



NREB
National Renewable Energy Board

National Renewable Energy Program 2020 - 2040



*In Pursuit of Energy Security
and Sustainable Future!*

MESSAGE FROM THE SECRETARY




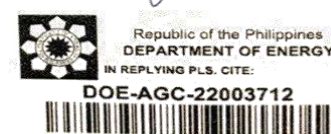
We are pleased to present the National Renewable Energy Program (NREP), 2020-2040, its first update since the Department of Energy (DOE) and industry stakeholders developed the NREP in accordance with the Renewable Energy (RE) Act of 2008. In this edition, we recalibrated the RE targets to support our national development goals, as embodied in the country's collective long-term vision known as the "AmBisyon Natin 2040". It likewise reinforces the goal towards clean energy transition as laid out in the Philippine Energy Plan (PEP), 2020-2040.

Consistent with the objectives of the RE Act, the NREP 2020-2040 seeks to significantly increase RE's share in the country's power generation mix by 2040, which would also help us reduce our greenhouse gas emissions (GHG) in the coming years. However, the Philippine power sector must undergo some transformation for RE to effectively meet our climate commitments and the expected energy demand growth in the new normal. The NREP 2020-2040 prescribes RE transition pathways that broaden markets for RE power generation, such as the Renewable Portfolio Standards (RPS) and the Green Energy Option Program (GEOP). These are supported by enabling mechanisms that are designed to make it easier for more stakeholders to participate in these new programs. Furthermore, RE is becoming an even more compelling energy resource with the greening of the financial sector. We also recognize the transformative power of RE in off-grid areas. While electrification levels have significantly improved since the baseline year of 2015, many homes still do not have access to electricity, while other areas remain underserved. Renewable energy could be the most technically and economically viable option in remote and isolated unelectrified areas, given the advancements in RE technologies in providing solutions to the unique challenges in these places.

The NREP adopts a whole-of-nation approach to achieve these RE goals and reap its positive socio-economic benefits. The DOE is inviting other government agencies to join us and come up with appropriate RE promotional programs. We are also engaging various local government units (LGUs) to facilitate the implementation of national RE policies and programs at the local level. The clean energy transition may be an extensive process, but it is definitely not a lonely one. The sector has grown exponentially with the active participation of the private sector and other stakeholders. With all the policy mechanisms prescribed by the RE Act in place, we are now poised for its full implementation. We hope that the NREP 2020-2040 would further enhance our understanding of key RE policies and programs. We call on everyone to take part in the clean energy transition for a more secure and resilient energy sector.

With the NREP in place, together, a brighter and cleaner energy future awaits us all!


Secretary Alfonso G. Cusi
Department of Energy



MESSAGE FROM THE NATIONAL RENEWABLE ENERGY BOARD




This 2020-2040 NREP is truly historic for two reasons apart from being borne in the midst of a pandemic:

This NREP builds on the 2011-2030 NREP and transforms our collective aspirations as a people into our shared imperatives as stakeholders – fully involved and accountable for our choices and actions. In preparing our contributions to this NREP, the National Renewable Energy Board (NREB) engaged in a consultative and collaborative review of the RE targets set in 2010 vis-à-vis actual capacities installed for the first 10 years of implementation of the RE Act of 2008. With inputs from all sectors, it was quite humbling to confront the reality that our RE targets will remain unattainable unless these are firmly anchored upon demand projections and situated at the core of our energy planning. In other words, we need to move decisively beyond aspirations to imperatives. Today, coming from this exercise and with RE technologies becoming increasingly cost competitive, the target of having more than 50% of our generation mix coming from RE sources by 2040 drive the clean energy scenario of the new PEP, 2020-2040 and all policies and efforts are being aligned towards achieving this cleaner and greener future.

In addition, this NREP is both a product and a roadmap of synergies. In the process of developing the NREP, the NREB and the DOE established a common set of assumptions on capital costs, fuel prices, demand, among others. This cost assumptions book was the basis for the data-driven modelling by both NREB and DOE. Likewise, the book is now a live document that can be updated as a dynamic tool to be used by planning agencies for a shared baseline on which scenarios can be built and against which deviations may be tracked. In the same spirit of finding a common ground, the NREB recommends in this NREP the adoption of a whole-of-nation approach to allow us to create and seize RE opportunities as a developing economy, as more nexus opens up between energy and food, energy and mobility, energy and healthcare, among others.

On behalf of the NREB, it was indeed our distinct honor to have contributed to this NREP that represents a commitment to the vision of an energy self-sufficient and inclusive Philippine economy.


Atty. Monalisa Dimalanta
Chairperson
National Renewable Energy Board
March 2019 – March 2021

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ACRONYMS

ADB	Asian Development Bank
AFD	Agence Française Développement
ANTECO	Antique Electric Cooperative
ASEP	Access to Sustainable Energy Programme
ASEAN	Association of Southeast Asian Nations
BPI	Bank of the Philippine Islands
BSP	Bangko Sentral ng Pilipinas
CEFIM	Clean Energy Finance and Investment Mobilisation
CFF	C40 Cities Finance Facility
CIT	Corporate Income Tax Rate
CO₂	Carbon Dioxide
COE	Certificate of Endorsement
CREZ	Competitive Renewable Energy Zones
CT	Carbon Trust
DA	Department of Agriculture
DAE	Direct Access Entity
DBP	Development Bank of the Philippines
DC	Department Circular
DO	Department Order
DER	Distributed Energy Resources
DGCs	Distributed Generation Companies
DILG	Department of the Interior and Local Government
DOE	Department of Energy
DREAMS	Development for Renewable Energy Applications Mainstreaming and Market Sustainability
DUs	Distribution Utilities
ECs	Electric Cooperatives
EE&C	Energy Efficiency and Conservation
EODB	Ease of Doing Business and Efficient Government Service Delivery Act
EPIMB	Electric Power Industry Management Bureau
ERC	Energy Regulatory Commission
ERSP	Expanded Rooftop Solar Program
ESG	Environmental, Social, and Corporate Governance
ESS	Energy Storage System
ETM	Energy Transition Mechanism
EU	European Union
EVOSS	Energy Virtual One-Stop Shop
FIT	Feed-In Tariff
FIT-ALL	Feed-In Tariff Allowance
FTAA	Financial and Technical Assistance Agreement

GBCGE	Great Basin Center for Geothermal Energy
GCF	Green Climate Fund
GEAC	Green Energy Auction Committee
GEAP	Green Energy Auction Program
GEAR	Green Energy Auction Reserve
GEF	Global Environment Facility
GEOP	Green Energy Option Program
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HH	Households
HEP	Household Electrification Program
HEPP	Hydroelectric Power Plant
HUC	Highly Urbanized City
HVDC	High-Voltage Direct Current
IRR	Implementing Rules and Regulations
JICA	Japan International Cooperation Agency
JIP	Joint Industry Platform
LandBank	Land Bank of the Philippines
LGUs	Local Government Units
LNG	Liquefied Natural Gas
LREP	Local Renewable Energy Planning
MPs	Mandated Participants
MSW	Municipal Solid Waste
NAMA	Nationally Appropriate Mitigation Action
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NGCP	National Grid Corporation of the Philippines
NPC	National Power Corporation
NPC-SPUG	National Power Corporation-Small Power Utilities Group
NPPs	New Power Providers
NREB	National Renewable Energy Board
NREL	National Renewable Energy Laboratory
OCSP	Open and Competitive Selection Process
OECD	Organization for Economic Co-operation and Development
PDP	Power Development Plan
PEMC	Philippine Electricity Market Corporation
PEP	Philippine Energy Plan
PREMS	Philippine Renewable Energy Market System
PSA	Power Supply Agreement
PURE	Productive Uses of Renewable Energy
PV	Photovoltaic

QTP	Qualified Third Party
RA	Republic Act
RCBC	Rizal Commercial Banking Corporation
RE	Renewable Energy
RE ACT	Renewable Energy Act of 2008
REC	Renewable Energy Certificate
REM	Renewable Energy Market
REMB	Renewable Energy Management Bureau
RER	Renewable Energy Registrar
RESC	Renewable Energy Service Contracts
RESHERR	Renewable Energy Safety, Health, and Environment Rules and Regulations
RETF	Renewable Energy Trust Fund
ROMELCO	Romblon Electric Cooperative
ROR	Run-of-River
RPS	Renewable Portfolio Standards
RPST	Renewable Portfolio Standards Composite Team
SDGs	Sustainable Development Goals
SF4RE	Support Facility for RE Services
SHS	Solar Home Systems
SPT	Simplified Planning Tool
TDP	Transmission Development Plan
TEP	Total Electrification Program
TRANSCO	National Transmission Corporation
UCME	Universal Charge for Missionary Electrification
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
UNOPS	United Nations Office for Project Services
US	United States
USAID	United States Agency for International Development
WESM	Wholesale Electricity Spot Market
WBG	World Bank Group
WTE	Waste-to-Energy
WTGs	Wind Turbine Generators

UNITS

CHF	Swiss Francs
B	Billion
CHF	Swiss Franc
GW	Gigawatt
GWh	Gigawatt Hour
kV	Kilovolt
kWh	Kilowatt-hour
M	Million
MW	Megawatt
MWh	Megawatt Hour
PhP	Philippine Peso
USD	United States Dollar
Wp	Watt Peak

FOREWORD AND EXECUTIVE SUMMARY

The formulation of NREP, 2020 - 2040 was spearheaded by the DOE, in collaboration with the NREB and with technical assistance from the Development for Renewable Energy Applications Mainstreaming and Market Sustainability (DREAMS) Project of the Global Environment Facility (GEF) and United Nations Development Program (UNDP). It was presented in a national public consultation held on 18 March 2021, which was actively participated by more than 400 stakeholders who expressed their support in accelerating RE development in the country. Building its foundation on the first NREP, 2011-2030, this update integrates recent developments in the RE sector and serves as the culmination of various consultations, collaborations, and stakeholder engagements over the years. The NREP, 2020-2040 is composed of three chapters summarized as follows:

Chapter I. NREP, 2011-2030 Assessment evaluates the NREP, 2011-2030 in terms of achieving RE installation targets and other key outcomes as of year 2019. It also highlighted the major RE policies and programs promulgated and implemented after the RE Act, and identified the main issues and challenges in RE development and integration.

Chapter II. NREP, 2020-2040 introduces the updated RE target of at least 35% RE share in the power generation mix by 2030 and 50% by 2040 to achieve energy security, sustainable development, and inclusive growth, and mitigate the impacts of climate change. It presents the long-term RE Outlook covering the period 2021-2040 and provides the upcoming RE projects.

Chapter III. NREP, 2020-2040 Framework and Roadmap rolls-out a revitalized NREP Framework and Roadmap composed of RE transition pathways and enablers, resource-specific programs, and strategies that promote RE in off-grid areas and other productive uses of RE (PURE).

Chapter IV. Investment Themes and Financing RE identifies RE investment opportunities, incentives, and financing options and programs for the private sector and end-users.

The strategies, policy mechanisms, and programs included in this 2020 NREP update are anchored on the AmBisyon Natin 2040 and aligned with the recently published PEP, 2020-2040 and Power Development Plan (PDP), 2020-2040. Joined together, these government documents advocate inclusive growth and sustainable development fueled by cleaner energy sources. The NREP, 2020-2040 adopts a whole-of-nation approach and emphasizes the roles of various stakeholders in achieving the RE targets and goals. As such, its successful implementation requires a strong synergy between the government, energy agencies, LGUs, and industry participants. Continued support of the financial sector, international organizations, and all stakeholders is likewise needed to strengthen the momentum of the country's RE industry.

