitio Looc, Barangay Bato, Toledo City, Cebu	Therma Visayas, Inc. (TVI)	169

Note: Data as of December 2022

Source: Department of Energy 2023, Arthur D. Little analysis



## List of operational grid-connected power plants in Visayas – Diesel

NON-EXHAUSTIVE

#	Name	Location	Owner	Capacity, MW
1	AVON-NABAS	Barangay Unidos, Nabas, Aklan	Global Business Power Corporation - Panay Power Corporation (GBPC-PPC)	8
2	AVON-NEW WASHINGTON	Barangay Mabilo, New Washington, Aklan	Global Business Power Corporation - Panay Power Corporation (GBPC-PPC)	5
3	BOHOL DPP	Dampas District, Tagbilaran City, Bohol	SPC Island Power Corporation (SIPC)	22
4	CALUMANGAN DPP	Barangay Calumangan, Bago City, Negros Occidental	Central Negros Power Reliability, Inc. (CENPRI)	31
5	CEBU PRIVATE POWER	Old VECO Compound, Barangay Ermita, Carbon, Cebu City	Cebu Private Power Corporation (CPPC)	70
6	PANAY DPP I	Barangay Tabugon, Dingle, Iloilo	SPC Island Power Corporation (SIPC)	22
7	PANAY DPP III	Barangay Tabugon, Dingle, Iloilo	SPC Island Power Corporation (SIPC)	58
8	PANAY POWER CORP.	Barangay Ingore, Lapaz, Iloilo City	Global Business Power Corporation - Panay Power Corporation (GBPC-PPC)	95
9	PB 101	Obrero, Iloilo (Iloilo City, Iloilo)	More Power Barge, Inc.	32
10	PB 103	Estancia, Iloilo (Lapu-Lapu City, Cebu)	SPC Power Corporation (SPC)	32
11	PB 104	Tapal Wharf, Ubay, Bohol	SPC Power Corporation (SPC)	32
12	TPC (Carmen Station)	Daang-Lungsod, Toledo City, Cebu	Global Business Power Corporation - Toledo Power Corporation (GBPC-TPC)	46
13	TPVI DPP	Barangay Colon, Naga, Cebu	Therma Power Visayas, Inc.	45
14	Isabel Modular Diesel Ancillary Service Power Plan	Barangay Libertad, Isabel, Leyte	Isabel Ancillary Services Co. Ltd. (IASCO)	86

Note: Data as of December 2022

Source: Department of Energy 2023, Arthur D. Little analysis

## List of operational grid-connected power plants in Mindanao – Coal

NON-EXHAUSTIVE

#	Name	Location	Owner	Capacity, MW
1	FDC MISAMIS U1	Barangay Balacanas, Tambobong, PHIVIDE, Villanueva, Misamis Oriental	Filinvest Development Corporation (FDC) Utilities, Inc.	135
2	FDC MISAMIS U2	Barangay Balacanas, Tambobong, PHIVIDE, Villanueva, Misamis Oriental	Filinvest Development Corporation (FDC) Utilities, Inc.	135
3	FDC MISAMIS U3	Barangay Balacanas, Tambobong, PHIVIDE, Villanueva, Misamis Oriental	Filinvest Development Corporation (FDC) Utilities, Inc.	135
4	MINDANAO COAL U1	Barangay Balacanas, Tambobong, PHIVIDE, Villanueva, Misamis Oriental	Power Sector Assets and Liabilities Management Corporation (PSALM)	116
5	MINDANAO COAL U2	Barangay Balacanas, Tambobong, PHIVIDE, Villanueva, Misamis Oriental	Power Sector Assets and Liabilities Management Corporation (PSALM)	116
6	SEC U2	Sitio Tampuan, Barangay Kamanga, Maasim, Sarangani	Sarangani Energy Corporation (SEC)	119
7	MPI U1	Sitio Inaburan, Barangay Culaman, Malita, Davao Occidental	Malita Power Inc.	150
8	MPI U2	Sitio Inaburan, Barangay Culaman, Malita, Davao Occidental	Malita Power Inc.	150
9	THERMA SOUTH U1	Barangay Binugao, Davao City/ Sta. Cruz, Davao Del Sur	Therma South Inc. (TSI)	150
10	THERMA SOUTH U2	Barangay Binugao, Davao City/ Sta. Cruz, Davao Del Sur	Therma South Inc. (TSI)	150
11	GNPOWER KAUSAWAGAN U1	Barangay Libertad, Kauswagan, Lanao Del Norte	GNPower Kauswagan Ltd. Co.	151
12	GNPOWER KAUSAWAGAN U2	Barangay Libertad, Kauswagan, Lanao Del Norte	GNPower Kauswagan Ltd. Co.	151
13	GNPOWER KAUSAWAGAN U3	Barangay Libertad, Kauswagan, Lanao Del Norte	GNPower Kauswagan Ltd. Co.	151
14	GNPOWER KAUSAWAGAN U4	Barangay Libertad, Kauswagan, Lanao Del Norte	GNPower Kauswagan Ltd. Co.	151

Note: Data as of December 2022

Source: Department of Energy 2023, Arthur D. Little analysis

## List of operational grid-connected power plants in Mindanao – Diesel

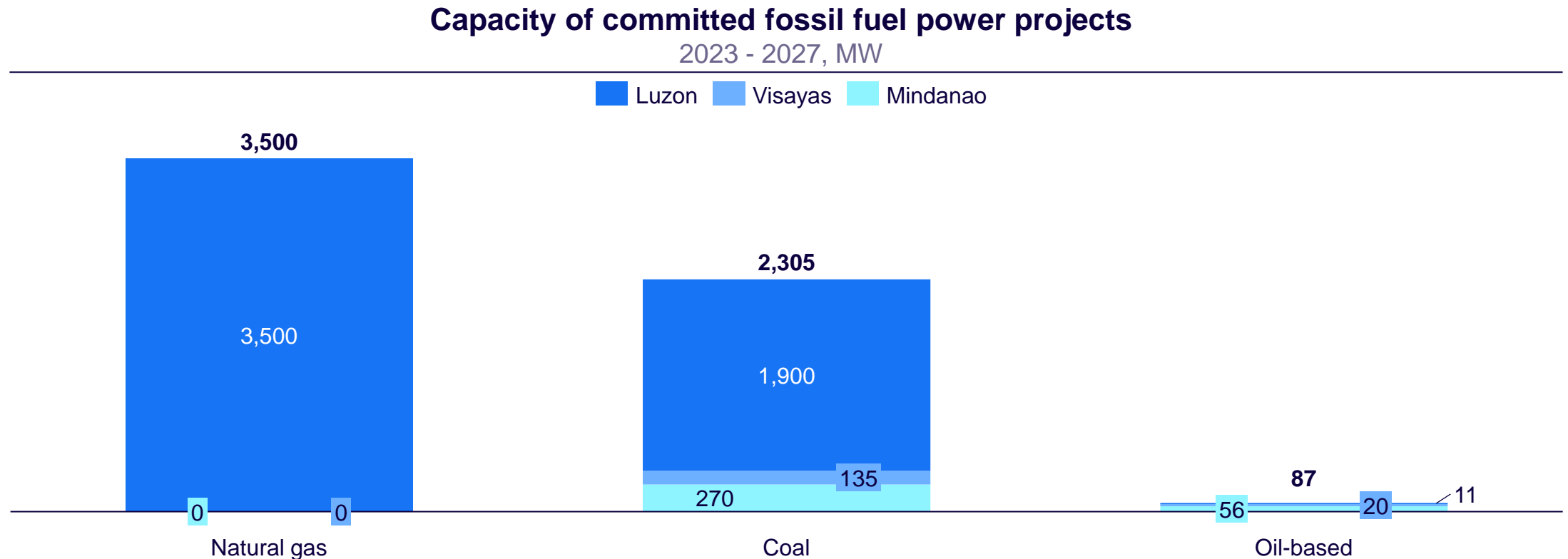
*NON-EXHAUSTIVE*

#	Name	Location	Owner	Capacity, MW
1	SEDI DIESEL	Barangay Magdum, Tagum City, Davao del Norte	Strategic Energy Development Inc. (SEDI)	15
2	KEGI - JIMENEZ	Barangay San Isidro, Brgy. San Isidro, Jimenez	King Energy Generation Inc. (KEGI)	16
3	KEGI - PANAON	Barangay Map-an, Panaon, Ozamis City, Misamis Occ.	King Energy Generation Inc. (KEGI)	16
4	KEGI - TANDAG	Barangay Telaje, Tandag, Surigao del Norte	King Energy Generation Inc. (KEGI)	8
5	MPC - Iligan DPP	Sitio Mapalad, Barangay Dalipuga, Dalipuga, Iligan City, Lanao del Norte	Mapalad Power Corporation (MPC)	114
6	SPPC	Barangay Baluntay, Alabel, Sarangani	Southern Philippines Power Corp. (SPPC)	62
7	TMI 1	Barangay San Roque, Maco, Davao del Norte	Therma Marine Inc. (TMI)	100
8	TMI 2	Barangay Sta. Ana, Nasipit, Agusan del Norte	Therma Marine Inc. (TMI)	100
9	WMPC	Malasugat, Barangay Sangali, Sangali, Zamboanga City, Zamboanga, del Sur	Western Mindanao Power Corporation (WMPC)	112
10	MATI BUNKER-C	Libudon Road, Lower Dawan, Mati City, Davao Oriental	Supreme Power Corporation (SPC)	11

Note: Data as of December 2022

Source: Department of Energy 2023, Arthur D. Little analysis

## フィリピンでは、開発中の化石燃料発電プロジェクトは天然ガスと石炭が中心



Currently, committed **natural gas and coal projects** are concentrated in **Luzon**, with committed **oil-based** projects more focused on **Mindanao**

## List of fuel power plant projects in development – Luzon

NON-EXHAUSTIVE

#	Fuel type	Name	Capacity, MW	Start-up year
1	Coal	Mariveles Coal-Fired Power Plant Phase I - Unit 1	150	2023
2	Coal	Mariveles Coal-Fired Power Plant Phase I - Unit 2	150	2023
3	Coal	Mariveles Coal-Fired Power Plant Phase I - Unit 3	150	2024
4	Coal	Mariveles Coal-Fired Power Plant Phase I - Unit 4	150	2024
5	Coal	Masinloc Power Plant - Unit 4	350	2025
6	Coal	Mariveles Coal-Fired Power Plant Phase II - Unit 5	150	2025
7	Coal	Masinloc Power Plant - Unit 5	350	2025
8	Coal	Mariveles Coal-Fired Power Plant Phase II - Unit 6	150	2026
9	Coal	Mariveles Coal-Fired Power Plant Phase II - Unit 7	150	2026
10	Coal	Mariveles Coal-Fired Power Plant Phase II - Unit 8	150	2026
11	Oil	Capas Bunker C-Fired Diesel Power Plant	11	2024
12	Natural gas	Batangas Combined Cycle Power Plant - Phase 1, Unit 1	438	2024
13	Natural gas	Batangas Combined Cycle Power Plant - Phase 1, Unit 2	438	2024
14	Natural gas	Batangas Combined Cycle Power Plant - Phase 1, Unit 3	438	2024
15	Natural gas	Batangas Clean Energy – Natural gas fired plant	1100	2026
16	Natural gas	Energy World Corporation Gas Fired Combined Cycle Power Plant	650	TBD
17	Natural gas	Batangas Combined Cycle Power Plant - Phase 2	438	TBD

Note: Data reported in April 2023 by the Philippines Department of Energy, for power projects initiated by the private sector  
Source: Department of Energy 2023, Arthur D. Little analysis

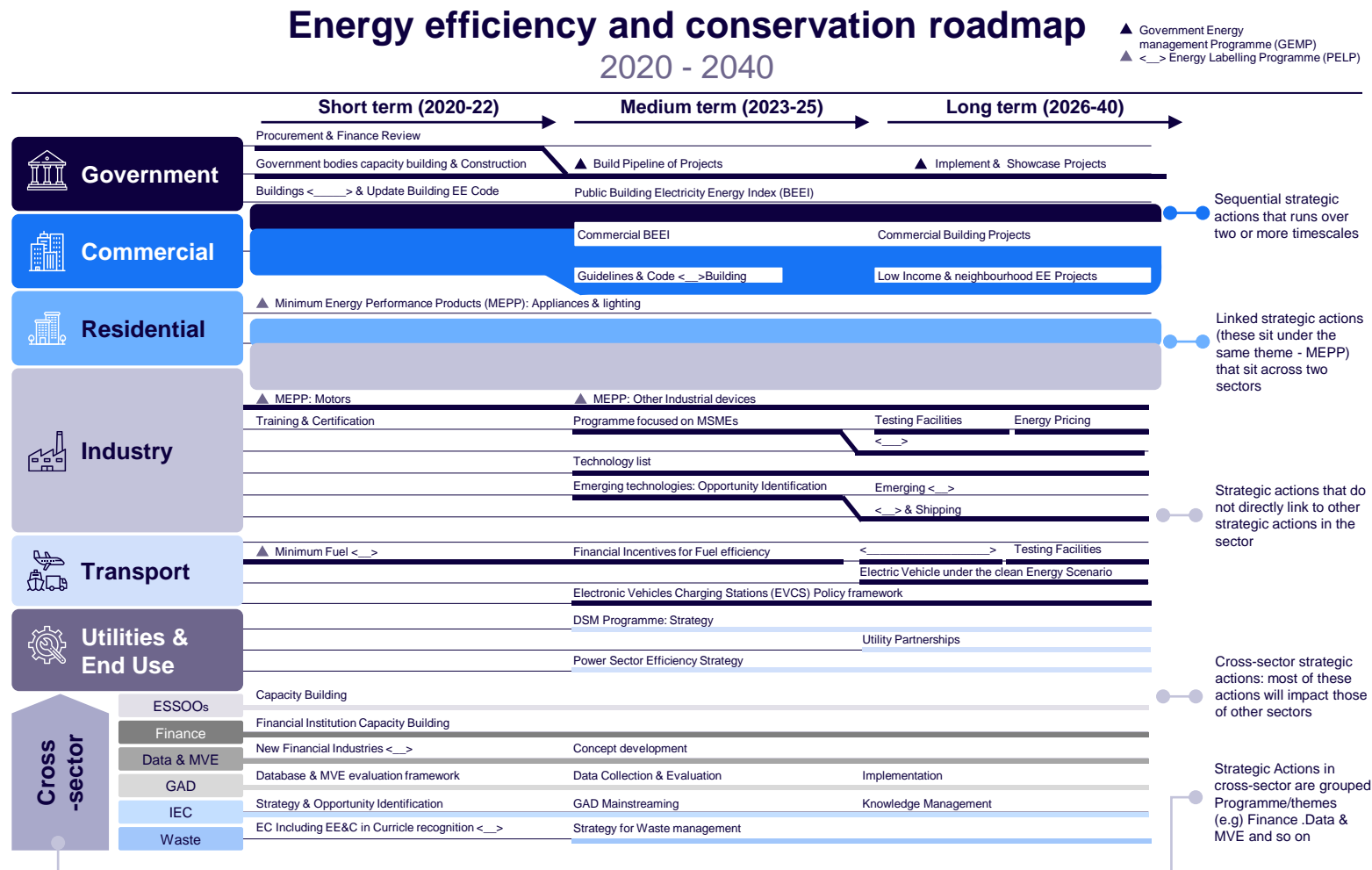
## List of fuel power plant projects in development – Visayas and Mindanao

NON-EXHAUSTIVE

#	Region	Fuel type	Name	Capacity, MW	Start-up year
1	Visayas	Coal	Palm Concepcion Coal- Fired Power Project	135	2024
2	Visayas	Oil	Calbayog Bunker C-Fired Diesel Power Plant	11	TBD
3	Visayas	Oil	Sulzer Diesel Power Plant	6	2024
4	Visayas	Oil	Caterpillar Diesel Power Plant	2	2024
5	Visayas	Oil	Cummins Diesel Power Plant	1	2024
6	Mindanao	Coal	FDC - MPC CFB Coal - Fired Power Plant	270	2027
7	Mindanao	Oil	Sangali Diesel Power Plant Phase 1	28	2024
8	Mindanao	Oil	Sangali Diesel Power Plant Phase 2	28	2024

## 7 電力品質

## エネルギー効率節約法は、政府の省エネの指針を規定



### COMMENTS

- On top of enacting the Energy Efficiency and Conservation (EE&C) act of 2019
  - The act aids the country's compliance to UN Sustainable Development Goals on Clean Energy and Climate Action as well as the Paris Agreement which sets a 75% reduction in GHG by 2030
- 2020 – Mid 2021 DOE-EAT energy audits of 90 firms showed total electricity savings of 11.62 GWh, equivalent to USD 1.8 mn



## 自然災害による大きな混乱に直面し、エネルギー省は電力会社が電力の安定性を維持するための対策を講じている

### Overview of electricity rate schedules

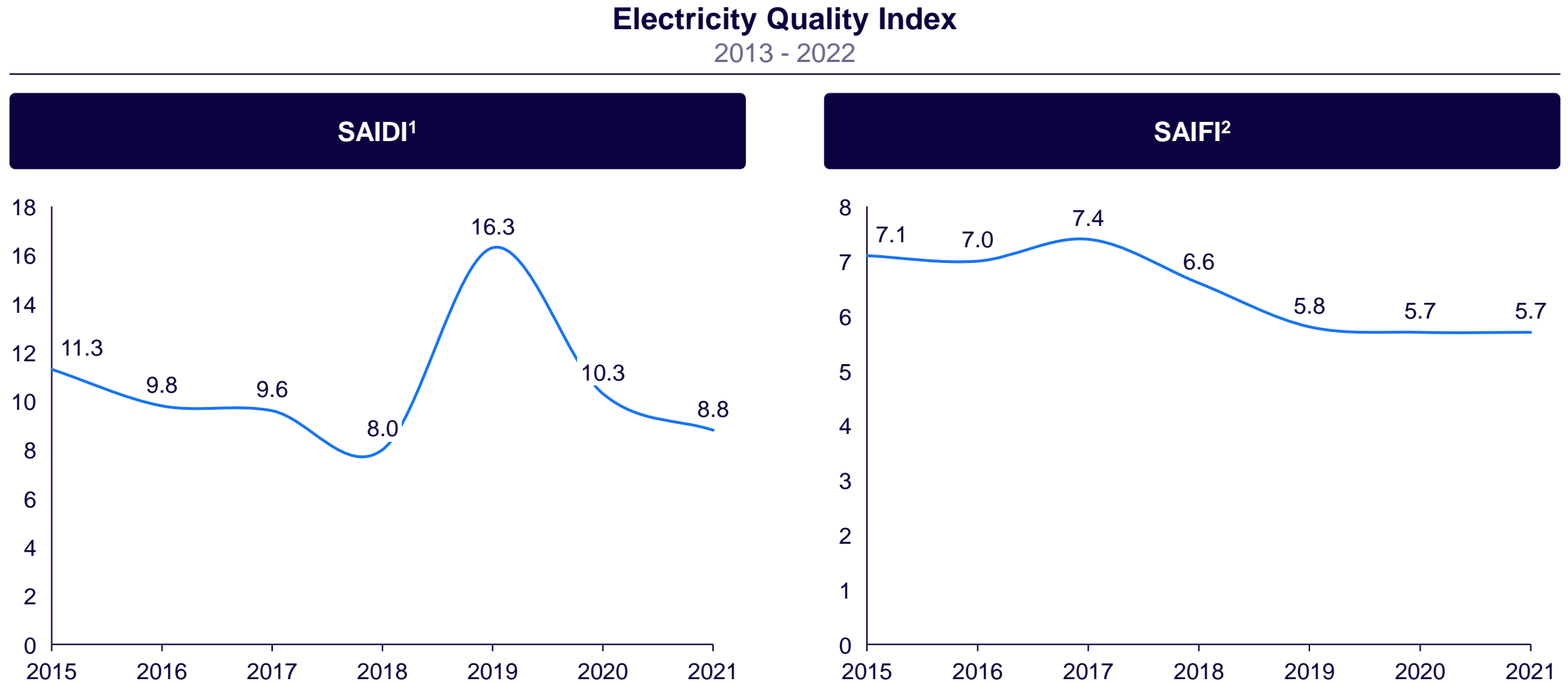


#### Department of Energy

2018 Significant Incident act: DOE DC2018-01-0001 was signed to ensure all energy companies had taken structural and non-structural adaptation measures before, during and after the occurrence of disruptive events. A task force was created as well

Disaster type	Details
<b>Typhoon</b>	In both 2019 and 2020, the country experienced the impact of multiple typhoons that caused significant damage to power generation plants, transmission lines, and distribution facilities. Repair and restoration efforts were hindered by the severe flooding and limited accessibility during and after each typhoon.
<b>Earthquakes and Volcanic eruptions</b>	In 2019, a 6.1 magnitude earthquake struck Central Luzon, tripping power plants and transmission lines. In 2020, the eruption of the Taal volcano caused ashfall, impacting power transmission and distribution facilities in Batangas. This led to prolonged power interruptions in the affected area.
<b>El Niño</b>	In 2019, a mild El Niño phenomenon resulted in higher electricity demand and decreased output from major hydroelectric power plants in Luzon and Mindanao. This trend continued into 2020, but the economic slowdown and pandemic-related quarantine restrictions significantly had curbed the expected electricity demand growth.
<b>Red and Yellow alerts</b>	In 2019, there were a total of 46 yellow alerts and 16 red alerts in the Luzon grid, and 186 yellow alerts and 10 red alerts in the Visayas grid. These alerts were triggered by factors such as high demand exceeding supply, power plant outages, gas restrictions, reduced solar output, insufficient operational reserves, and delays in power projects. However, in 2020, the number of yellow and red alerts decreased due to reduced demand amid the pandemic.

## SAIFIは2015年以降改善が見られたが、SAIDIは2019年に急上昇し、その後改善傾向

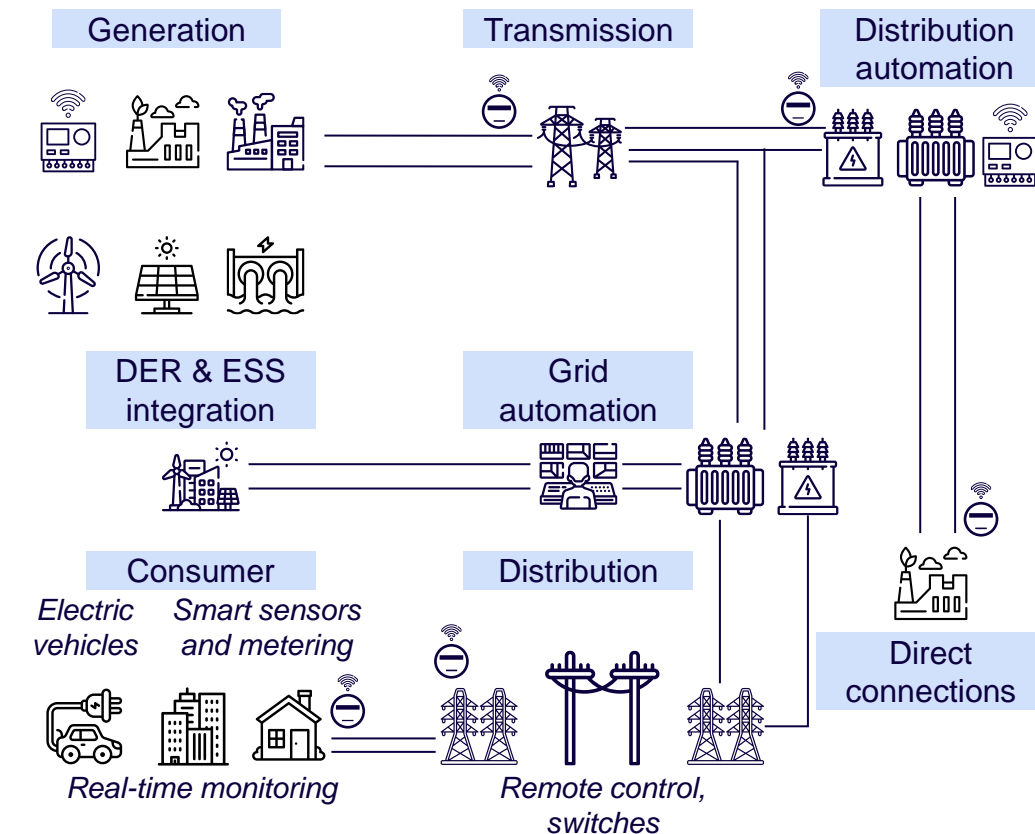


Note: 1) System Average Interruption Duration Index (Minutes/Customer/Year); 2) System Average Interruption Frequency Index (Number of Interruptions/Customer/Year)

Source: Philippine Institute for Development Studies 2022, Arthur D. Little analysis

## スマートグリッド政策の枠組みとロードマップは、電力セクター・ロードマップ2021-2040のサブセットであり、今後促進していくと宣言

### Overview of the multi-pronged approach in the smart grid strategy



- A focus on smart grids is a part of the Power Sector Roadmap 2021 – 2040, together with a power sector database enhancement
- The main objectives are:
  - Energy security, resiliency, affordability, and sustainability;
  - Transparent and fair playing field in the power industry; and
  - Electricity access for all.