I. NATIONAL RENEWABLE ENERGY PROGRAM, 2011-2030 ASSESSMENT

In pursuit of its mandate under the Republic Act (RA) No. 9513 or the Renewable Energy Act of 2008 (RE Act), the DOE, in coordination with the NREB, issued the NREP covering the period 2011-2030. The NREP, 2011-2030 served as the first comprehensive document that provided the country's RE installation targets, and institutionalized strategies and action plans. It aims to encourage more RE investments to achieve energy security, self-reliance, emission reduction, and sustainable development, as enshrined in the RE Act. A decade after its launch, it is imperative to evaluate its implementation by identifying key outcomes, major policy and program issuances, and issues and challenges in RE development and integration.

A. KEY OUTCOMES

The NREP, 2011-2030 set the target of tripling the installed RE capacity from 5,438 MW in 2010 to 15,304 MW in 2030, based on the RE Service and Operating Contracts awarded or being evaluated by the DOE at that time. The actual installed capacity addition from 2011-2019 at 2,115 MW remained significantly lower than the 9,865 MW target by 2030 (Table 1). Similarly, the RE installed capacity as of 31 December 2019 at 7,399 MW was only around half of the 2030 target at 15,304 MW. Among RE technologies, only solar and biomass reached and exceeded their respective targets. Solar and biomass also had the highest installed capacity addition over the period with 958 MW and 470 MW, respectively, followed by wind, hydro, and geothermal. The increase in RE installation was largely triggered by the implementation of the Feed-in Tariff (FIT) which provided guaranteed fixed payments per kWh of electricity produced from eligible RE resources. Meanwhile, no RE facility utilizing ocean technology has been constructed to date. The appendix provides the maps of all existing RE facilities as of 2021.

Table 1. NREP, 2011-2030 Installation Targets vs. Actual, in MW

Technology	2010 Baseline Installed Capacity	Target		Actual	
		Installed Capacity Addition, 2011- 2030	Installed Capacity by 2030	Installed Capacity Addition, 2011- 2019	Installed Capacity as of 31 December 2019
Biomass	39	277	316	470	363
Geothermal	1,966	1,495	3,461	83	1,928
Solar	1	284	285	958	921
Hydropower	3,400	5,394	8,794	195	3,760
Wind	33	2,345	2,378	410	427
Ocean	0	71	71	0	0
Total*	5,438	9,865	15,304	2,115	7,399

*Due to rounding, some totals may not correspond to the sum of the separate figures

In terms of power generation, the share of RE declined from 26% in 2010 to 21% in 2019 as depicted in Figure 1. Renewable energy's share in the power generation mix, mainly from geothermal and hydro, has been falling at an average of 2% annually during the said period. This decline is mainly attributed to the significant increase in coal power generation from 34% in 2010 to 55% in 2019.

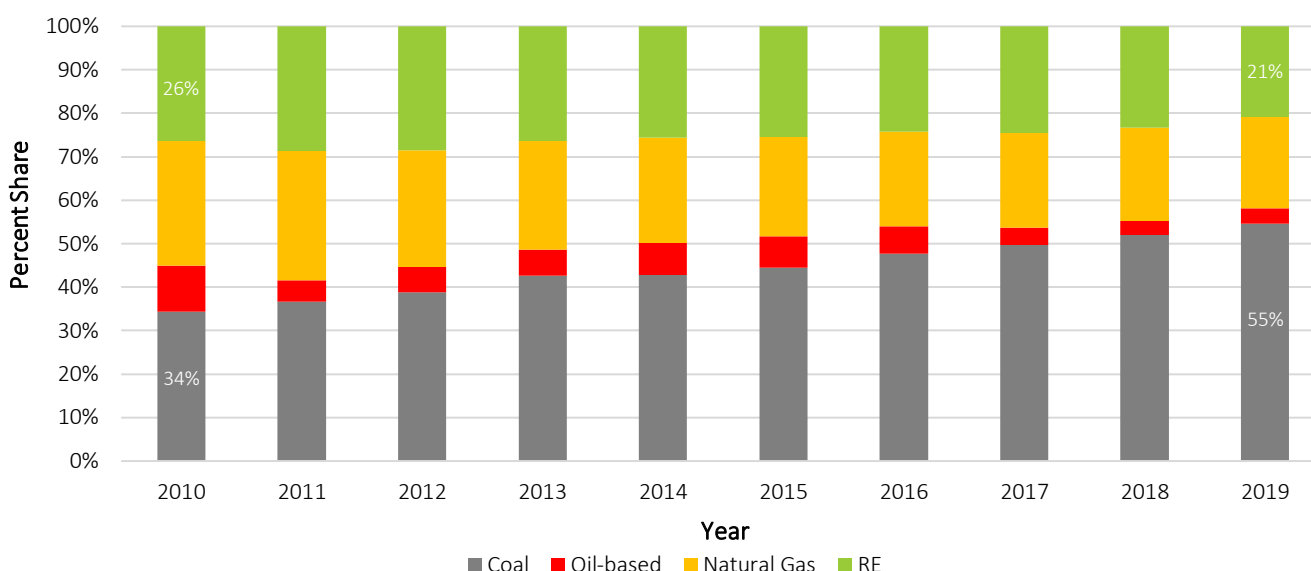


Figure 1. Philippines' Power Generation Mix , 2010-2019, in Percent

Despite the shortfalls in reaching the RE targets, the NREP, 2011-2030 achieved outcomes that go beyond the commercial operation of new RE power plants. It encouraged greater participation of the financial sector by generating more than PhP 217B worth of RE investments from 2009-2019. In addition, more than 168,400 new jobs were created in various fields which include research and development, installation and construction, and operation and maintenance, among others. Several own-use RE facilities also commissioned during the period with a total of 126.89 MW (119.86 MW of biomass and 7.03 MW of solar photovoltaic [PV]). Greater use of RE also reduced carbon dioxide (CO₂) emission by approximately 17.13 million tons and transformed agricultural solid wastes into useful energy, through biomass facilities.



>PhP 217B
RE Investments



>168,400
Jobs Created



17.13M Tons
CO₂ Emission

B. MAJOR POLICIES AND PROGRAMS

Most policies and programs embodied in the RE Act were issued and implemented during the assessment period. Altogether, these policies and programs triggered the growth of RE capacities in the previous years and will likewise remain as the catalysts of RE development in the future.

1. Feed-in Tariff

The FIT is an RE policy mechanism that provides guaranteed fixed payments per kWh of electricity produced from emerging RE resources, excluding generation for own use, for a period of 20 years. It also

provides priority connection to the main grid, and priority purchase, transmission, and payment for RE electricity generation by grid system operators, pursuant to Section 7 of the RE Act. Eligible RE technologies covered by FIT include solar, wind, biomass, ocean¹, and run-of-river (ROR) hydropower. The FIT system served as the most significant driver for installations of new and emerging RE technologies, particularly for solar, wind, and biomass, from 2014-2019. The initial 50 MW installation target for solar was immediately increased to 500 MW and was still oversubscribed by more than 300 MW. Likewise, the initial installation target for wind was expanded from 200 MW to 400 MW due to the strong interest of the private sector to develop such projects.

As of 31 December 2021, the installation targets for solar, wind, and biomass were already fully subscribed as shown in Table 2. On the other hand, there was a slow uptake for ROR hydropower such that about 99 MW out of the 250 MW target is still open for FIT subscription.

Table 2. Status of FIT Implementation, as of 31 December 2021

Technology	FIT Installation Target	ERC Approved Rates	With Certificate of Endorsement to ERC		FIT Installation Target Remaining Balance
	Capacity (MW)	PhP/kWh	No. of Projects	Capacity (MW)	Capacity (MW)
Hydropower	250	5.90	5	35.956	98.887
		5.8705 ^c	1	8.500	
		5.8705 ^d	8	102.901	
		TBD*	2	3.756	
Wind	200	8.53	3	249.9	0
	200 ^a	7.40 ^b	3	144	
Solar	50	9.68	6	108.90	0
	450 ^a	8.69 ^b	17	417.05	
Biomass	250	6.63	12	117.351	0
		6.5969 ^c	5	18.064	
		6.19 ^d	14	121.63	
Ocean	10	Deferred	-	-	-
Total	1,410		76	1,328.008	98.887

^a Additional Installation Targets

^b FIT rates for the additional installation targets (Wind – Energy Regulatory Commission [ERC] Resolution No. 14, Series of 2015; Solar – ERC Resolution No. 6, Series of 2015)

^c Degressed FIT rates (Hydropower and Biomass – ERC Resolution No. 1, Series of 2017)

^d Degressed FIT rates (Hydropower and Biomass – ERC Resolution No. 6, Series of 2021)

*To be determined

The FIT Rules was issued in 2010 through ERC Resolution No. 16, Series of 2010, whose some provisions were later amended by ERC Resolution No. 15 Series of 2012. Meanwhile, the initial FIT rates were set in 2012 through ERC Resolution No. 10 Series of 2012. Other ERC resolutions providing additional installation targets and adopting new FIT rates were issued in the succeeding years as noted in Table 2. In 2013, the guidelines on the collection of the FIT Allowance (FIT-ALL) and the disbursement of the FIT-

¹ FIT for ocean has been deferred

ALL Fund were adopted through ERC Resolution No. 24, Series of 2013². The FIT-All represents the difference between the FIT price and the prevailing market price, plus other components, charged to all on-grid end-users at a uniform rate in PhP/kWh. The National Transmission Corporation (TRANSCO) is the FIT-All Fund Administrator tasked to establish, manage, disburse, and settle the FIT-All Fund pursuant to ERC Resolution No. 15 Series of 2012.

2. Net-Metering for RE Program

Pursuant to Section 10 of the RE Act, the net-metering program allowed end-users to generate electricity from RE-based systems up to 100 kW for own use and sell their excess to the grid, thereby giving rise to a new type of end-user called “prosumer” (producer and consumer). Prosumers benefit from the program through rebates or reduced power generation rates. Under net-metering, distribution utilities (DUs) charge the net of prosumers’ electricity import and export on the monthly electricity bills.

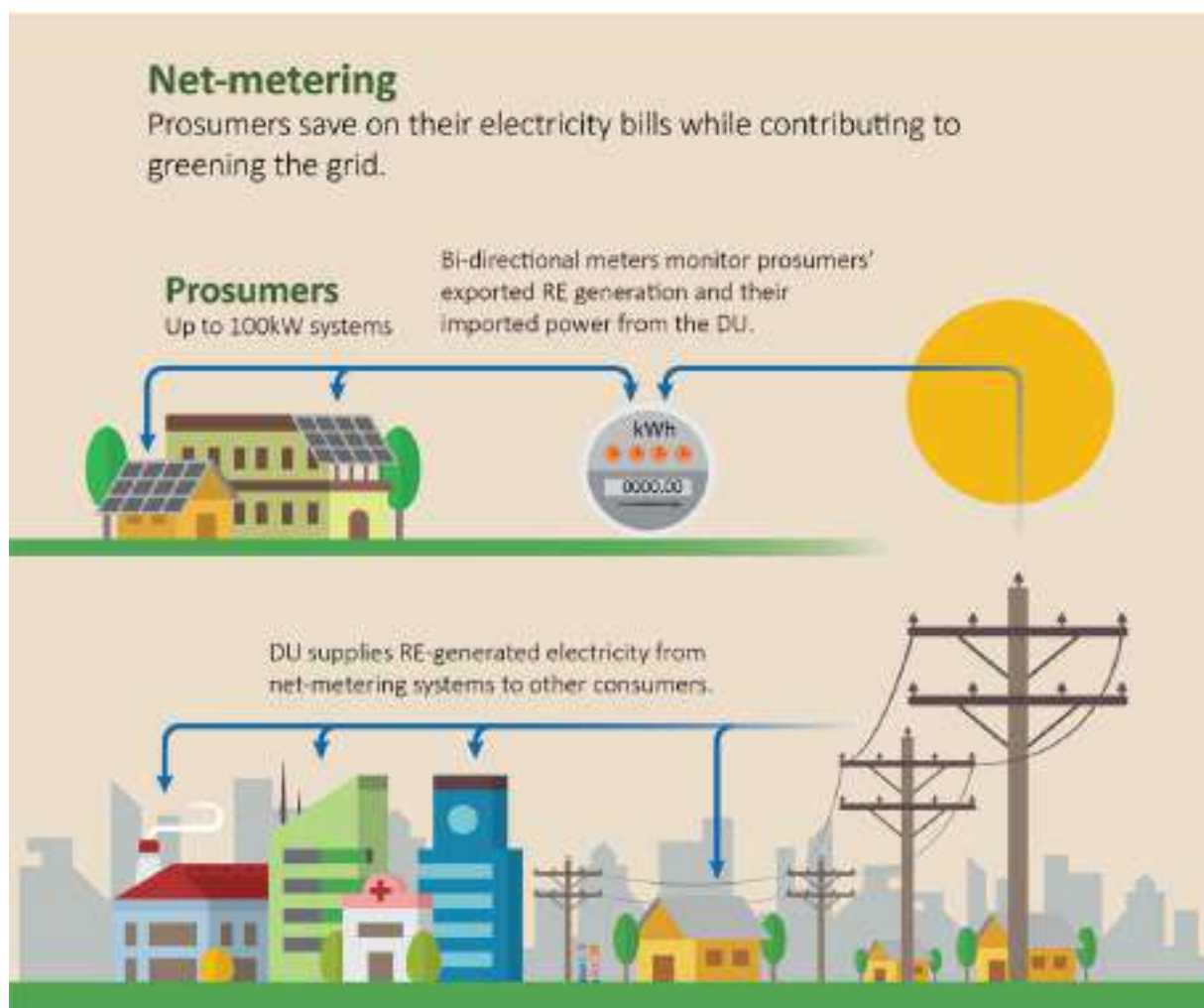


Figure 2. Net-Metering Implementation

² Entitled “A Resolution Adopting the Guidelines on the Collection of the Feed-in Tariff Allowance (FIT-ALL) and the Disbursement of the FIT-ALL Fund”

Following are the ERC issuances related to the net-metering program:

- a. ERC Resolution No. 9, Series of 2013³ – This resolution adopted the Net-Metering Rules.
- b. ERC Resolution No 6, Series of 2019⁴ – This resolution adopted amendments to the 2013 Net-Metering Rules. It prescribed a maximum of 20 days for DUs to complete the whole interconnection process and reduced installation costs by removing the Distribution Impact Study fee and other soft costs. These modifications aim to simplify the application process and encourage greater prosumer participation in the program.

3. Preferential Dispatch of Renewable Energy

Intermittent and FIT-eligible RE generating units are given preference in the Wholesale Electricity Spot Market's (WESM) dispatch schedule to ensure its maximum output injection in the grid. Pursuant to Section 4 of DOE Department Circular (DC) No. DC2015-03-0001⁵, intermittent RE-based plants such as wind, solar, ROR hydropower, and ocean energy, whether or not under the FIT system, are must dispatch in the WESM; while biomass plants under the FIT system are priority dispatch.

4. Renewable Portfolio Standards

4.1. On-Grid

The DOE DC No. DC2017-12-0015⁶ referred to as the "RPS On-Grid Rules" required all Mandated Participants (MPs) to source or produce a specified portion of their electricity requirements from RE to develop indigenous and environmentally friendly energy resources. The MPs include (i) all DUs for their Captive Customers; (ii) electricity suppliers for the Contestable Market; (iii) power generating companies only to the extent of their actual supply to Directly-Connected Customers (DCCs); and (iv) other electric power industry participants that may be recommended by the NREB and approved by the DOE. The RPS On-Grid Rules also established the minimum annual RPS requirement and increments, identified eligible RE facilities, directed compliance monitoring of MPs, and provided penalties for non-compliance.

The minimum annual RPS increment was initially set at 1% of the net electricity sales of the MP for the previous year. This shall be adjusted by the DOE, in coordination with the NREB, as necessary, to achieve the aspirational target of 35% RE share in the power generation mix by 2030, as defined in Section 7 of the RPS On-Grid Rules. Renewable energy facilities utilizing biomass, waste-to-energy (WTE), wind, solar, ROR and impounding hydropower, ocean, geothermal, hybrid systems with respect to its RE component, and other technologies which may be later identified by the DOE, shall be eligible for RPS compliance

³ Entitled "A Resolution Adopting the Rules Enabling the Net-Metering Program for Renewable Energy"

⁴ Entitled "A Resolution Adopting the Amendments to the Rules Enabling the Net-Metering Program for Renewable Energy"

⁵ Entitled "Promulgating the Framework for the Implementation of Must Dispatch and Priority Dispatch of Renewable Energy Resources in the Wholesale Electricity Spot Market"

⁶ Entitled "Promulgating the Rules and Guidelines Governing the Establishment of the Renewable Portfolio Standards for On-Grid Areas"

and the attribution of RE Certificates (RECs), provided that these facilities became commercially operational after the effectivity of the RE Act.

In complying with the RPS On-Grid Rules, the MP shall use RECs generated from any, a combination, or all of the following: (i) allocation from FIT-eligible RE facilities; (ii) Power Supply Agreement (PSA) with RPS-eligible facilities; (iii) purchase or acquisition of RECs from the RE Market (REM); (iv) generation from net-metering installations; (v) RE facility for own-use; and (vi) energy sales from the GEOP. One REC is equivalent to 1 MWh of electricity generated from registered eligible RE facilities. The tracking, surrendering and issuance of RECs will be done through the REM. In addition, all MPs are required to undertake Competitive Selection Process (CSP) in sourcing their RE supply such that any additional cost arising from their RPS compliance will not result to higher electricity rates for their customers.

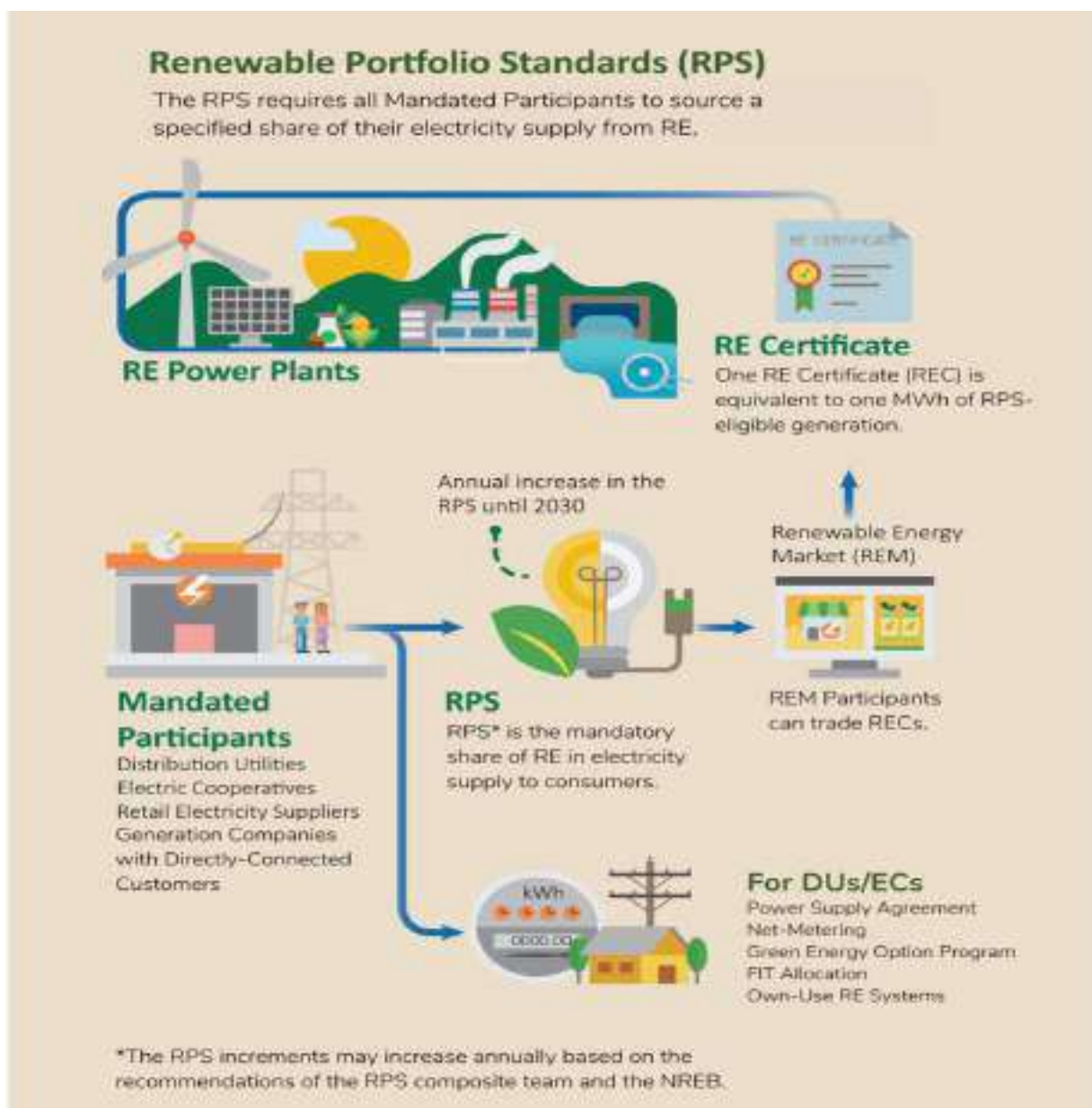


Figure 3. RPS On-Grid Implementation

4.2. Off-Grid

The DOE DC No. DC2018-08-0024⁷ or the “RPS Off-Grid Rules” aims to increase RE utilization in off-grid and missionary areas by mandating industry participants to source or produce a specified portion of their electricity requirements from eligible RE resources, similar to the RPS for on-grid areas. It also intends to rationalize the Universal Charge for Missionary Electrification (UCME) subsidy⁸ and improve off-grid areas’ energy self-sufficiency. Mandated participants in the RPS for off-grid areas include power generation companies (National Power Corporation-Small Power Utilities Group [NPC-SPUG], New Power Providers [NPPs], and Qualified Third Parties [QTPs]), and DUs and LGUs operating their own embedded generation facilities. Due to foreseen issues such as the varying commercial and contractual arrangements in off-grid and isolated areas, identification of appropriate MPs and RPS compliance mechanism, and determination of the Optimal Power Supply Mix for each off-grid area, among others, the implementation of the RPS Off-Grid Rules was suspended and is currently being reviewed.

The Simplified Planning Tool (SPT), developed by the DOE with technical assistance of the Access to Sustainable Energy Programme (ASEP) supported by the European Union (EU), aims to assist MPs in preparing and executing their respective RPS Compliance Plans consistent with their optimal power supply mix.

5. Green Energy Option Program

Section 9 of the RE Act empowered and accelerated customers’ power of choice through the implementation of the GEOP. Under this policy, electricity end-users have the option to source their electricity supply from their preferred RE Power Suppliers. To implement this, the DOE issued DC No. DC2018-07-0019, entitled “Promulgating the Rules and Guidelines Governing the Establishment of the Green Energy Option Program Pursuant to the Renewable Energy Act of 2008” on 18 July 2018, which established the policy framework for GEOP. Pursuant to this DC, participation in the program is voluntary for end-users with an average peak demand of 100 kW and above for the past 12 months. The GEOP is a non-regulated activity as end-users can directly enter a contract with its chosen RE supplier at an agreed price, and through its own procurement process. Hence, it can contribute to the development and utilization of RE resources in a least cost and sustainable manner.