<b>Dere-gulation</b>	<ul style="list-style-type: none"> <li>• Smart regulation</li> <li>• Policy and regulatory framework</li> </ul>	<b>Digiti-zation</b>	<ul style="list-style-type: none"> <li>• Internet of things</li> <li>• Smart monitoring</li> <li>• ICT innovation</li> <li>• Cybersecurity</li> <li>• Smart homes and cities</li> </ul>
<b>Decarbo-nisation</b>	<ul style="list-style-type: none"> <li>• Renewable energy sources</li> <li>• Electric vehicles</li> <li>• Clean technology</li> </ul>		
<b>Dere-gulation</b>	<ul style="list-style-type: none"> <li>• Distributed energy resources</li> <li>• Isolated power supply</li> <li>• Energy storage systems</li> <li>• Prosumers</li> </ul>	<b>Democra-tization</b>	<ul style="list-style-type: none"> <li>• Full customer choice</li> <li>• Energy democracy</li> <li>• Microgrids and power trading</li> </ul>

## ただし、各レベルの実現時期は規定しておらず

NON-EXHAUSTIVE

### Smart distribution utility roadmap and goals

SMART DISTRIBUTION UTILITY ROADMAP (SDUR)					
	Level 0	Level 1	Level 2	Level 3	Level 4
Networks	<ul style="list-style-type: none"> <li>Manually-operated Distribution Network System</li> </ul>	Physical Network Transformation <ul style="list-style-type: none"> <li>SCADA-Ready Reclosers</li> <li>Sectionalizers</li> <li>Load Break Switches</li> <li>Fault Circuit Indicators</li> <li>Distribution Transformer Monitoring Equipment</li> <li>SCADA System               <ul style="list-style-type: none"> <li>Remote Feeder Lines</li> <li>Remote Substation</li> </ul> </li> <li>Implementation of Geographic Information System (GIS)</li> </ul>	<ul style="list-style-type: none"> <li>Remote voltage regulators, and capacitor banks</li> <li>Implementation of Distribution Management System (DMS)               <ul style="list-style-type: none"> <li>Distribution and Substation Automation</li> </ul> </li> <li>Outage Management System (OMS)               <ul style="list-style-type: none"> <li>Mobile Workforce Management System (MWMS)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Smart Distribution and Substation Automation</li> <li>Advanced Distribution Management System (ADMS)               <ul style="list-style-type: none"> <li>Fault Location, Isolation, and Service Restoration (FLISR)</li> <li>Integrated Volt-Var Optimization (IVVO)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Full Smart Distribution and Substation Automation</li> </ul>
Customer Service	<ul style="list-style-type: none"> <li>Conventional Metering</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of Automated Meter Reading (AMR)</li> </ul>	<ul style="list-style-type: none"> <li>Initial Implementation of AMI               <ul style="list-style-type: none"> <li>Smart Meters</li> <li>Data Management</li> <li>System</li> <li>Data Center and Server</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Scaling-up AMI deployments</li> </ul>	<ul style="list-style-type: none"> <li>Full Smart Distribution and Substation Automation</li> </ul>
Continuous/Parallel Programs	<ul style="list-style-type: none"> <li>Integration of Energy Storage System (ESS) and Electric Vehicle (EV) Charging Station</li> <li>Distributed Energy Resources Integration and Energy Management Systems</li> <li>Consumer Education</li> <li>Updating of GIS</li> <li>Interoperability and Cybersecurity</li> <li>Telecommunications infrastructure</li> </ul>				

#### SMART GRID VISION BY 2040

- Self-healing Grid
- Full RCOA, RPS, GEOP and Net Metering Implementation
- Full Customer Choice
- Demand Response
- Peak Load Management
- Virtual Power Plants
- Islanding
- Optimized ESS, EMS and DER Management System
- Smart Homes and Cities

### Smart grid vision

#### Smart utility

- DDP
  - Roadmap for distribution utilities
  - Smart metering
  - Real time monitoring

#### Smart power generation

- Power development plan
  - Distributed energy resources
  - Energy storage systems
  - Hybrid systems
  - Intermittent and flexible generation
  - Clean coal technology

#### Smart homes and cities

- Solar power battery storage system
- Advanced metering infrastructure
- Electric vehicles and infrastructure
- Demand response
- Peak load management

#### Transmission modernisation

- Transmission development plan
  - Automation and network optimization
  - System enhancement
  - Long-term interconnection-wide expansion plans

## スマートグリッドの環境が整いつつある

NON-EXHAUSTIVE

### Technologies involved

#### Geographics Information System (GIS)

- Integration with systems to assist in outage detection, restoration speed and asset optimisation via precise location identification

#### Mobile workforce management system (MWMS)

- Manpower optimisation tool for utilities provider
- Easier fault detection and faster troubleshooting

#### Outage Management system (OMS)

- Efficiently identify and resolve outages with historical database
- GIS integration for fault location identification and resolving

#### Fault location, isolation and service restoration (FLISR)

- System that involves and links monitoring, communication systems, SCADA systems, GIS, etc, and has data processing tools to locate faults, isolate the affected area/s, automate power restoration and reduce both the impact and duration of power interruptions

#### Advanced metering infrastructure (AMI)

- An integrated system of smart meters, communication networks and data management systems that allow for smart tracking

#### Advanced distribution management system

- Integration platform for multiple utility systems, provides automated outage restoration and optimization of distribution grid performance

### Current projects



Elevated meter clusters



Higatangan micro-grid project



Solar hybrid mini-grid  
in Malaisan Island

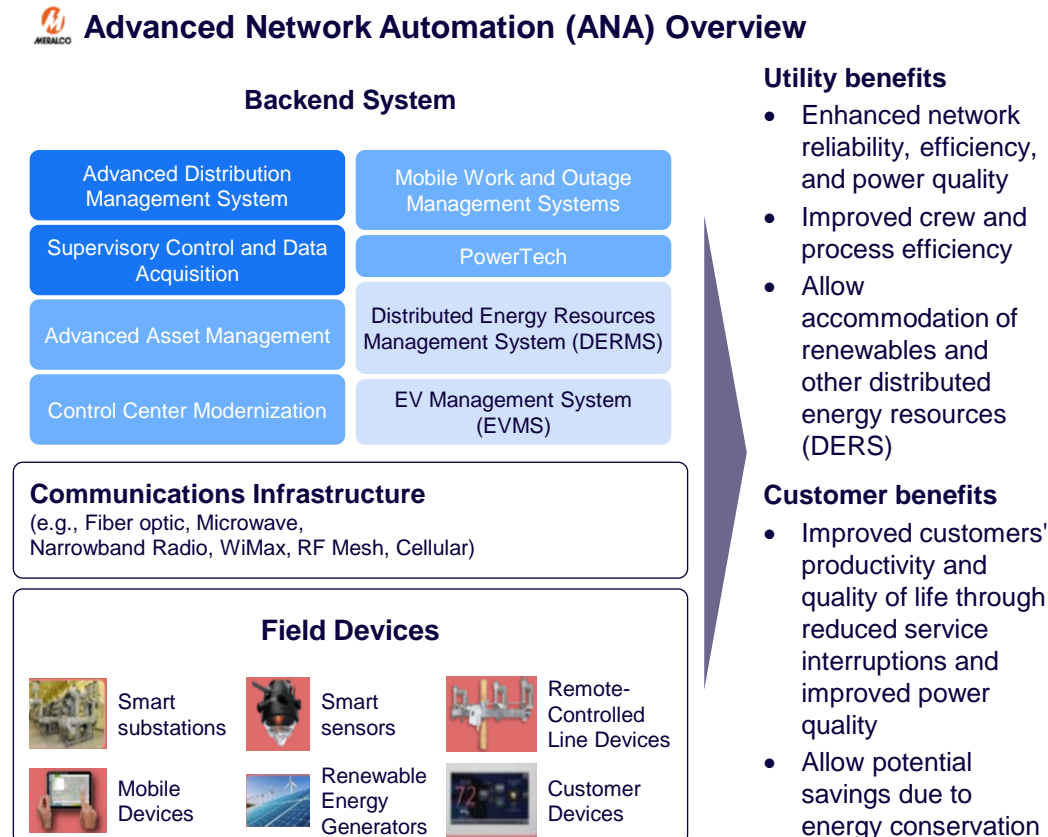


Solar-EES hybrid in New Ibajay,  
Palawan

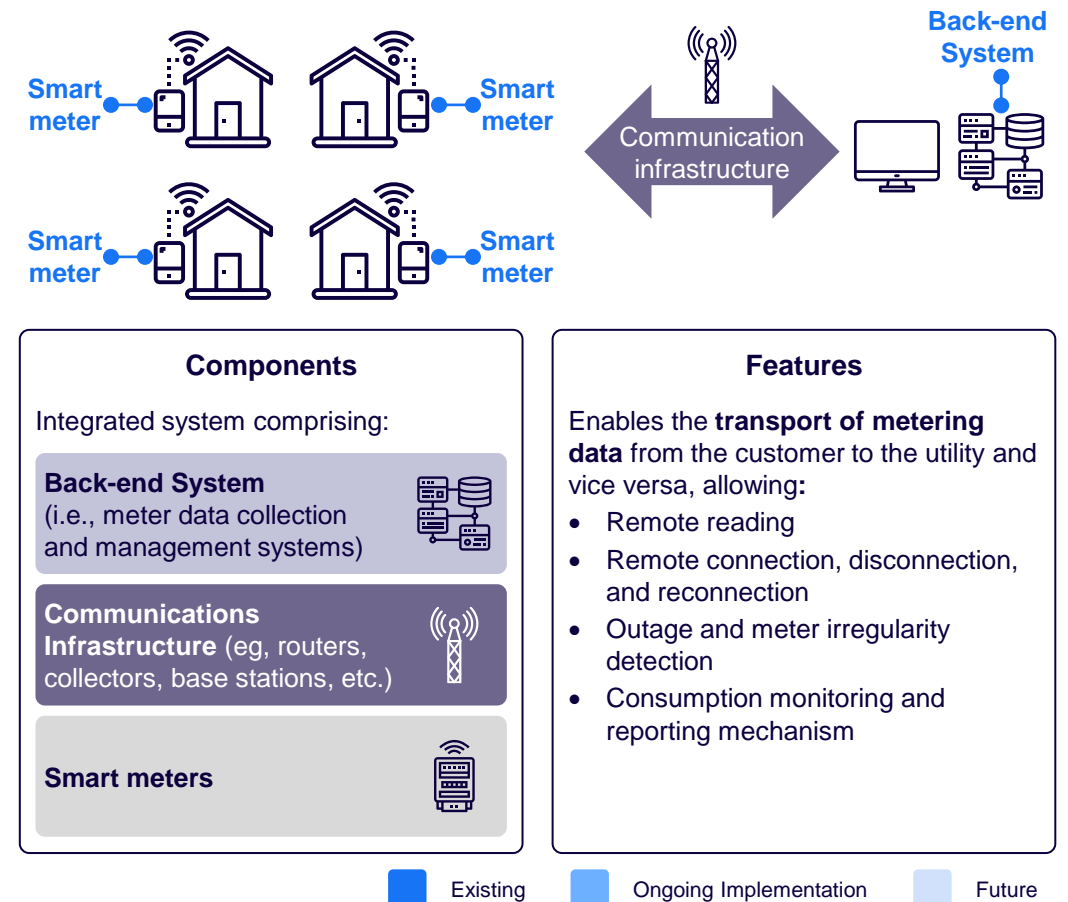


## ケーススタディ:民間最大の配電会社であるマニラ・エレクトリック・カンパニー (MERALCO) は、スマート・テクノロジーの開発で飛躍的な進歩を遂げた

### Advanced Network Automation (ANA) overview

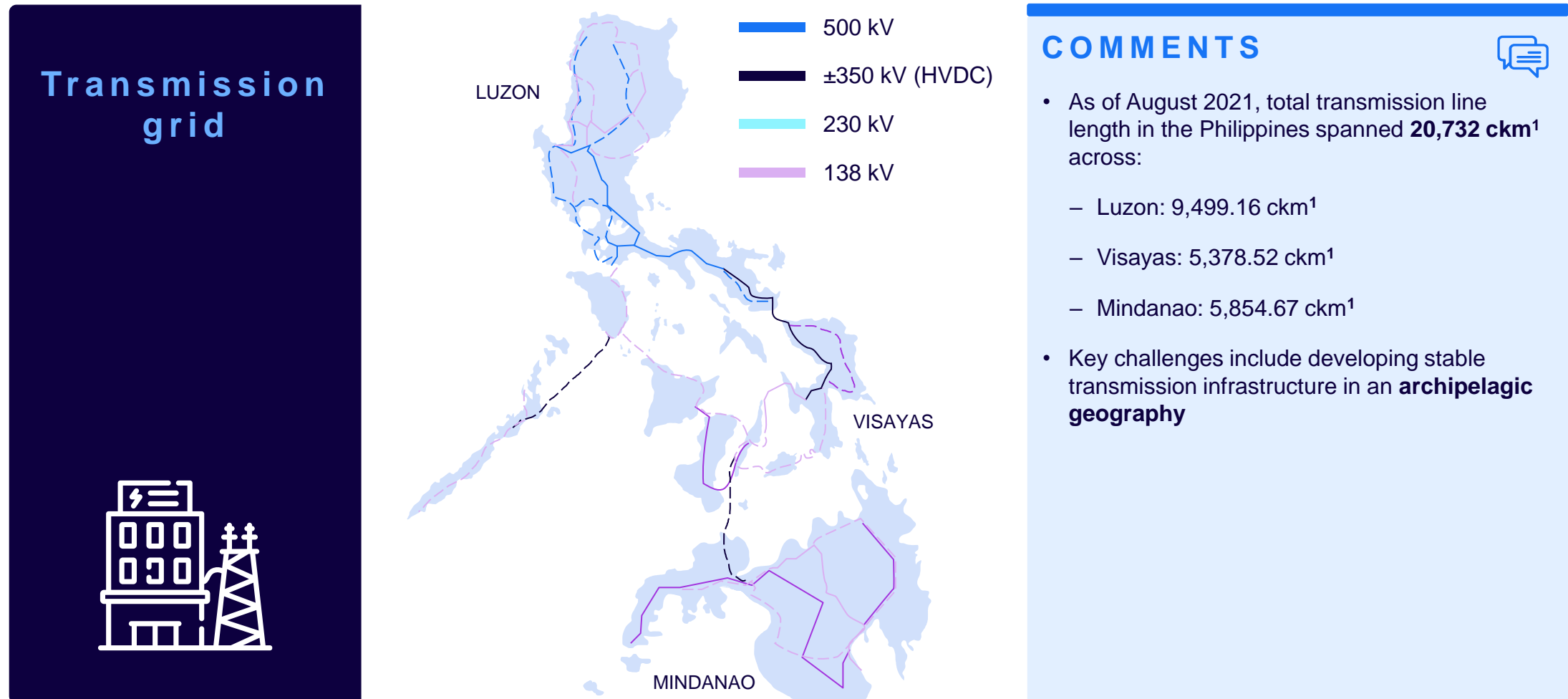


### AMI overview



## 8 送電網

## フィリピンにはルソン、ビサヤ、ミンダナオをカバーする3つの主要送電網が存在

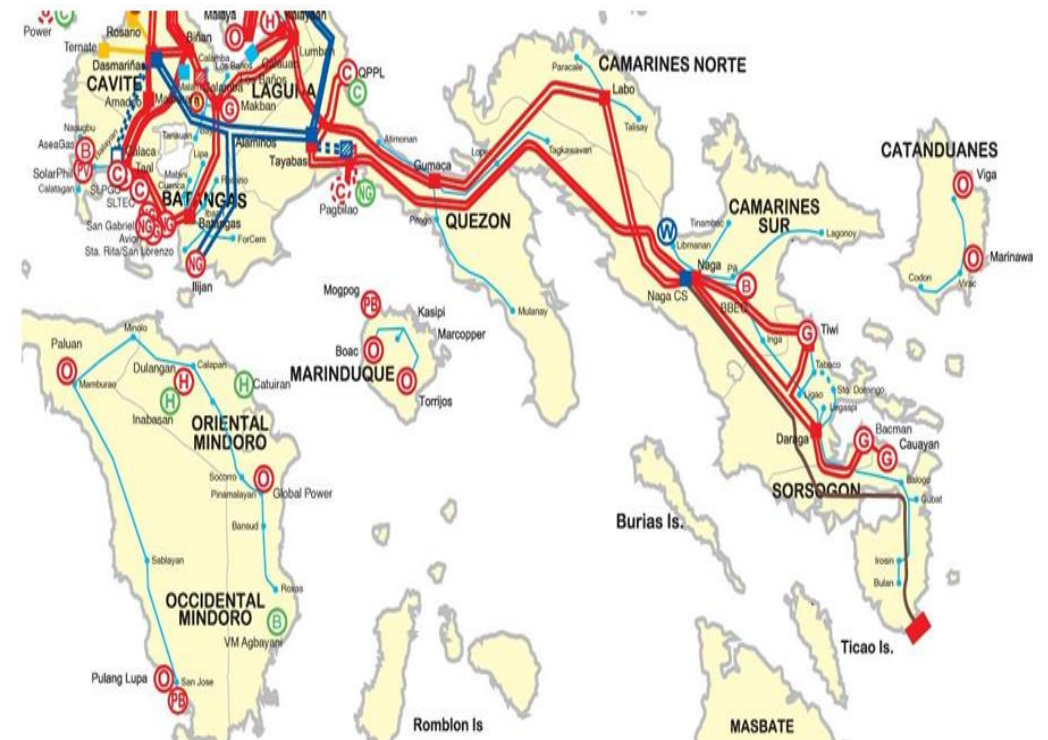


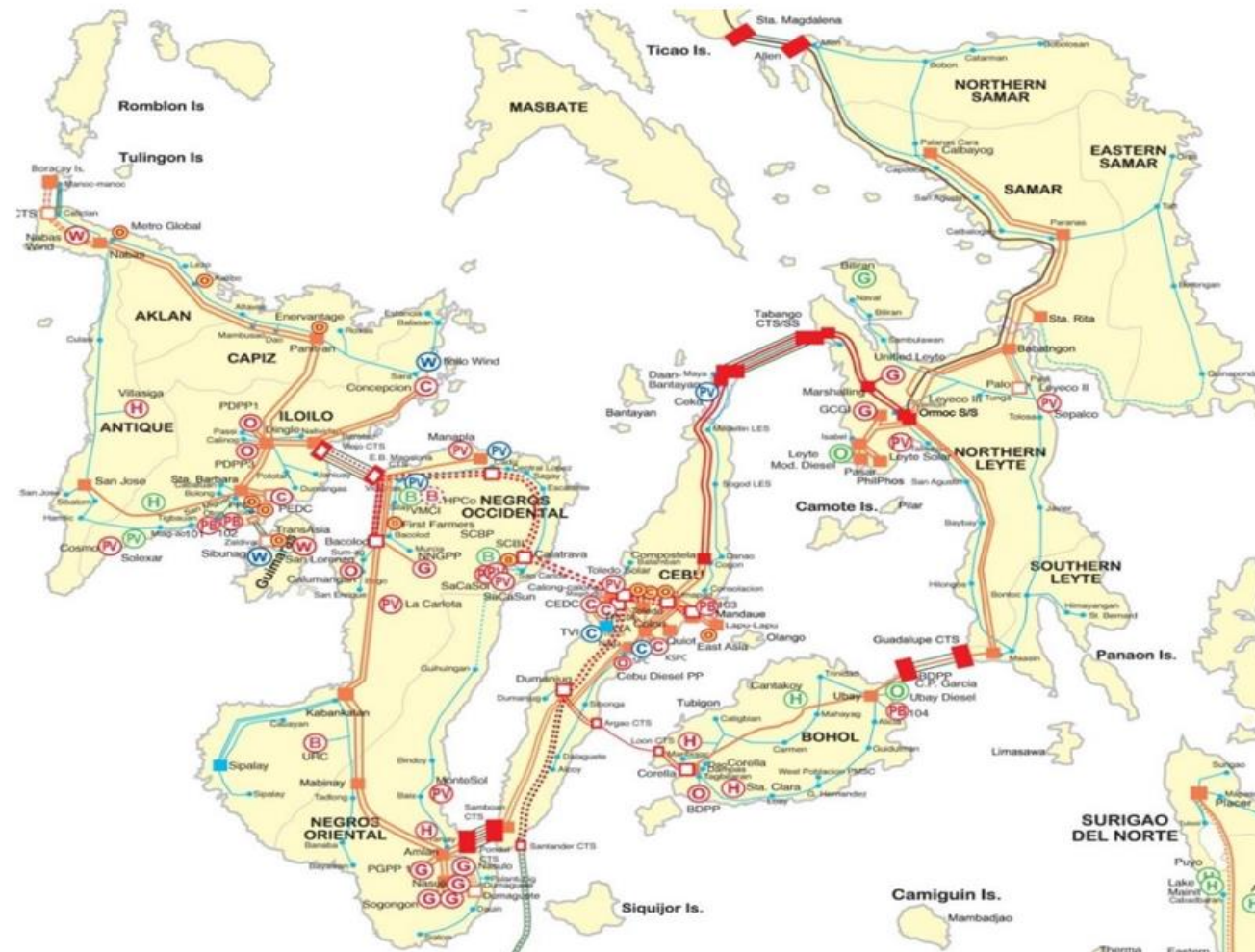
Note: Map is illustrative and not drawn to scale; 1) Circuit kilometre

Source: Philippines Power Development Plan 2020-2040, Philippines Transmission Development Plan 2022-2040 (Consultation Draft)