⁷ Entitled “Promulgating the Rules and Guidelines Governing the Establishment of the Renewable Portfolio Standards for Off-Grid Areas”

⁸ Charged to all electricity consumers to subsidize and support missionary electrification, among other purposes

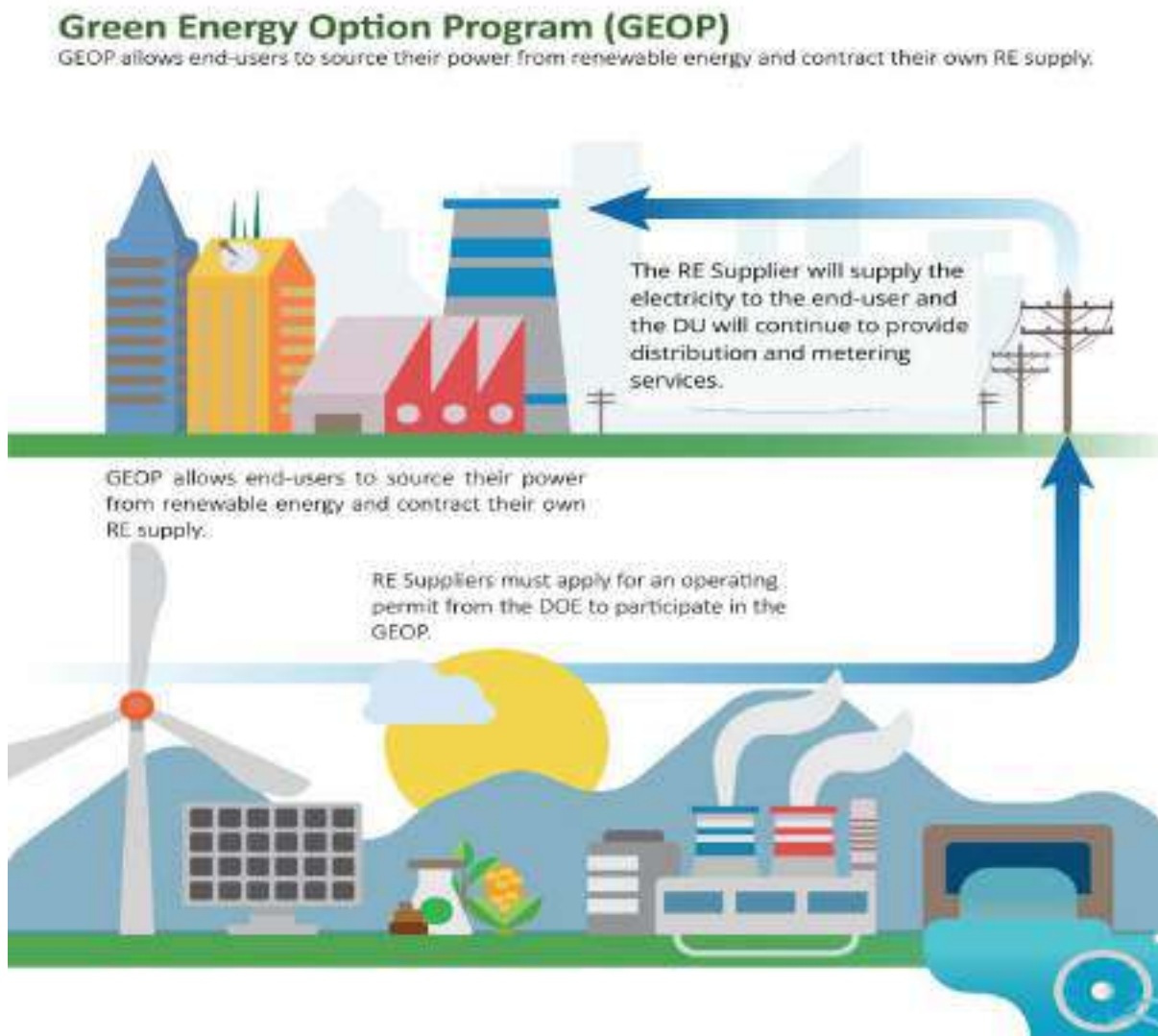


Figure 4. GEOP Implementation

6. Renewable Energy Trust Fund

Pursuant to Section 28 of the RE Act, the Renewable Energy Trust Fund (RETF) was established to promote the development and greater utilization of RE. It shall be administered by the DOE as a special account in any Government Financial Institutions and shall be used exclusively to:

- a. Finance the research, development, demonstration, and promotion of the widespread and productive use of RE for power and non-power applications;
- b. Provide funding to qualified institutions engaged in RE studies, and scholarships and fellowships for energy studies;
- c. Support the development and operation of new RE resources;
- d. Conduct nationwide RE resource and market assessment studies for the power and non-power applications of RE systems;

- e. Propagate RE knowledge by accrediting, tapping, training, and providing benefits to institutions, entities, and organizations to promote RE at the national and local level; and
- f. Fund other activities necessary to attain the objectives of the RE Act.

The RETF shall be sourced from various entities and mechanisms as enumerated in Section 28 of the RE Act and Section 34 of its Implementing Rules and Regulations (IRR), and may be used in the form of grants, loans, equity investments, loan guarantees, insurance, counterpart fund or other financial arrangements. On 23 October 2018, the DOE issued Department Order (DO) No. DO2018-10-0018⁹ which prescribed the internal guidelines governing the collection, administration, and utilization of the RETF, among others.



Figure 5. RETF Implementation

7. Renewable Energy Market

To facilitate compliance to the RPS and pursuant to Section 8 of the RE Act, the DOE issued DC No. DC2019-12-0016 entitled “Promulgating the Renewable Energy Market Rules” or the “REM Rules” on 04 December 2019, which established the REM. The REM will serve as the venue for the transparent and fair trading of RECs, which represent the environmental attributes of electricity generated from RE resources between and among REM participants.

⁹ Entitled “Adopting the Guidelines for the Operationalization of the Renewable Energy Trust Fund, and for Other Purposes”

On 17 December 2019, the Philippine Renewable Energy Market System (PREMS) was launched, which will serve as the online platform where trading participants can manage their REC accounts. The development of PREMS was supported by the DREAMS Project, with funding from the GEF and UNDP. The RE Registrar (RER) will operate the REM and perform the following functions, among others:

- a. Issue RECs to eligible recipients (1 MWh = 1 REC);
- b. Administer and maintain the RE Registry and REC transactions;
- c. Facilitate REM registration and accounts management; and
- d. Develop, improve, and implement systems and processes for the operation of REM and administration of the RE Registry.



Figure 6. Definition of RECs

8. Omnibus Guidelines Governing the Award and Administration of Renewable Energy Contracts and the Registration of Renewable Energy Developers

To harmonize and enhance existing guidelines governing the application and awarding of RE Contracts, the DOE issued DC No. DC2019-10-0013 entitled as above. This DC prescribed the procedures for the pre-application, application, and awarding of RE Service and Operating Contracts. Awarding of RE contracts will be through an Open and Competitive Selection Process (OCSP) for pre-determined areas or through direct application. In addition, the DC also set the rules for registering RE projects for own-use or non-commercial purposes. In lieu of RE Contracts, a Certificate of Registration from the DOE shall be secured for such projects to avail the relevant RE incentives.

9. Other Renewable Energy Policies and Programs

9.1. Household Electrification Program

The DOE's Household Electrification Program began in 2010 in support of its Barangay Electrification Program at that time. It is one of the most extensive RE-based electrification programs of the government which provided household lighting using solar PV systems. The program also organized recipient households into Sitio Power Associations and provided capacity building activities on basic accounting and auditing procedures, load management, and system operation and maintenance, among others. From 2010-2017, a total of 55,248 households were provided with solar PV lighting systems.

9.2. Renewable Energy Safety, Health, and Environment Rules and Regulations

Due to the Philippines' vulnerability to extreme weather conditions and the impacts of climate change, ensuring resiliency and safety of energy infrastructure and personnel has been at the forefront of government's policies and programs. Prior to the enactment of the RE Act, the DOE already issued the Geothermal Safety and Health Rules and Regulations through the Office of Energy Affairs (former name of DOE) Circular No. 91-11-06 and DC 2000-02-001. On 21 November 2012, the DOE issued DC No. DC2012-11-009 which provided the "Renewable Energy Safety, Health, and Environment Rules and Regulations" (RESHERR) covering all RE technologies. Its objective is to ensure safety and protection against hazards to health, life, and property and address environmental concerns such as air, land and water pollution during the operation of RE facilities. The implementation of the RESHERR Code of Practice is in accordance with the DOE Act, RE Act, and the Department of Labor and Employment's Occupational Safety and Health Standards. It applies to all employers, employees, contractors, and other entities engaged in RE operations in the Philippines.

9.3. Competitive Renewable Energy Zones

On 18 September 2018, the DOE DC No. DC2018-09-0027 entitled "Establishment and Development of Competitive Renewable Energy Zones in the Country" was issued. This DC institutionalized the process that facilitates proactive transmission planning by identifying areas with the most economically viable RE resources. The Competitive RE Zones or CREZ are geographic areas with abundant RE resources, suitable topography, appropriate land-use classification, and demonstrated interest for development. Identifying such areas aids the formulation and implementation of the DOE's NREP and PDP, and the National Grid Corporation of the Philippines' (NGCP) Transmission Development Plan (TDP). This ongoing activity is supported by the United States Agency for International Development (USAID) and National Renewable Energy Laboratory (NREL).



Figure 7. Timeline of Major RE Policies and Programs

C. ISSUES AND CHALLENGES IN RENEWABLE ENERGY DEVELOPMENT AND INTEGRATION

The DOE awarded 1,090 RE service contracts (RESCs) from 2009–2019. These RESCs can potentially generate about 36,735 MW of installed capacity, which is more than enough to cover the NREP, 2011-2030 target of 15,304 MW by 2030. However, out of the total number of awarded RESCs, only 183 projects or about 17% were completed. This reveals that the Philippines' RE sector faced several issues and challenges which significantly hampered its supposed development. These include the following:

1. **Delayed implementation of RE policy mechanisms.** The implementation of RE policies and programs, particularly the RPS and GEOP, was significantly delayed as opposed the provisions set forth in the RE Act (i.e., one year after its effectivity). These enabling mechanisms aim to encourage RE investments by establishing a robust market and demand for RE. Hence, their late implementation contributed to the slow growth of RE capacities during the assessment period.
2. **Complex permitting process.** According to Senator Sherwin T. Gatchalian, Chairman of the Senate Committee on Energy, about 359 signatures from 74 different agencies, are required in the permitting process for ROR hydropower plants, which is equivalent to about 1,340 days period of completion¹⁰. The tedious process in securing local and national permits from various institutions caused significant delays in the construction, commissioning, and commercial operation of both non-RE and RE projects.
3. **Grid interconnection issues.** Existing grid infrastructure have limited remaining capacity and the needed grid expansion projects are usually delayed. These result to the inability of the grid to immediately absorb new RE projects and delays in its commercial operation.
4. **RE resource development.** Geothermal exploration is expensive and has a long gestation period of about 4-6 years. Uncertainty in developing geothermal sites is also high as only about 59% of drilled wells have sufficient resource for power generation. With geothermal energy's exclusion from the FIT and in the absence of specific programs to spur its development, there were hardly any new geothermal capacity addition from 2011-2019. Meanwhile, the high cost and lack of model projects for offshore wind and ocean technologies made its initial development a challenge.
5. **Limited access to financing.** The country's largest banks have mostly financed the RE projects of major developers and industry players, which are often part of conglomerates. Meanwhile, smaller independent power producers are continued to be perceived as risky by funding institutions which limit their access to project finance.
6. **Exposure to climate related risks.** Severe typhoons damaged some RE power plants leading to extended periods of shutdown. Climate change also affected the availability and output of RE resources. During drought or El Niño season, electricity generation of hydropower plants are significantly reduced.