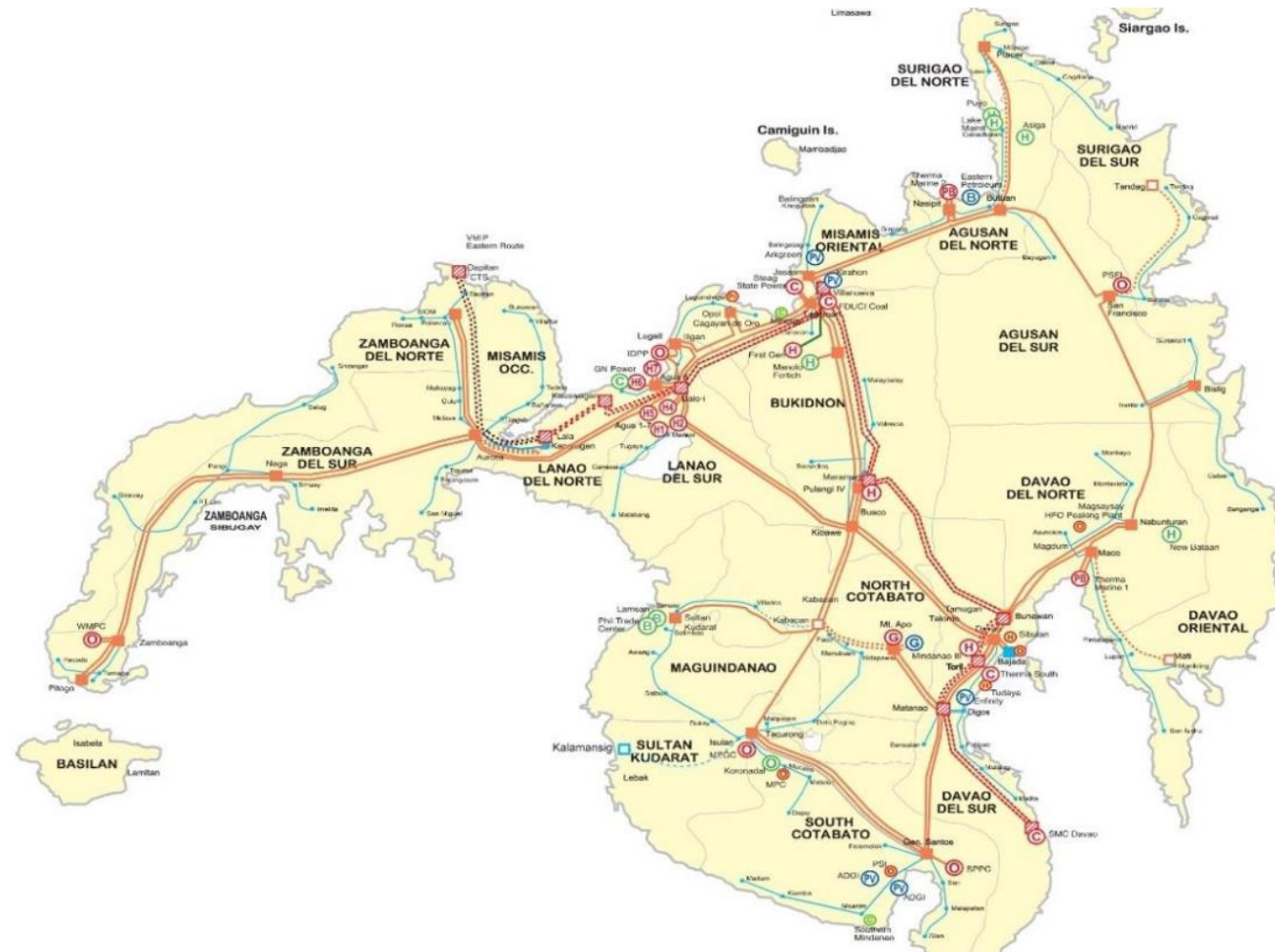


## Detailed schematic – Luzon transmission network





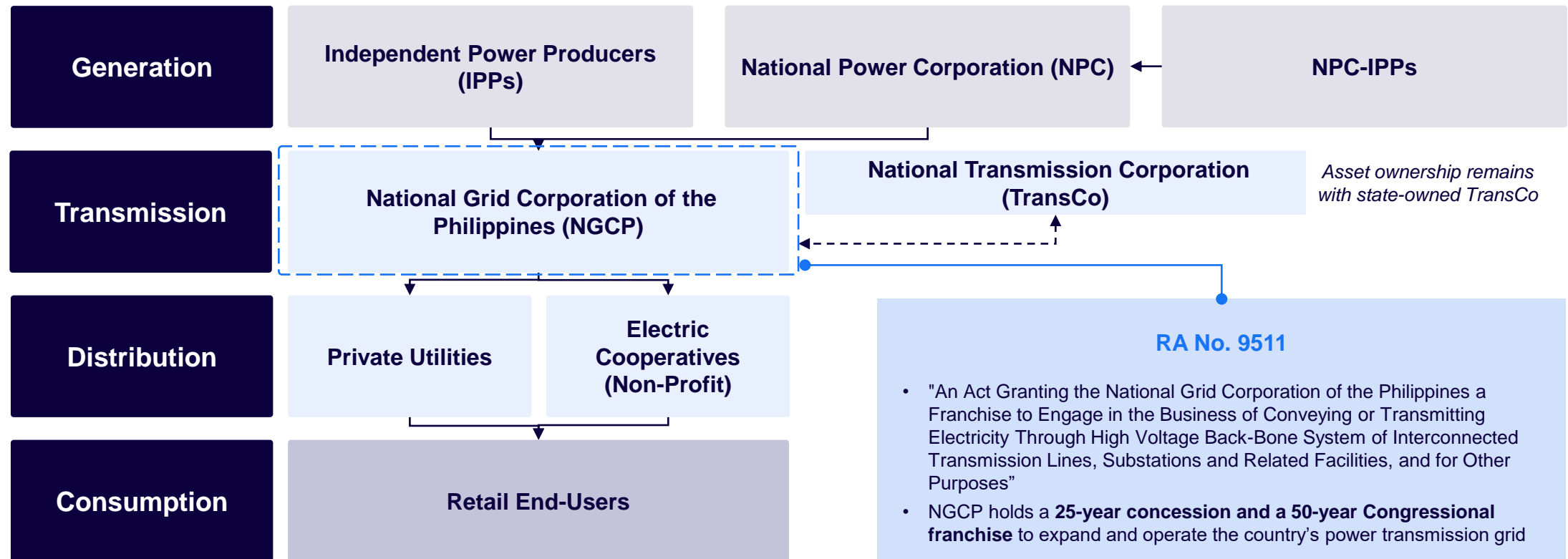
## Detailed schematic – Mindanao transmission network





## フィリピン国家送電網公社（National Grid Corporation of Philippines）は、全国的な送電網を独占的に運営

### Domestic electricity supply chain in the Philippines



## Transmission lines: List of planned projects from 2023 to 2025 – Luzon

*NON-EXHAUSTIVE*

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Bataan–Cavite TL Feasibility Study	Bataan, Cavite	3	2023
2	Tuguegarao–Lal-lo 230 kV TL	Cagayan	37	2023
3	Ambuklao–Binga 230 kV TL Upgrading	Benguet	18	2023
4	Eastern Albay 69 kV Line Stage 2	Albay	7	2023
5	Santiago–Magat 230 kV Transmission Line Reconductoring Project	Isabela	16	2024
6	Taguig–Taytay 230 kV TL	Rizal, Metro Manila	59	2024
7	Concepcion–Sta. Ignacia 69 kV TL Phase 2	Tarlac	16	2024
8	Daraga–Bitano 69 kV TL	Albay	4	2024
9	La Trinidad–Calot 69 kV TL	Benguet	7	2024
10	Pagbilao–Tayabas 500 kV TL	Quezon Province	61	2025
11	Western Luzon 500 kV Backbone (Stage 2)	Pangasinan, Zambales	341	2025
12	Luzon–Visayas HVDC Bipolar Operation	Camarines Sur and Leyte	<i>Unknown</i>	2025
13	Tuguegarao–Enrile 69 kV TL	Tuguegarao	13	2025

Note: 1) TL refers to transmission line developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

## Transmission lines: List of planned projects from 2023 to 2025 – Visayas

*NON-EXHAUSTIVE*

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Cebu–Bohol 230 kV Interconnection	Cebu and Bohol	356	2023
2	Cebu–Lapu-Lapu 230 kV TL	Cebu	34	2023
3	Panay–Guimaras 138 kV Interconnection	Panay and Guimaras	41	2023
4	Amlan–Dumaguete 138 kV TL	Negros Occidental	33	2024
5	Barotac Viejo–Natividad 69 kV TL	Iloilo	1	2024
6	Luzon–Visayas HVDC Bipolar Operation	Cebu, Negros, and Panay	326	2025
7	Babatngon–Palo 230 kV TL (Initially at 138 kV)	Southern Leyte	48	2025
8	Ormoc–Babatngon 230 kV TL	Kananga, Ormoc	50	2025
9	Nabas–Caticlan–Boracay TL	Aklan	99	2025
10	Calbayog–Allen TL	Samar and Northern Samar	50	2025

Note: 1) TL refers to transmission line developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

## Transmission lines: List of planned projects from 2023 to 2025 – Mindanao

NON-EXHAUSTIVE

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Tacurong–Kalamansig 69 kV TL	Sultan Kudarat	35	2023
2	Maco–Mati 138 kV TL	Davao de Oro, Davao Oriental	50	2025
3	San Francisco–Tago 138 kV TL	Agusan del Sur, Surigao del Sur	76	2025
4	Sultan Kudarat–Pinaring 69 kV TL Upgrading	Maguindanao	10	2025

Note: 1) TL refers to transmission line developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

## Substations: List of planned projects from 2023 to 2025 – Luzon (1/2)

NON-EXHAUSTIVE

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Pinili 230 kV SS	Ilocos Norte	30	2023
2	South Luzon 230 kV SS Upgrading	Laguna, Batangas, Albay, Quezon, Camarines Norte	39	2023
3	South Luzon 230 kV SS Upgrading 2	Batangas, Laguna, Quezon, Camarines Norte, Albay, Rizal and Metro Manila	104	2023
4	Taguig 500 kV SS	Taguig	172	2024
5	Marilao 500 kV SS Phase 1 and 2	Bulacan	109	2024
6	Pinamucan 500 kV SS	Batangas	74	2024
7	Navotas 230 kV Substation	Navotas	63	2024
8	Abuyog 230 kV SS	Sorsogon	60	2024
9	San Simon 230 kV SS	Pampanga	69	2024
10	Palauig 500 kV SS	Zambales	174	2025
11	Tanauan 230 kV SS	Batangas	44	2025
12	Porac 230 kV SS	Pampanga	115	2025
13	Capas 230 kV SS	Tarlac	47	2025

Note: 1) SS refers to substation developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis



## Substations: List of planned projects from 2023 to 2025 – Luzon (2/2)

NON-EXHAUSTIVE

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
14	Sampaloc 230 kV SS	Nueva Ecija	31	2025
15	Pasay 230 kV SS	Las Piñas, Pasay	232	2025
16	Castillejos 230 kV SS	Zambales	55	2025

Note: 1) SS refers to substation developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

Substations: List of planned projects from 2023 to 2025 – Visayas

NON-EXHAUSTIVE

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Lapu-Lapu 230 kV SS	Lapu-Lapu, Cebu	78	2023
2	Visayas Mobile Capacitor	Panay and Negros	9	2023
3	Visayas SS Upgrading Project 2	Cebu, Negros, Panay, Leyte	337	2025
4	Banga 138 kV SS	Panay	18	2025

Note: 1) SS refers to substation developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)  
Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

## Substations: List of planned projects from 2023 to 2025 – Mindanao

*NON-EXHAUSTIVE*

#	Name <sup>1</sup>	Location	Estimated cost, USD mn <sup>2</sup>	Start-up year
1	Mindanao Substation Expansion 3 Project (MSE3P)	Zamboanga del Sur, Surigao del Norte, Agusan del Sur, Davao del Sur	26	2023
2	Laguindingan 230 kV SS	Misamis Oriental	42	2024
3	Mindanao Substation Upgrading Project (MSUP)	Surigao del Sur, Agusan del Norte, North Cotabato, Zamboanga del Sur, Surigao del Norte, Agusan del Sur, South Cotabato, Sultan Kudarat, Lanao del Norte, Bukidnon, Zamboanga Sibugay, Misamis Oriental and Zamboanga del Norte	90	2024
4	Mindanao Substation Expansion 4 Project (MSE4P)	Zamboanga Sibugay, Zamboanga del Norte, Lanao del Norte, Bukidnon, Davao de Oro, Davao Occidental, Maguindanao, Agusan del Norte	63	2024
5	Mindanao Substation Rehabilitation Project (MSRP)	Davao del Sur, Davao de Oro, Agusan del Norte, Maguindanao, Misamis Oriental, Bukidnon, Lanao del Norte, Zamboanga del Sur	62	2024
6	Kabacan 138 kV SS	North Cotabato, South Cotabato, Sultan Kudarat, Maguindanao	75	2025
7	Malaybalay 138 kV SS	Bukidnon	35	2025
8	Koronadal 138 kV SS	South Cotabato	<i>Unknown</i>	2025

Note: 1) SS refers to substation developments. Only projects targeted from completion from Q3 are included in 2023 figures; 2) Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

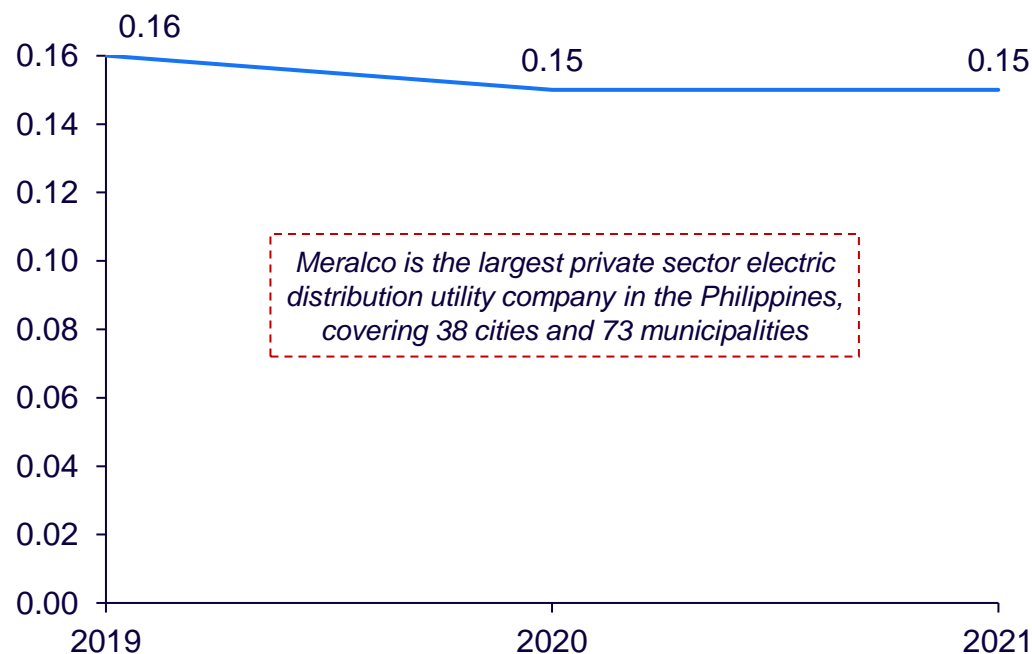
Source: Philippines Transmission Development Plan 2022-2040 (Consultation Draft), Arthur D. Little analysis

## 9 電力料金

## フィリピンの電力料金はASEANで最も高い水準にあるが、近年は比較的安定

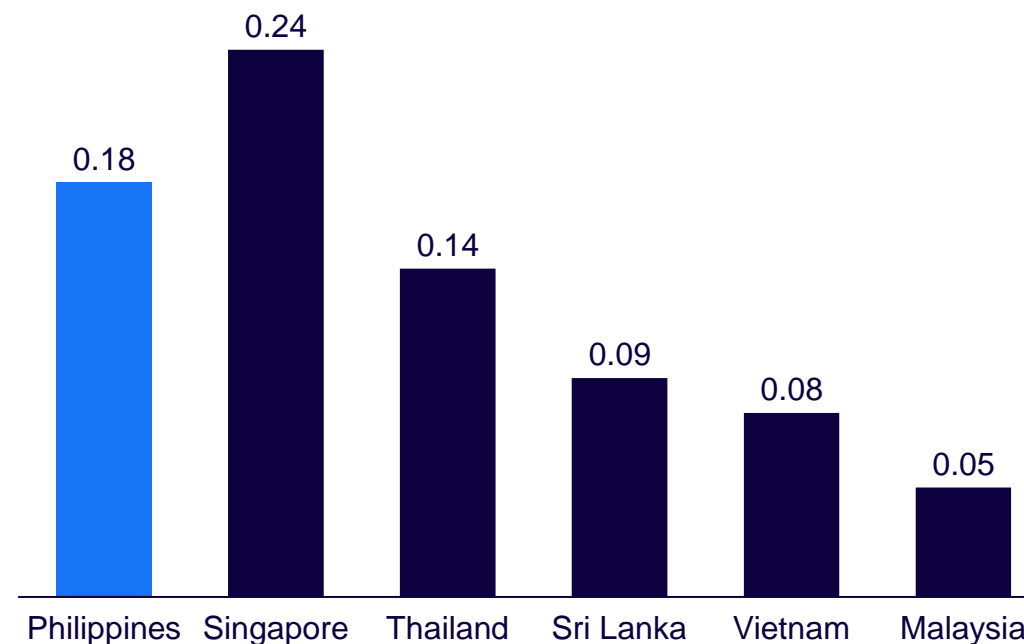
### Average retail rate of electricity

2019 - 2021, USD/kWh



### Household electricity retail prices in ASEAN<sup>1</sup>

Dec 2022, USD/kWh



The relatively high electricity prices in the Philippines are attributed to a **commercial privatized system** which seeks to recover the actual costs of (generation) supply, and **high distribution costs** due to its archipelagic geography

Note: Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

1) Prices for households referenced, for selected ASEAN countries. For households, the displayed number is calculated at the average annual level of household electricity consumption.

Source: Statista 2023, Global Petrol Prices 2023, Asian Development Bank 2016, Arthur D. Little analysis

電力料金表はエネルギー規制委員会（Energy Regulatory Commission）によって承認され、主に以下の2つのカテゴリーに分類される

### Overview of electricity rate schedules



#### Energy Regulatory Commission

Determine, fix, and approve, transmission & distribution wheeling Charges, and retail rates through an ERC established and enforced rate-setting methodology

01

#### Private utilities

- ~20 **private utility firms** involved in electricity retail to residential and non-residential customer groups
- Manila Electric Company (**Meralco**) holds ~80% of the total **distribution market**, with the remaining firms largely being regional players

*ELABORATED IN NEXT SLIDE*

02

#### Electric Cooperatives

- Operate as **membership-based, non-profit electricity providers** that offer renewable energy solutions at scale in **remote areas** across The Philippines
- ~119 **electric cooperatives** in the deregulated electricity market across Luzon, Mindanao, and Visayas

## Meralco: Retail electricity tariffs are segmented into several components, and are differentiated based on consumption volumes and customer groups (1/3)

NON-EXHAUSTIVE

### Residential electrical tariffs

As of June 2023

Consumption volumes	Generation charge, USD / kWh	Transmission charge, USD / kWh	System loss charge, USD / kWh	Distribution charge, USD / kWh	Supply charge, USD / kWh	Metering charge, USD / kWh
0 to 20 kWh	0.13	0.01	0.01	0.02	0.01	0.01
21 to 50 kWh	0.13	0.01	0.01	0.02	0.01	0.01
51 to 70 kWh	0.13	0.01	0.01	0.02	0.01	0.01
71 to 100 kWh	0.13	0.01	0.01	0.02	0.01	0.01
101 to 200 kWh	0.13	0.01	0.01	0.02	0.01	0.01
201 to 300 kWh	0.13	0.01	0.01	0.02	0.01	0.01
301 to 400 kWh	0.13	0.01	0.01	0.03	0.01	0.01
Over 400 kWh	0.13	0.01	0.01	0.04	0.01	0.01

Note: Price components vary on a month-by-month basis. Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Meralco 2023, Arthur D. Little analysis

## Meralco: Retail electricity tariffs are segmented into several components, and are differentiated based on consumption volumes and customer groups (2/3)

NON-EXHAUSTIVE

### Business electrical tariffs

As of June 2023

General Service A (GS-A): Any business premise whose contracted capacity does not exceed 5 kW						
Consumption volumes	Generation charge, USD / kWh	Transmission charge, USD / kWh	System loss charge, USD / kWh	Distribution charge, USD / kWh	Supply charge, USD / kWh	Metering charge, USD / kWh
0 to 200 kWh	0.13	0.01	0.01	0.02	0.01	0.01
201 to 300 kWh	0.13	0.01	0.01	0.02	0.01	0.01
301 to 400 kWh	0.13	0.01	0.01	0.03	0.01	0.01
Over 400 kWh	0.13	0.01	0.01	0.04	0.01	0.01

General Service B (GS-B): Any business premise whose contracted capacity is between 5 kW – 39 kW						
Consumption volumes	Generation charge, USD / kWh	Transmission charge, USD / kWh	System loss charge, USD / kWh	Distribution charge, USD / kWh	Supply charge, USD / kWh	Metering charge, USD / kWh
NA	0.13	3.07	0.01	4.26	6.67	6.51

Note: Price components vary on a month-by-month basis. Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Meralco 2023, Arthur D. Little analysis



## Meralco: Retail electricity tariffs are segmented into several components, and are differentiated based on consumption volumes and customer groups (3/3)

NON-EXHAUSTIVE

### Business electrical tariffs

As of June 2023

General Power (GP): Commercial and industrial customers with a connected load above 40 kW						
Consumption volumes	Generation charge, USD / kWh	Transmission charge, USD / kWh	System loss charge, USD / kWh	Distribution charge, USD / kWh	Supply charge, USD / kWh	Metering charge, USD / kWh
Medium secondary	0.13	3.29	0.01	4.18	14.90	14.97
Large secondary	0.13	3.29	0.01	4.18	61.78	62.13
Very Large secondary	0.13	3.29	0.01	4.18	224.29	212.82

Note: Price components vary on a month-by-month basis. Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Meralco 2023, Arthur D. Little analysis

## フィリピン全土で、エネルギーと燃料の補助金は様々な部門によって提供されている

NON-EXHAUSTIVE

### Overview of selected end-user energy subsidy schemes 2022 to 2023

Year	Name	Details	Administering government departments
2023	Not stated	<ul style="list-style-type: none"> <li>Allocation of PHP 4 billion to provide fuel assistance to <b>transport workers and farmers</b> for FY2023</li> <li>Fuel vouchers to qualified public utility vehicle (PUV), taxi, tricycle, and full-time ride-hailing and delivery services drivers nationwide</li> <li>P1 billion would be given as fuel subsidies to farmers and fisherfolk, benefiting over 312,000 members of the sectors with PHP 3,000 per beneficiary</li> </ul>	<ul style="list-style-type: none"> <li>Department of Transportation (DOTr)</li> <li>Department of Agriculture (DA)</li> </ul>
2022	Fuel Discount for Farmers and Fisherfolk Program	<ul style="list-style-type: none"> <li>Provision of PHP 3,000 per eligible beneficiary for the purchase of diesel or gasoline at accredited gas stations</li> <li>The main beneficiaries are <b>corn farmers and fisherfolks</b>, who must exclusively use the subsidy to fuel their farm machineries and motorized bancas, respectively</li> </ul>	<ul style="list-style-type: none"> <li>Department of Agriculture (DA)</li> </ul>
2022	IRR of Republic Act No. 11552 <sup>1</sup>	<ul style="list-style-type: none"> <li>Provision of a <b>lifeline subsidized rate</b> to low-income end-users who cannot afford to pay the full cost</li> <li>Extension of the 20-year-coverage subsidy provision to <b>marginalized electricity consumers</b> to 50 years, benefiting some 6 million <b>“poorest of the poor” families</b></li> <li>Based on ERC records, the lifeline program provided an average monthly subsidy of PHP 541 million, across all beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>Department of Energy (DOE)</li> <li>Department of Social Welfare and Development (DSWD)</li> </ul>