The above issues and challenges are continuously being addressed by the DOE, together with the NREB, other energy agencies, RE industry players, and stakeholders, with support from various international development organizations.

¹⁰ Sponsorship Speech of Senator Gatchalian on Senate Bill No.1439, otherwise known as the Energy Virtual One Stop Shop Act of 2017, Session No. 80 Seventeenth Congress First Regular Session. Accessible at <http://legacy.senate.gov.ph/lisdata/2597322329!.pdf>

II. NATIONAL RENEWABLE ENERGY PROGRAM, 2020-2040

As highlighted in the previous chapter, the implementation of NREP, 2011-2030 set milestones in the Philippines RE sector with the increase in RE capacity and investments, achievement of various outcomes, and promulgation of critical RE policies and programs. The NREP, 2020–2040 intends to continue this momentum by calibrating RE targets and objectives and adopting a revitalized NREP framework and roadmap to further accelerate and mainstream RE development and utilization in the country. To realize these, the updated NREP employs a whole-of-nation approach enjoining government institutions, energy agencies, private sector, international development organizations, and all stakeholders

A. RENEWABLE ENERGY TARGET AND GOALS

The NREP, 2020-2040 aims to revert the share of RE to at least 35% of the power generation mix by 2030, similar to the 2008 level when the RE Act was promulgated. With key policies and programs already in place, the government aspires to further increase this target to at least 50% by 2040 in line with the following goals:

NREP, 2020-2040
sets a target of at least
35% RE share
in the power generation mix **by 2030** and
aspires to **increase it to at least 50% by 2040.**



Figure 8. Overarching RE Goals

1. **Energy Security.** Meeting the growing electricity demand with cleaner energy resources is the central objective of the RE Act and the DOE's recently issued PEP, and PDP, 2020-2040. Achieving energy self-reliance with cleaner and indigenous resources, such as RE, reduces the country's dependence on imported fossil fuels and exposure to international price fluctuations and exchange rate volatility.
2. **Sustainable Development.** Accelerating RE use is aligned with Filipinos' collective long-term vision of "Matatag, Maginhawa, at Panatag na Buhay" (strongly rooted, comfortable, and secure life) embodied in the Ambisyon Natin 2040 of the National Economic and Development Authority (NEDA). Expediting the implementation of remaining policy mechanisms under the RE Act is also included in NEDA's latest Philippine Development Plan 2017-2022 as a critical strategy to attain "inclusive growth, a high-trust and resilient society, and a globally competitive knowledge economy". Setting higher RE targets also supports the United Nations' (UN) Sustainable Development Goals (SDGs), particularly SDG 7 – Affordable and Clean Energy.¹¹
3. **Climate Change Mitigation.** On 15 April 2021, the Philippines submitted its Nationally Determined Contribution which aims to reduce the economy-wide GHG emissions by 75% relative to the business-as-usual. This commitment solidifies the need to scale-up RE to reduce emissions in the energy sector, which is the largest contributor of GHG in the country at 59% in 2019.¹²
4. **Capacity Building.** Advancing RE development enhances technical knowledge and capabilities of the energy workforce and end-users. Addressing RE-related challenges such as variability, efficiency, and grid integration drives innovation, provides more opportunities for research and development, and advances the use of disruptive systems and technologies like distributed generation, energy storage, and smart grid, among others.
5. **Inclusive Growth.** Greater adoption of RE or hybrid technologies, especially in off-grid and missionary areas, promotes inclusive growth by increasing clean energy access and improving living standards. It also aids poverty alleviation by generating local investments, boosts domestic industries, and creates jobs in manufacturing, installation, and operations and maintenance, among others.

In addition to existing RE technologies, the Philippines will explore the potential and viability of new and alternative cleaner sources of energy to realize the ambitious RE target. Technical studies and initiatives are already underway, in partnership with various international development organizations and experts, to develop offshore wind, ocean and tidal stream, WTE, hydrogen, and RE hybrid systems. Details of these will be discussed in the next chapter. The DOE also plans to roll-out an Expanded Rooftop Solar Program (ERSP) to scale-up solar energy production and utilization at the end-use level, and provide growth opportunities for local solar PV developers and installers. Revamping the country's geothermal energy competitiveness is also a key policy thrust moving forward.

¹¹ It also supports SDG 9 - Industry, Innovation, and Infrastructure, SDG 11 - Sustainable Cities and Communities, SDG 12 Responsible Consumption and Production, and SDG 13 - Climate Action.

¹² Climate Watch. (2022). Historical Emissions - Philippines. Retrieved from <https://tinyurl.com/DEClimateWatch>

B. Renewable Energy Outlook, 2021-2040

To realize the aspirational target of 35% RE generation by 2030 and 50% by 2040, the NREP provides the RE power supply expansion plan on a per technology basis for the planning period of 2021-2040. The DOE, in collaboration with the NREB, built and simulated a model using PLEXOS®, an internationally-used power and RE sector planning and market simulation software developed by Energy Exemplar. PLEXOS® optimally times and positions investments of all types of RE technologies given the assumptions on technical plant parameters, electricity demand, and transmission constraints, among others.

While PLEXOS® is capable of analyzing high resolution information, the software heavily depends on hardware limitations. Thus, to reduce the complexity of the model, major islands (i.e., Luzon, Mindanao, and major islands of Visayas) in the Philippines were only considered in the simulation. Further, only key transmission lines and projects connecting major islands were considered, consistent with the published PDP, 2020-2040.

1. Data and Assumptions

The RE Outlook for 2021-2040 was derived using the following data and assumptions:

Table 3. Data and Assumptions for the RE Outlook

Particulars	Inputs and Assumptions
Electricity Demand	<ul style="list-style-type: none"> High Gross Domestic Product growth-based annual peak demand forecast consistent with the PDP, 2020-2040
Generator Parameters	<ul style="list-style-type: none"> Dependable capacity of existing power plants as of 31 December 2020, with no derating and retirement considered Committed power plants as of 31 December 2020, with firm target commercial operation dates Operating technical parameters of existing power plants Forced and maintenance outage rates Replacement of domestic natural gas fuel to liquefied natural gas starting 2025 for natural gas power plants
New Build Options	<ul style="list-style-type: none"> Existing power plant technologies in the Philippines (i.e., coal, oil, gas turbines, geothermal, hydro, biomass, solar, wind), excluding battery energy storage system, nuclear, hydrogen, fuel cell, and ocean technology Cost parameters and technical parameters developed by DOE and the NREB
Policy Implementation	<ul style="list-style-type: none"> Minimum of 35% RE generation by 2030 and 50% by 2040

The committed power projects considered in this outlook are as follows:

Table 4. DOE's List of Committed Power Projects as of 31 December 2020

Power Plant	Maximum Capacity	Target Commercial Operation Date
Luzon		
Coal	2,550.0	
GN Power Dinginin Supercritical Coal-fired Power Plant	1,300.0	Unit 1 – Mar 2021 Unit 2 – Jun 2021

Power Plant	Maximum Capacity	Target Commercial Operation Date
Atimonan One Energy Coal-fired Power Plant	600.0	Unit 1 – Jun 2024
Masinloc Power Partners Co, Ltd. Coal-fired Power Plant	650.0	May 2024
Natural Gas	3,404.0	
Energy World Corporation Combined Cycle Gas Turbine Power Plant	650.0	Dec 2022
Ilijan LNG Power Plant	1,672.0	Jun 2023
Batangas Clean Energy, Inc. Gas-fired Power Plant	1,082.0	Dec 2025
Oil-Based	311.0	
Ingrid Pililla Diesel Power Plant	300.0	Unit 1 – Jun 2021 Unit 2 – June 2024
SPC Tarlac Bunker Fired Power Plant	11.0	Aug 2021
Biomass	13.2	
HEC Rice Husk-Fired Biomass Power Plant	12.0	Mar 2021
FQBC Biogas Power Plant	1.2	Dec 2021
Geothermal	90.0	
Bacman Botong – Rangas Geothermal Power Plant	20.0	Dec 2021
Bacman 3 (Tanawon) Geothermal Power Plant	20.0	Dec 2023
Maibarara 3 Geothermal Power Plant	20.0	Dec 2025
Kayabon Geothermal Power Plant	30.0	Dec 2026
Solar	408.6	
San Miguel Solar Plant	80.9	Jan 2021
ELPI Pasaquin Solar Plant	100.0	Mar 2021
Bulacan 2 Solar Plant	22.0	Mar 2021
Bataan (Jobin-Sqm, Inc.) Solar Plant	67.7	Jun 2021
Concepcion 1 Solar Plant (Solar Philippines)	15.0	Dec 2021
Sta. Rosa Solar Plant (Terasu Energy, Inc.)	40.0	Jan 2022
Tarlac Solar Plant (Petrosolar Corporation)	20.0	Dec 2022
Gigasol 3 Solar Plant	63.0	Dec 2023
Hydro	52.9	
Biyao Hydroelectric Power Plant (HEPP)	0.8	Dec 2021
Laguio Malaki 1 HEPP	1.6	Dec 2021
Matuno 2 HEPP	8.0	Dec 2021
Colasi HEPP	1.0	Dec 2021
Labayat River (Upper Cascade) HEPP	3.0	Dec 2021
Butao HEPP	1.3	Dec 2021
Man-Asok HEPP	3.0	Dec 2021
Lalawinan Mini-Hydro Power Plant	3.0	Dec 2021
Tubao HEPP	1.5	Dec 2022
Tibag HEPP	4.4	Dec 2022
Rangas HEPP	1.5	Dec 2022
Dupinga HEPP	3.0	Dec 2023
Piapi HEPP	3.3	Dec 2023
Olilicon HEPP	10.0	Dec 2024
Ibulao I HEPP	6.0	Dec 2025
Tignoan River (Upper Cascade) HEPP	1.5	Dec 2025
Wind	132.0	
Pasuquin Wind Power	132.0	Sep 2021
Visayas		
Coal	135.0	
Palm Concepcion Coal-fired Power Plant	135.0	Dec 2024
Oil-Based	70.0	
Isabel Modular Diesel Ancillary Service Power Plant	70.0	Jun 2021

Power Plant	Maximum Capacity	Target Commercial Operation Date
Biomass	3.0	
HDJ Bayawan Agri-Venture Corporation Biomass Power Plant	3.0	Mar 2021
Geothermal	50.0	
Biliran Geothermal	50.0	Dec 2027
Hydro	23.1	
Timbaban	18.0	Dec 2021
Igbulo HEPP	5.1	Dec 2021
Mindanao		
Coal	270.0	
FDC Circulating Fluidized Bed Coal-fired Power Plant	270.0	Dec 2024
Oil-Based	11.0	
SPC Diesel Power Plant	11.0	Mar 2021
Hydro	68.3	
Lake Mainit HEPP	25.0	Dec 2021
Maladugao (Upper Cascade) HEPP	8.4	Dec 2023
Bubunawan HEPP	23.0	Dec 2025
Liangnan HEPP	11.9	Dec 2025

2. Resulting Renewable Energy Outlook

To meet the electricity demand and RE target, the Philippines' installed capacity should be increased to 102,231 MW in 2040 coming from existing, committed, and new build capacities. Simulations showed that new-build capacities from RE, with a total of 52,826 MW, have to be added. This will be comprised of solar (27,162 MW) and wind (16,650 MW), followed by hydro (6,150 MW), geothermal (2,500 MW), and biomass (364 MW). New gas plants were also built by the simulation with a total of 18,859 MW, as shown in Figure 9 and Table 5.