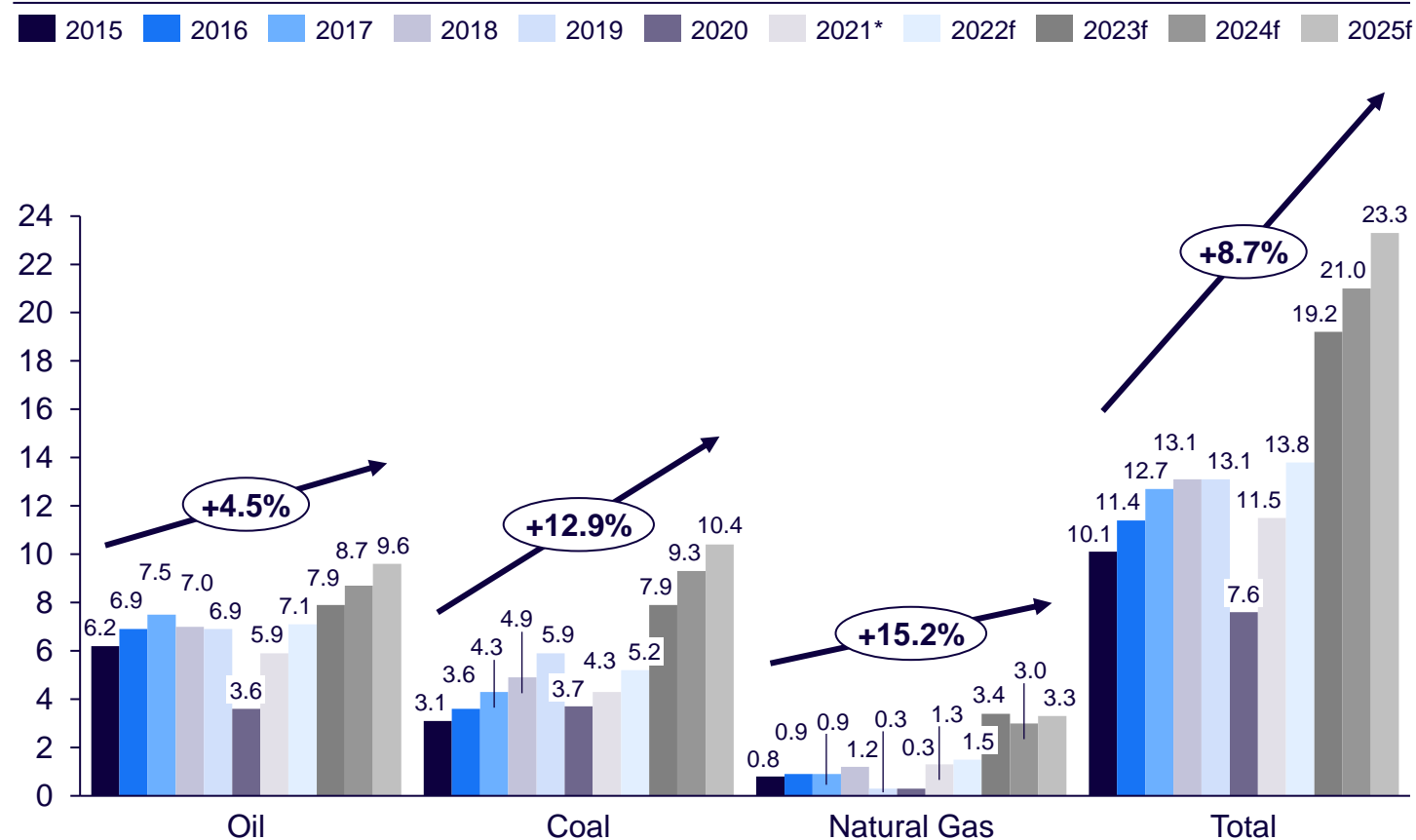
Note: 1) Also known as “An Act Extending and Enhancing the implementation of the Lifeline Rate, Amending for the Purpose Section 73 of Republic Act. No. 9136 (Electric Power Industry Reform Act of 2021).

Source: GMA News Online 2023, CNN Philippines 2023, Department of Agriculture Philippines 2022, Arthur D. Little analysis

## 化石燃料への補助金は～9%の割合で増加している

### Fossil fuel subsidies, by energy source

The Philippines, 2015 – 2025f, USD bn



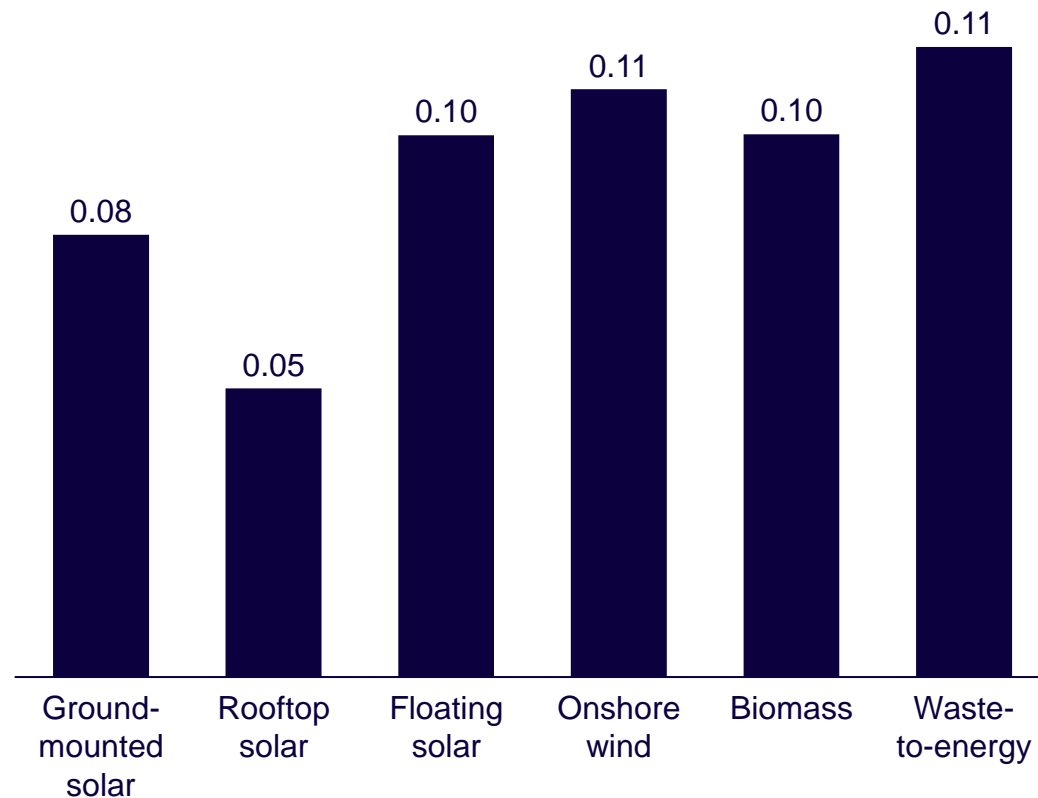
### Comments

- **Coal and oil** are largely driving the overall subsidies for the period 2015 – 2025, at a CAGR of 12.9% and 4.5% respectively.
- Fossil fuel subsidies increased more than threefold from USD 7.6 bn in 2020 to USD 23.3 bn in 2025, on the back of the country being a **net importer and vulnerable to volatile prices** which have been spilling over to the economy since the Russia-Ukraine war
- Natural gas saw the greatest increases of 15.2%, however due to its lower consumption, the absolute value is lower than coal and oil
- Despite the steep increases in subsidies, on average they only account for ~4% of the country's GDP across 2015 – 2025, especially in comparison to countries like Singapore, Malaysia, Vietnam, Thailand and Indonesia, which have upwards of 5% or even 10% of GDP spending

## 廃棄物発電プロジェクトには最も高いオークション料率が割り当てられているが、太陽光発電の拡大はGEAPの主な優先事項

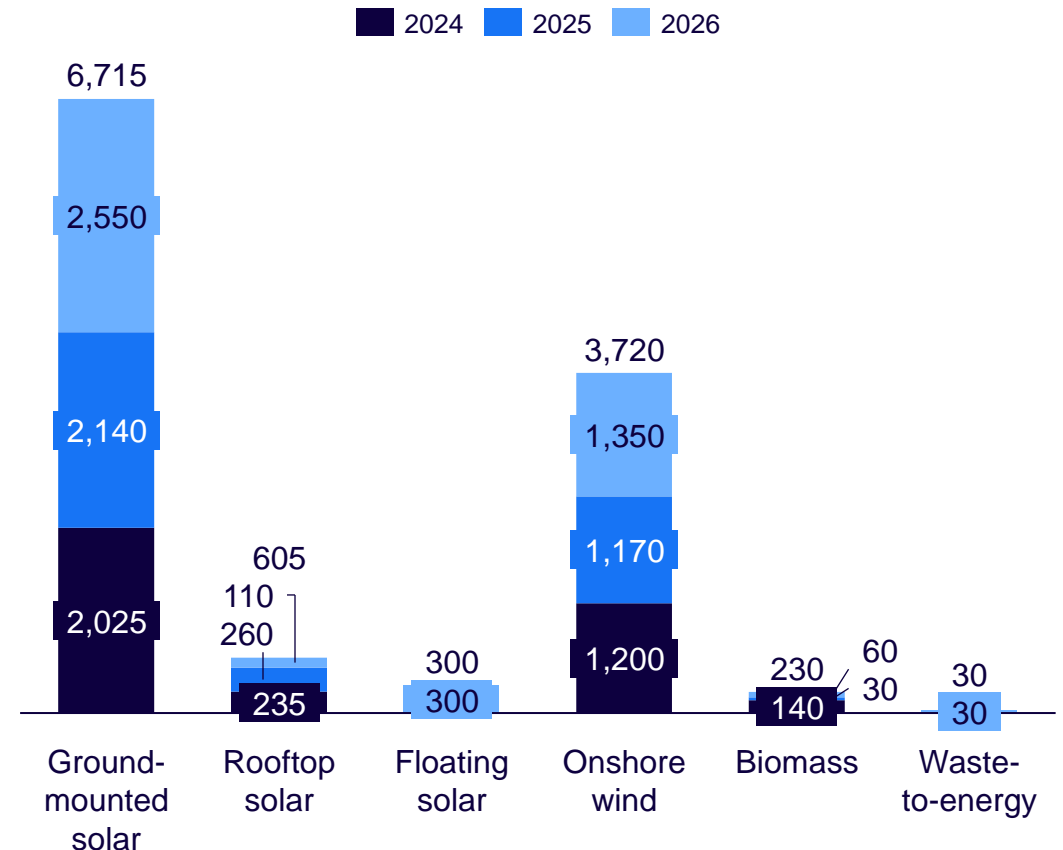
Green Energy Auction Reserve prices (GEAR)<sup>1</sup>

June 2023, USD/kWh



Targets for renewables addition through GEAP

2024 to 2026, MW



Note: 1) The GEAR Prices are the maximum price offers in PHP/kWh that shall be used as the ceiling price in the Green Energy Auction Program (GEAP). Rate converted from local currencies using the exchange rate 1 PHP to 0.018 USD (2 dp.)