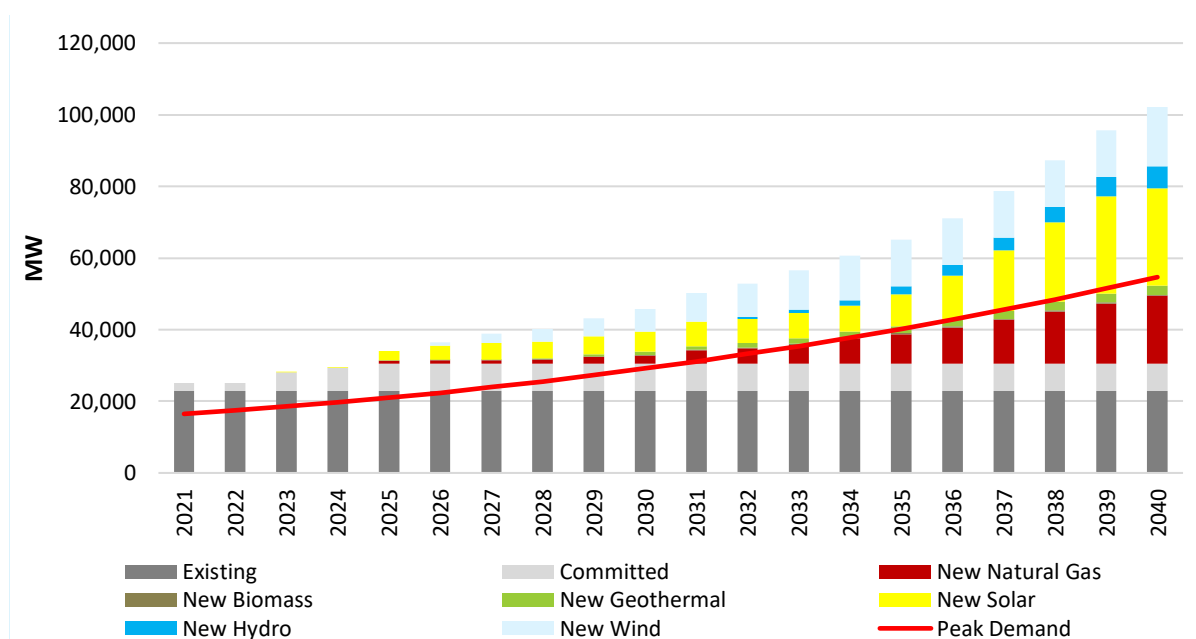


Figure 9. Philippines' RE Outlook, 2021-2040, in MW

Table 5. Philippines' RE Outlook, 2021-2040, in MW

Particulars, in MW	2021	2025	2030	2035	2040
Committed Capacity*	2,066	7,512	7,592	7,592	7,592
Coal	1,300	2,955	2,955	2,955	2,955
Natural Gas	0	3,404	3,404	3,404	3,404
Oil	242	392	392	392	392
Biomass	16	16	16	16	16
Geothermal	20	60	140	140	140
Solar	286	409	409	409	409
Hydro	70	144	144	144	144
Wind	132	132	132	132	132
New Capacity*	0	3,539	15,264	34,579	71,685
Natural Gas	0	759	2,259	8,159	18,859
Biomass	0	120	120	360	364
Geothermal	0	0	850	1,900	2,500
Solar	0	2,660	5,585	8,910	27,162
Hydro	0	0	0	2,200	6,150
Wind	0	0	6,450	13,050	16,650
Existing Capacity	22,954	22,954	22,954	22,954	22,954
Peak Demand	16,482	21,019	29,128	40,209	54,655

*Cumulative

The resulting power generation mix reached the 35% (65,316 GWh) and 50% (174,783 GWh) RE targets by 2030 and 2040, respectively, as depicted in Figure 10 and Table 6. By 2040, the remaining share will be comprised of 26% natural gas and 24% coal.

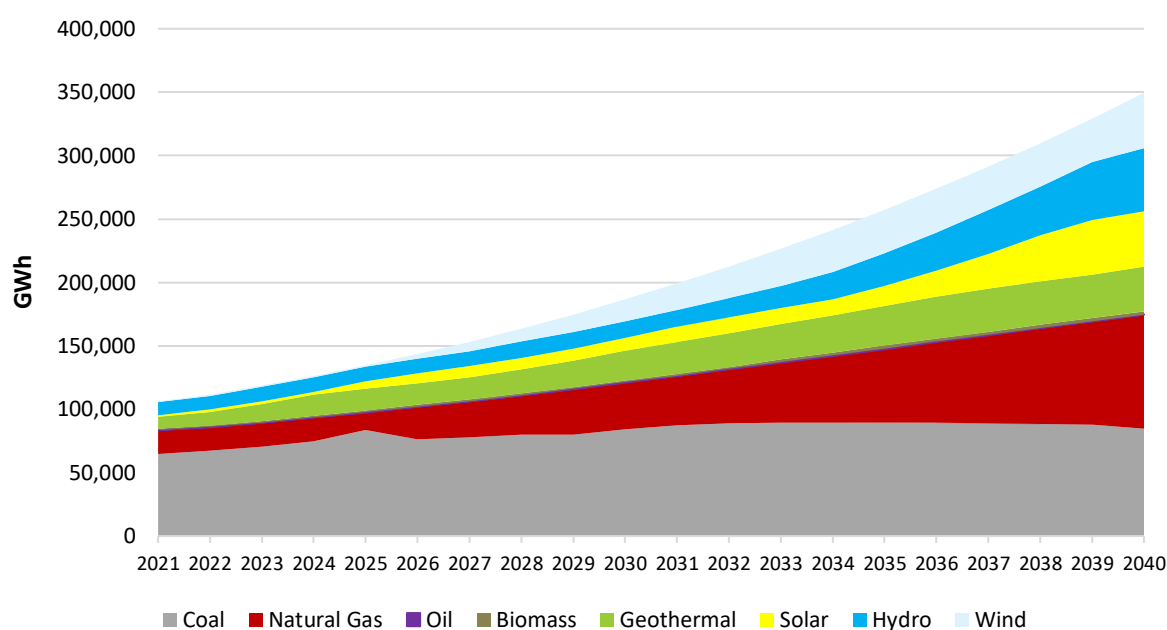


Figure 10. Philippines' Power Generation Mix, 2021-2040, in GWh

Table 6. Philippines' Power Generation in GWh and Percent Share, 2021-2040

Plant Type	2021	2025	2030	2035	2040
Power Generation in GWh					
Coal	64,704	83,696	84,306	89,303	84,491
Oil-based	84	140	308	509	365
Natural Gas	18,776	13,810	36,618	58,105	89,866
Renewable Energy	22,917	37,071	65,316	109,384	174,783
Biomass	847	1,455	1,455	2,331	2,353
Geothermal	9,573	16,883	23,293	31,144	35,321
Solar	1,263	5,945	10,436	15,540	43,686
Hydro	10,424	11,677	12,884	26,041	49,697
Wind	810	1,112	17,250	34,328	43,726
Total	106,481	134,717	186,547	257,301	349,505
Power Generation in Percent Share					
Coal	61	62	45	35	24
Oil-based	0	0	0	0	0
Natural Gas	18	10	20	23	26
Renewable Energy	22	28	35	43	50
Biomass	1	1	1	1	1
Geothermal	9	13	12	12	10
Solar	1	4	6	6	12
Hydro	10	9	7	10	14
Wind	1	1	9	13	13
Total	100	100	100	100	100

C. Upcoming Renewable Energy Projects

As of 31 December 2021, a total of 901 MW committed RE power generation projects are expected to be operational from 2022-2027. Majority of which will be coming from solar at 54% (489 MW), followed by hydro at 26% (232 MW), geothermal at 13% (116 MW), and biomass at 7% (65 MW), as depicted in Figure 11 and Figure 12. Majority of committed RE capacities will be built in Luzon at 694 MW (77%), followed by Mindanao at 114 MW (13%) and Visayas at 94 MW (10%) (Figure 13). Committed projects are already in the advanced stage of development (e.g., financially secured, final permitting procedures, ongoing construction, testing and commissioning) with firm target commercial operation dates.



Meanwhile, a total of 27,334 MW indicative RE power generation projects may be operational from 2022-2032 as shown in Figure 12. Similar to committed RE projects, solar comprised the largest share at 54% (14,688 MW), followed by several wind projects at 24% (6,473 MW). Other indicative RE technologies include hydro at 21% (5,862 MW), geothermal at 1% (274 MW), and biomass at less than 1% (37 MW). On a per grid basis, Luzon have the highest indicative capacities with 22,789 MW (83%), followed by Visayas with 3,595 MW (13%) and Mindanao with 951 MW (3%) (Figure 13). Indicative projects are those still in the early stage of development with no firm commercial operation dates yet. The list of committed and indicative capacities for all power generation technologies are regularly updated and posted in the DOE website, accessible through the above QR code.