Source: Energy Regulatory Commission Philippines 2022, Solar Quarter 2023, Arthur D. Little analysis

再生可能エネルギー事業者に対する優遇措置は主に税制に焦点を当てたもので、最近の政策変更では外資による完全所有が認可

NON-EXHAUSTIVE

Incentives for renewable energy projects

2022

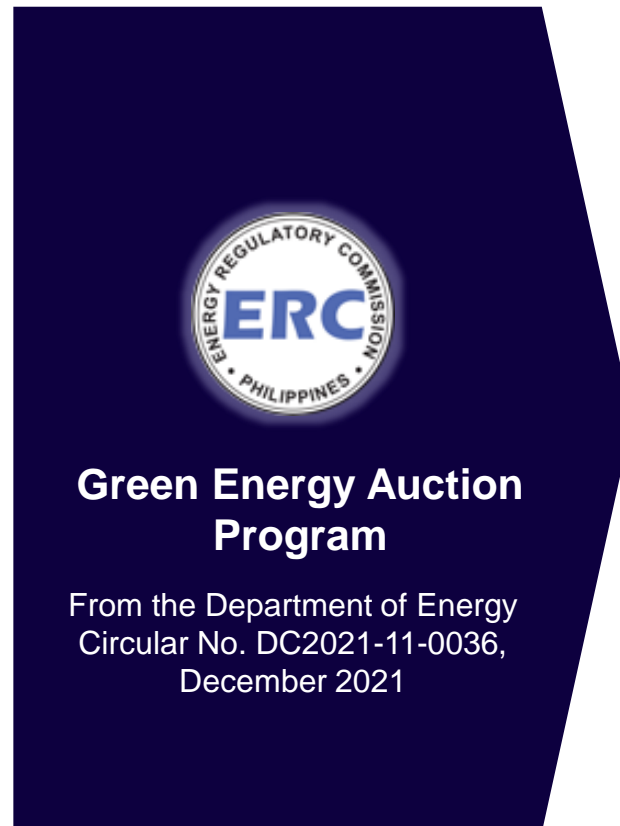
Category	Details of incentive
Tax exemptions and preferential rates	<ul style="list-style-type: none"><li>• A seven-year corporate income tax holiday</li><li>• A reduced 10% corporate income tax rate upon expiration of the tax holiday</li><li>• Tax exemptions for carbon credits generated from renewable energy sources</li><li>• A 1.5% realty tax cap on the original cost of equipment and facilities used to produce renewable energy</li><li>• Value-added tax exemptions for the purchase, grid connection, and transmission of electricity generated from renewable sources</li></ul>
Permission of full foreign ownership	<ul style="list-style-type: none"><li>• Foreign investors can now hold 100% equity in the exploration, development, and utilization of solar, wind, hydro, and ocean or tidal energy resources</li><li>• Amended in 2022, from up to 40% foreign ownership previously</li><li>• Those currently operating in a joint venture with a Filipino partner may also now take a controlling stake in such ventures</li></ul>



A **similar range of incentives are broadly offered** to power producers, **regardless of the technology deployed** for renewable energy generation

## グリーン・エネルギー・オークション・プログラム（Green Energy Auction Program : GEAP）が、全国的な自然エネルギーの導入を推進するために導入された最新の仕組み

### Overview of the GEAP in the Philippines



#	Details
1	• Promote the growth of RE as one of the country's primary sources of energy to achieve energy security and self-reliance
2	• Implement the RE Act mandate to prioritize the connection and building of RE capacity
3	• Ensure transparent and competitive selection of RE facilities to achieve reasonable rates and encourage, as far as practicable, the best RE entrants in the system
4	• Support energy security by adding new capacities to the grid thereby ensuring an adequate and sustainable supply of electricity, especially in the short-to medium-term
5	• Address price volatility related to the procurement and pricing of RE Certificates by increasing the availability of RECs in the RE market
6	• Enhance the RE programs, in general, by promoting a competitive setting of rates for RE supply in the country
7	• Assist the Mandated Participants of the RPS Program by increasing the allocation of RECs generated from the GEAP
8	• Ensure the utilization of efficient RE technologies for low carbon shift in the energy sectors

The Philippines appears to be discontinuing its FiT program, instead switching to the GEAP as a form of competitive reverse auctions

## 以下がフィリピンのFit価格。太陽光、風力に高いインセンティブ

	Solar		Wind		Biomass	Biogas	Hydro	Other
Pricing scheme (FIT price) (USD cent /kWh)	18.00		16.00		14.00	16.00	12.00	N/A
	50MW	450MW	150MW	250MW	250MW	N/A	250MW	N/A
Corporate tax incentives	<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>		<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>		<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>	<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>	<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>	<ul style="list-style-type: none"> <li>0% for 7 years</li> <li>Afterwards 10%</li> </ul>
Import duties	0% for 2 years on raw materials		0% for 2 years on raw materials		0% for 2 years on raw materials	0% for 2 years on raw materials	0% for 2 years on raw materials	0% for 2 years on raw materials
Additional incentives	<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>		<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>		<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>	<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>	<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>	<ul style="list-style-type: none"> <li>Accelerated depreciation and amortization</li> <li>Net Operating Loss Carry-Over for 3 years</li> </ul>

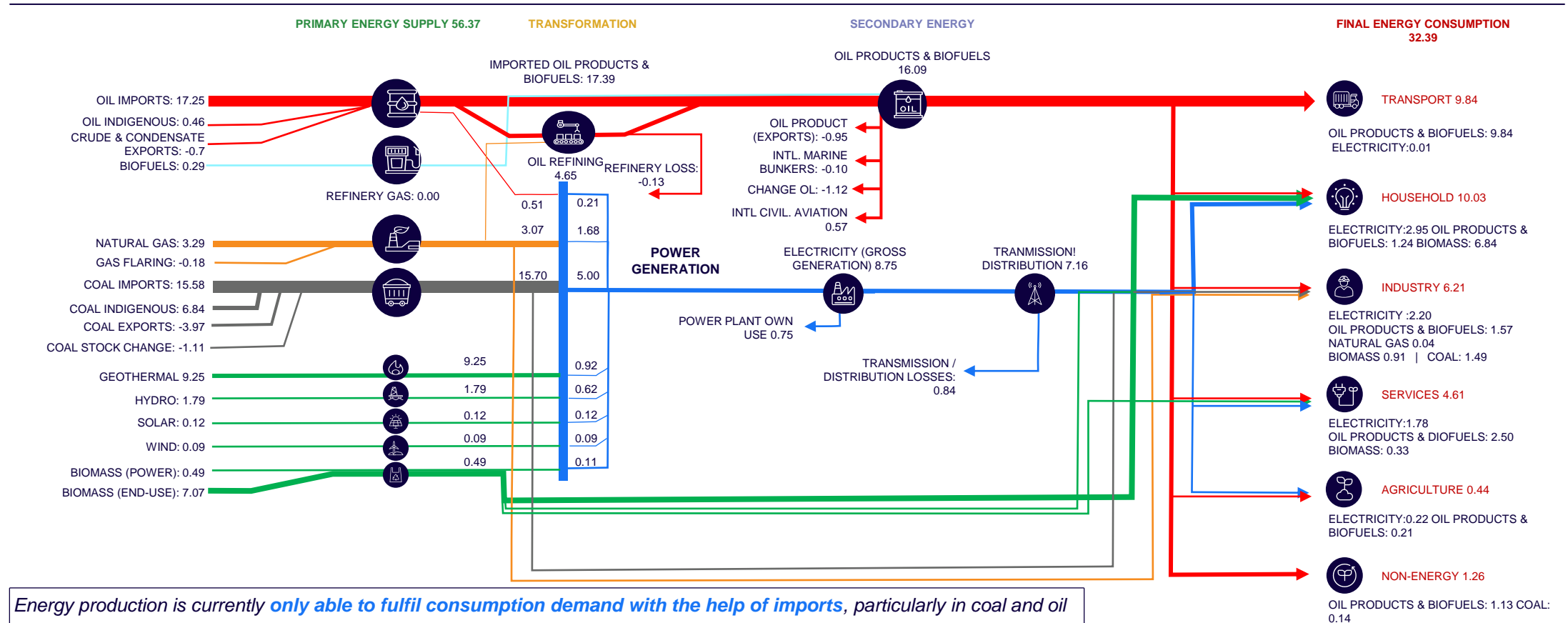
## 10 電力需給状況



# Energy flow in the Philippines

NON-EXHAUSTIVE

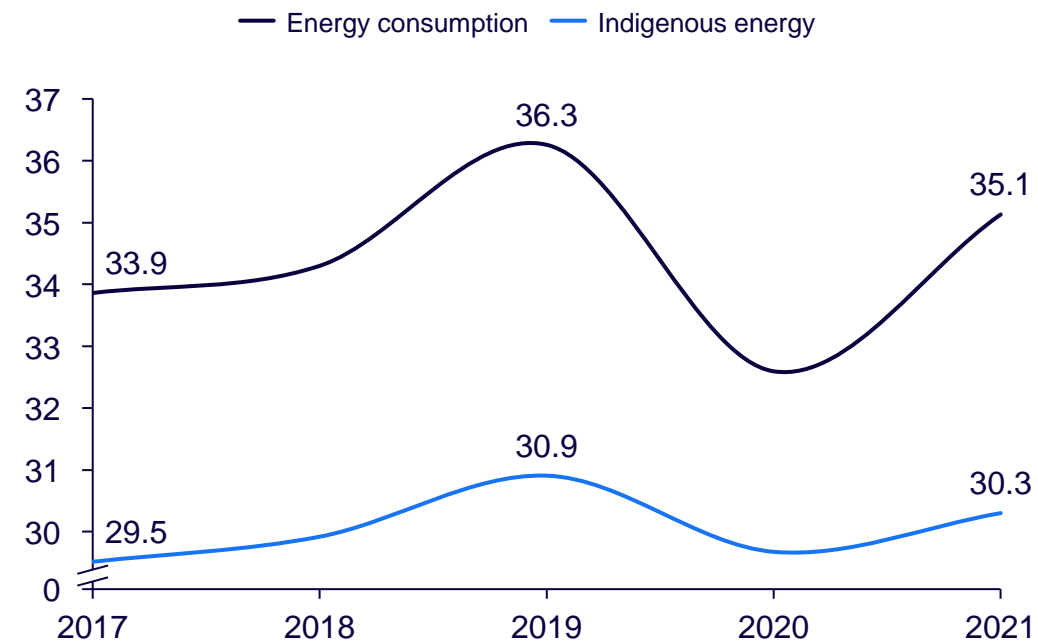
## Energy flow 2020, mtoe<sup>1</sup>



## フィリピンは現在、エネルギーの純輸入国であり、輸入量は比較的安定

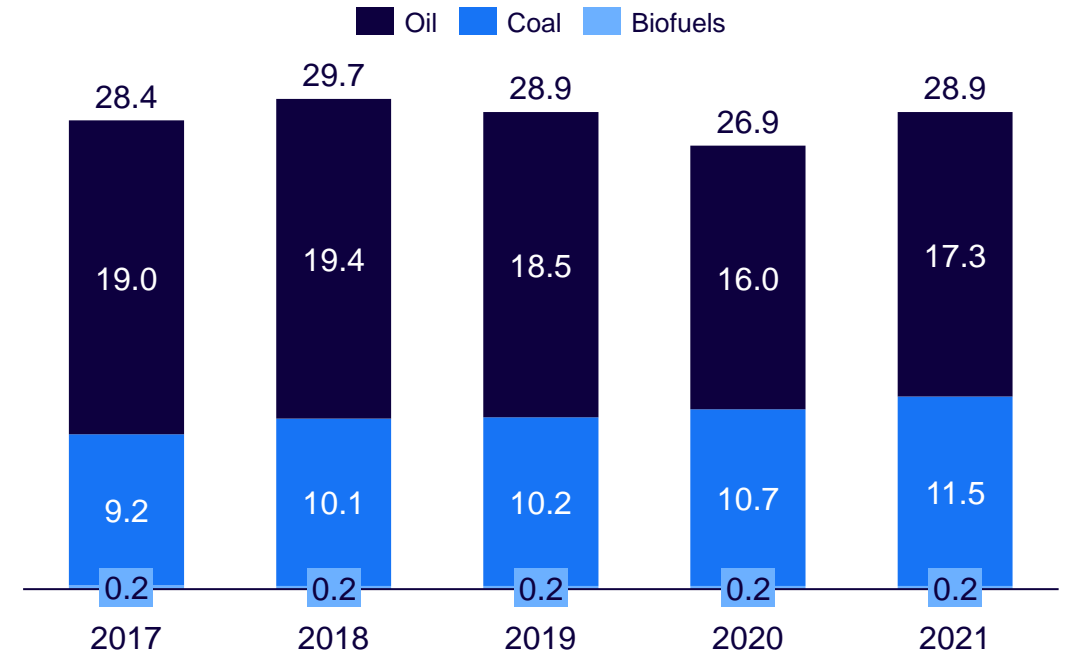
### Energy consumption and indigenous production

2017 - 2021, mtoe<sup>1</sup>



### Energy imports

2017 - 2021, mtoe<sup>1</sup>



The Philippines currently has an **energy self sufficiency ratio of ~50%**, and will be reliant on energy imports in the near to medium term to meet consumption demands

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations.

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## Contact

Arthur D. Little Ltd. (Thailand)  
RSU Tower, 9th Fl, 571 Sukhumvit 31,  
Khlong Toei Nuea, Watthana, Bangkok  
10110, Thailand

Tel: +66(0)2-662-3415

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