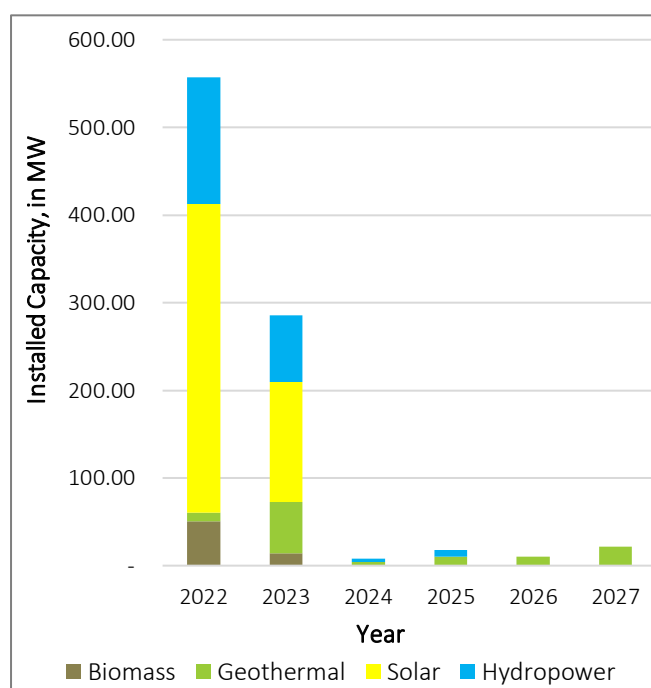


Figure 11. Committed RE Power Projects as of 31 December 2021, in MW

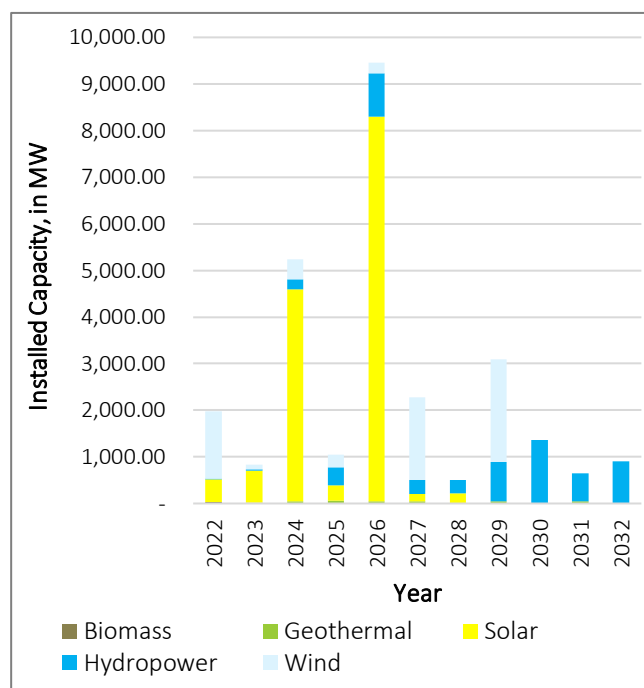


Figure 12. Indicative RE Power Projects as of 31 December 2021, in MW

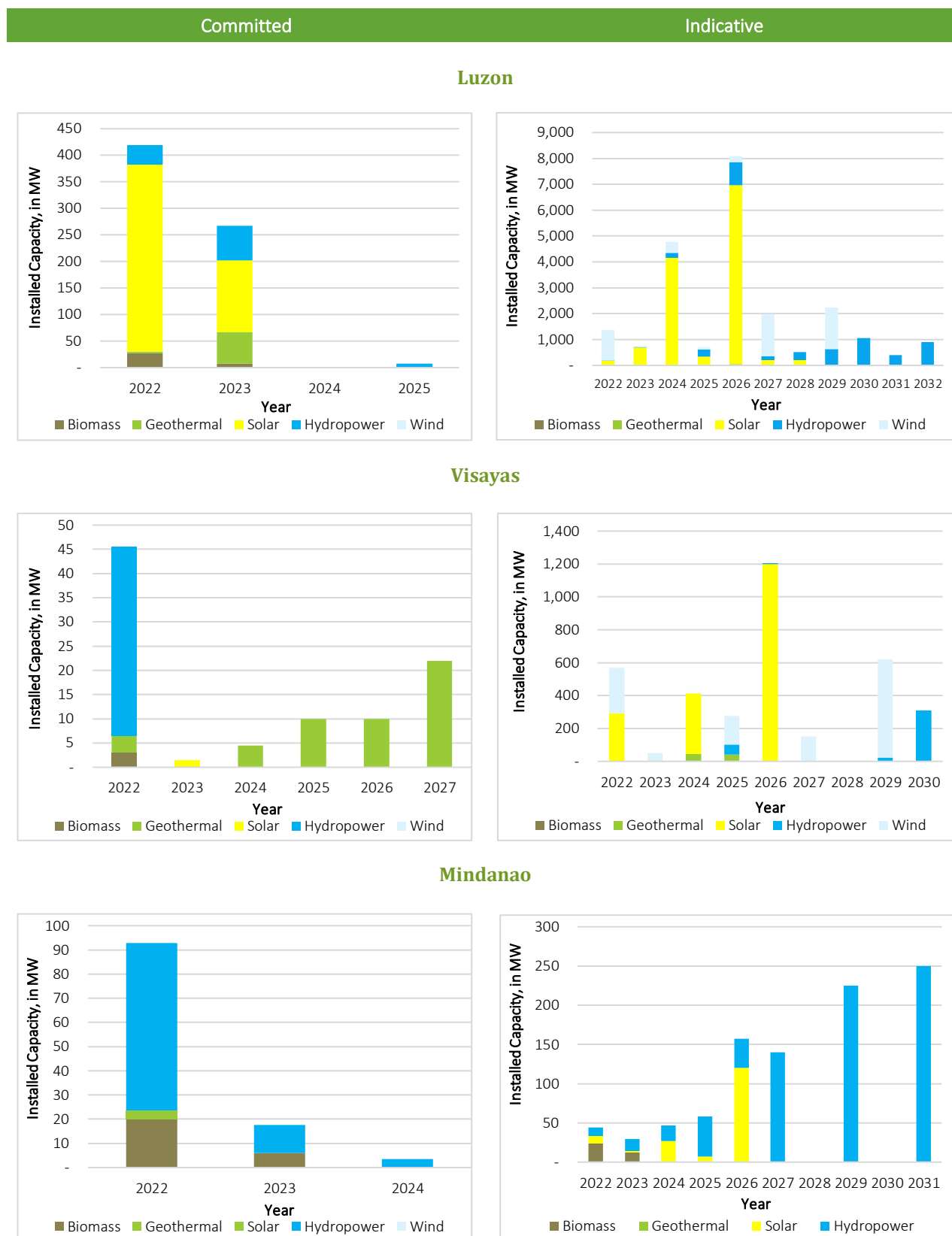


Figure 13. Committed and Indicative RE Projects in Luzon, Visayas, and Mindanao as of 31 December 2021

For these RE power projects to materialize, addressing the complex and tedious permitting and licensing procedures will be imperative. The ongoing operation of the Energy Virtual One Stop Shop (EVOSS), which is the country's first centralized online platform that facilitates the submission, processing, monitoring, and approval of energy project permits, is expected to address this long withstanding investor concern, along with other measures which will be discussed in Chapter III, Section 2. Tantamount to this, timely availability of infrastructure in the whole power supply chain, particularly transmission and distribution, will be critical to deliver and integrate all the upcoming RE generation capacities. The financial sector is also an important catalyst for RE development by providing the needed capital. Hence, giving preferential support to RE investments and aligning the financing framework and requirements with the current power industry structure will be necessary. Likewise, policy and regulatory support must be effectively put in place to create an enabling environment and advance the developments in the country's RE industry.

III. National Renewable Energy Program, 2020-2040 Framework and Roadmap

A. FRAMEWORK

The NREP, 2020-2040 Framework has four components bound together to address the issues and challenges in RE development and integration, and achieve the aspirational RE target by 2040:

1. **RE Transition Pathways** identify the mandatory policies and voluntary programs that will establish the robust demand and market for RE.
2. **RE Transition Enablers** include laws, programs, and activities that will create an enabling environment for RE investments, facilitate RE project development, and further strengthen the local RE industry.
3. **RE Off-Grid and PURE Strategies** support the provision of social services, livelihood, and enhanced quality of life in rural communities and off-grid areas.
4. **Resource-Specific Programs** define the strategies that will promote and develop specific RE resources and technologies.

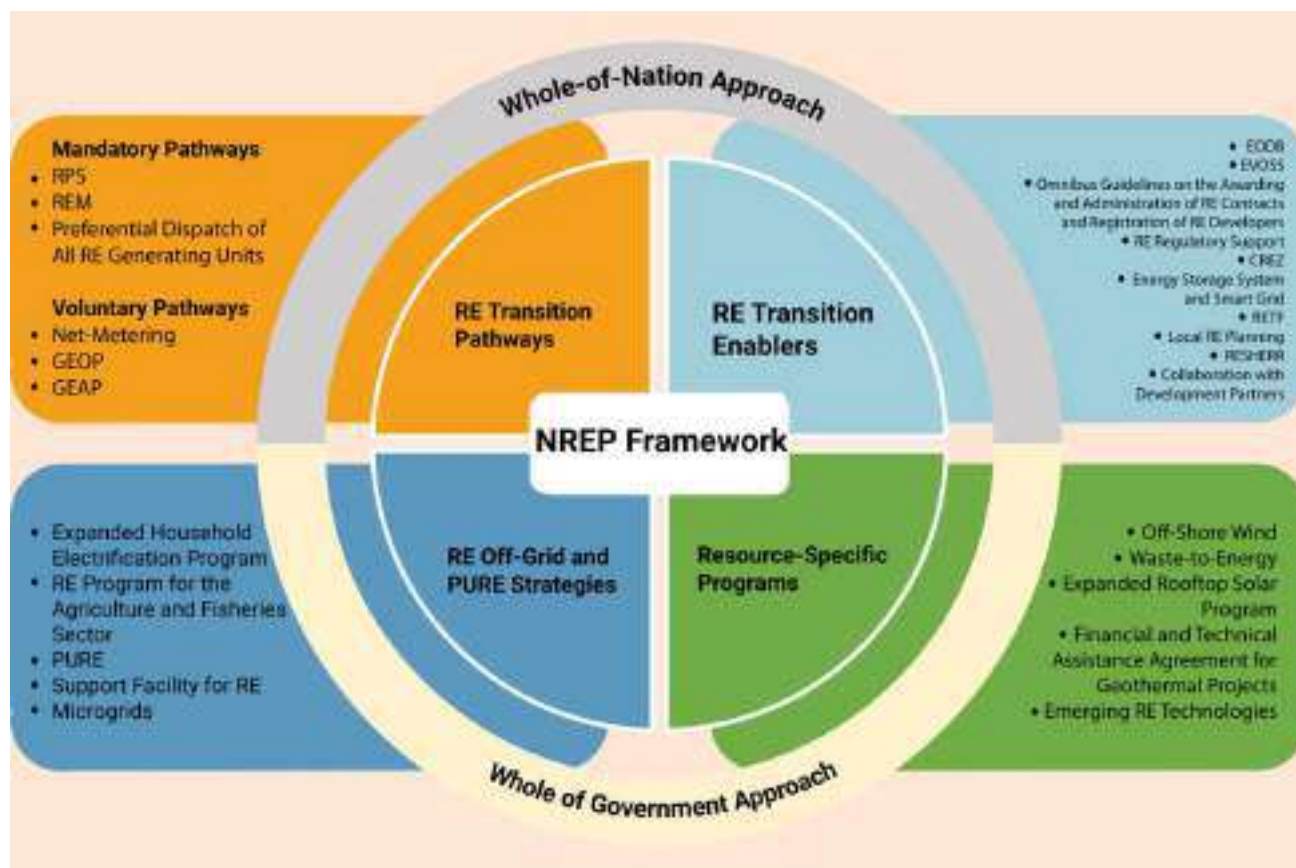


Figure 14. NREP Framework

1. Renewable Energy Transition Pathways

Promulgating enabling policies is a proven driver of RE development in the Philippines as evidenced by the adoption of the FIT. In this light, the continued and full implementation of RE policies and programs introduced in Chapter I, are at the forefront of this NREP updated framework.

1.1. Mandatory Pathways

1.1.1. Renewable Portfolio Standards

To achieve the 35% RE power generation mix target by 2030 and 50% by 2040, the minimum RPS annual increment (K_m) of 1% shall be increased to 2.52% by 2023 onwards. Pursuant to the RPS On-Grid Rules, 2020 was set as the starting year of RPS compliance. However, it provided a transition period to enable MPs prepare their compliances. Each of the MPs was allocated with RECs beginning 2018 thereby allowing them to accumulate enough RECs for the initial two to three years (2020-2022) of the RPS implementation. The minimum annual RPS requirement, compliance level, and volume of REC shortfall is computed on a per MP basis. Hence, the REC shortfall values come from MPs with insufficient RECs to comply with their respective RPS requirements on a given year.

As shown in Table 7, DUs' shortfall will begin in 2023 with 440,295 RECs and will increase to 18.3 million RECs by 2029. Meanwhile, Figures 15-17 present the RPS requirement and compliance of DUs in Luzon, Visayas, and Mindanao.

Table 7. RPS Requirement and Compliance of DUs, as of July 2020

Philippines	GWh								
	2018	2019	2020	2021	2022	2023	2024	2025	2029
RPS Requirement	0	0	2,624	3,402	4,389	6,407	8,616	11,024	22,578
RPS Compliance	2,723	5,870	9,383	10,052	9,918	8,794	6,238	5,008	4,536
REC Shortfall	0	0	0	0	0	440	3,885	7,252	18,319

Using adjusted K_m of 2.52% starting 2023

1 REC = 1 MWh

The RPS requirement of Luzon DUs is expected to increase from 1,874 GWh in 2020 to 15,499 GWh in 2029. Their REC shortfall is anticipated to occur starting 2023 at 221,896 RECs and will increase to 12.2 million RECs in 2029. From 2020-2029, Luzon DUs' REC allocations from FIT-eligible RE plants will largely contribute to their RPS compliance at 66%. Meanwhile, RECs from RE plants under PSA, net-metering, and own-use RE plants will contribute 24%, 9%, and 1%, respectively.



Figure 15. RPS Requirement and Compliance of Luzon DUs, as of July 2020

The RPS requirement of Visayas DUs will increase from 362 GWh in 2020 to 3,308 GWh in 2029. Their REC shortfall, particularly those with FIT as the only source of RPS compliance, is expected to increase from 118,341 RECs in 2023 to 2.9 million RECs in 2029. Visayas DUs will mainly source their RPS compliance from RECs corresponding to generation of RE Plants under the FIT system, at 95% (2020-2029). Meanwhile, RECs from RE plants under PSA will contribute 1%, while facilities under the net-metering will contribute 4%.

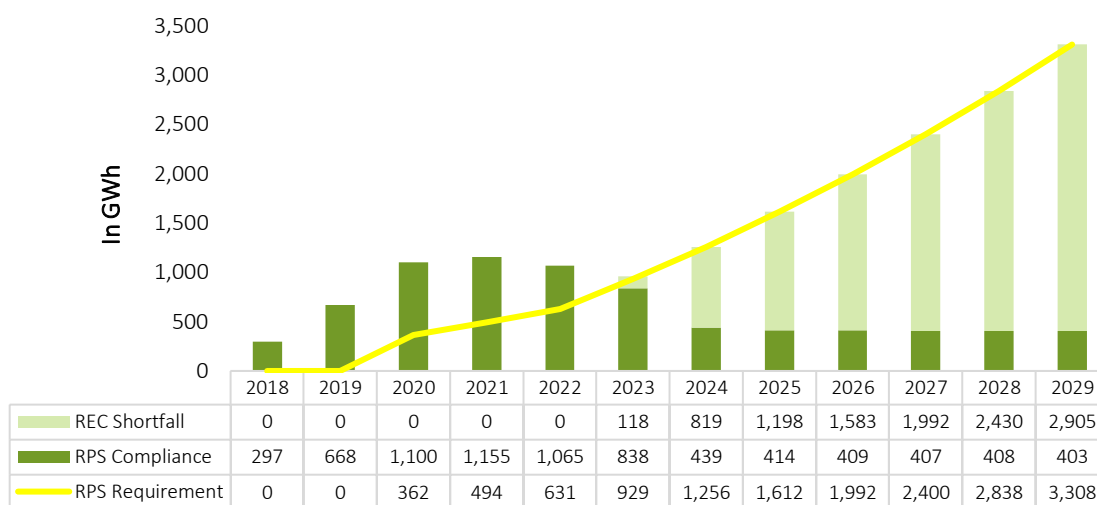


Figure 16. RPS Requirement and Compliance of Visayas DUs, as of July 2020

The RPS requirement of Mindanao DUs is projected to increase from 388 GWh in 2020 to 3,770 GWh in 2029. Their REC shortfall will start in 2023 at 100,058 RECs and is anticipated to increase to 3.2 million RECs in 2029. Bulk of their RPS compliance for the planning period 2020-2029 will come from FIT-eligible RE Plants at 73%, while the remaining 27% will come from RE plants under PSA. Facilities under net-metering agreements and those installed within the premises of end-

users for their own use are potential sources of RPS compliance once these are properly metered and registered in the REM.



Figure 17. RPS Requirement and Compliance of Mindanao DUs, as of July 2020

Moving forward, the DOE will continue to monitor the compliance of MPs to their RPS mandates. Likewise, it is set to issue a policy that will prescribe the rules and regulations on administrative actions for violations in the RPS Rules. For RPS off-grid, the DOE shall resolve the issues and challenges surrounding RPS implementation in off-grid and missionary areas, in coordination with relevant energy agencies, industry participants, and stakeholders.

1.1.2. Renewable Energy Market

The REM's commercial operation is contingent on the completion of preparatory activities identified in the REM Readiness Criteria, which include the promulgation of REM Manuals, execution of DOE and Philippine Electricity Market Corporation's (PEMC) Usufruct Agreement; and ERC's Provisional Authority of the REC price cap and methodology. Pursuant to Section 17 of the RPS On-Grid Rules, the DOE already endorsed to the ERC a proposed REC price methodology and initial price cap, as recommended by the NREB. Meanwhile the formulation of REM Manuals, execution of the Usufruct Agreement, and performance of other preparatory activities are ongoing. The REM commercial operation is targeted in 2022.

1.1.3. Preferential Dispatch of All Renewable Energy Generating Units

Granting preferential dispatch to all RE power generating units in the WESM will aid in achieving the aspirational RE target, accelerating the development and utilization of indigenous energy resources, reducing dependence on imported fossil-based fuels, and achieving energy security, among others. In line with this, the DOE is currently formulating the appropriate policy and

analyzing its impacts on the country's power system and electricity rates, in partnership with the Clean, Affordable and Secure Energy for Southeast Asia (CASE) Project¹³.

1.2. Voluntary Programs

1.2.1. Net-Metering

On 27 February 2020, the ERC issued Resolution No. 5 Series of 2020¹⁴ clarifying some provisions of its previously issued Resolution No 6, Series of 2019. In the same year, the DOE promulgated DC No. DC2020-10-0022 entitled "Prescribing the Policies to Enhance the Net-Metering Program for Renewable Energy Systems" to further increase consumers' participation in the program. This DC institutionalized further enhancements to the existing net-metering program by allowing the banking of net-metering credits for a maximum period of one year, mandating DUs to publish their respective net-metering programs and hosting capacities, and opening the net-metering program to prospective prosumers in areas not connected to the main grid. It also prescribed the development of a Net-Metering Guidebook which will set the guidelines, procedures, and minimum standards related to net-metering.

The "Guidebook on Net Metering in the Philippines" was released and published on April 2022. As of 31 December 2021, a total of 46.73 MWp net-metering capacity are owned by 5,716 qualified prosumers. Table 8 shows the net-metering capacities in Luzon, Visayas, and Mindanao.

Table 8. Summary of Net-Metering Implementation, as of 31 December 2021

Grid	Net-Metering Capacity in MWp	Qualified Prosumers
Luzon	33.84	4,655
Visayas	10.69	871
Mindanao	2.20	190
Total	46.73	5,716

Source: ERC

1.2.2. Green Energy Option Program

Complementing the GEOP policy issued in 2018, DOE DC No. DC2020-04-0009 entitled "Guidelines Governing the Issuance of Operating Permits to Renewable Energy Suppliers under the Green Energy Option Program" was signed on 22 April 2020. In addition, the GEOP Rules was issued by the ERC through its Resolution No. 8, Series of 2021 which defined the obligations and commercial arrangements of GEOP participants, interconnection process and standards, and switching, relocation, billing, and payment procedures, among others. The GEOP end-users may revert to

¹³ A project funded by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and the Institute for Climate and Sustainable Cities

¹⁴ Entitled "A Resolution Clarifying ERC Resolution No. 6, Series of 2019, entitled "A Resolution Adopting the Amendments to the Rules Enabling the Net-Metering Program for Renewable Energy"

being a captive customer subject to the terms and conditions stipulated in Section 24 of the GEOP Rules. As of 31 December 2021, the DOE issued GEOP Operating Permits to the 18 RE suppliers as follows:

1. Bacman Geothermal, Inc.
2. First Gen Energy Solutions, Inc.
3. SN Aboitiz Power-Magat, Inc.
4. SN Aboitiz Power-RES, Inc.
5. AC Energy Philippines, Inc.
6. SPARC-Solar Powered Agri-Rural Communities Corporation
7. Citicore Energy Solutions Inc.
8. Prism Energy, Inc.
9. Aboitiz Energy Solutions, Inc.
10. Adventenergy, Inc.
11. Shell Energy Philippines, Inc.
12. Green Core Geothermal Inc.
13. DirectPower Services, Inc.
14. Solar Philippines Retail Electricity, Inc.
15. EEI Energy Solutions Corp.
16. AP Renewables, Inc.
17. Therma Luzon, Inc.
18. MPower

1.2.3. Green Energy Auction Program

The GEAP was issued on 03 November 2021 through DC No. DC2021-11-0036, which intends to provide additional market for RE through a competitive electronic bidding of RE capacities. The DOE, through the Green Energy Auction Committee (GEAC), will facilitate the first auction targeted in 2022. Under the GEAP, qualified bidders shall place their lowest price offers in PhP/kWh which must not be higher than the ceiling price set by the ERC – i.e., Green Energy Auction Reserve (GEAR) price. Winning bidders' offered price represent their Green Energy Tariff which shall be the basis for their payments. On 09 February 2022, the DOE issued the first Notice of Auction for a total of 2,000 MW RE capacities from hydro, biomass, solar, and wind. The capacities generated from the GEAP shall provide additional RPS compliance for MPs, particularly DUs, by increasing the allocation of RECs.

As of June 2022, the GEAC has already released the Terms of Reference, Auction Round Procedures, and Updated GEAP Timelines for the first round of auction. It also evaluated and released the list of qualified bidders and conducted the pre-bid conference. Meanwhile, the ERC have issued the GEAR prices per RE technology on 26 May 2022, through its Resolution No. 02 Series of 2022. The GEAP electronic platform, developed in collaboration with the USAID-Energy Secure Philippines, will serve as the medium for the electronic bidding.

2. Renewable Energy Transition Enablers

These include laws, programs, and initiatives that will support the implementation of RE policies and programs, create conducive environment for RE investments, and facilitate full RE integration in the country's energy system.

2.1. Ease of Doing Business and Efficient Government Service Delivery Act

Republic Act No. 11032 or the “Ease of Doing Business and Efficient Government Service Delivery Act” (EODB) was promulgated in 2018 which aims to encourage more investments, increase economic competitiveness, and create a more enabling business environment in the country by streamlining government systems and processes. It mandated the use of standardized business application forms and the establishment of a single facility or “one-stop-shop” for LGUs where all relevant permits and clearances can be obtained. Likewise, it mandated government agencies, which include the DOE, to create their “Citizen’s Charter” which shall guide the public of the documentary requirements, process flow, and maximum timeline for the completion of requests, among others. If the concerned agency fails to evaluate and process a request within the specified timeline, it will be automatically approved under the EODB.

2.2. Energy Virtual One Stop Shop

As emphasized in Chapter I, the complex permitting process served as one of the major bottlenecks for RE development in the Philippines. To address this issue and in congruence with the EODB, the government established and operationalized the EVOSS by virtue of RA No. 11234¹⁵ signed on 08 March 2019. The EVOSS is a centralized web-based platform that facilitates the coordinated submission, and synchronous processing and monitoring of permits for energy projects. It fast-tracks permitting procedures by integrating the systems of all relevant agencies and institutions and setting specific timeframes for the evaluation and approval process. Through the EVOSS, which is being managed by the DOE, energy companies and developers can submit, monitor, and inquire about the status of their applications in a transparent and efficient manner. Currently, most DOE permits and endorsements for RE projects are already lodged in the EVOSS. Attached energy agencies namely the National Electrification Administration (NEA), National Power Corporation (NPC), and TRANSCO have also included some of their processes in the EVOSS, while other entities are preparing their systems to be integrated in the platform.



¹⁵ Entitled “An Act Establishing the Energy Virtual One-Stop Shop for the Purpose of Streamlining the Permitting Process of Power Generation, Transmission, and Distribution Projects”. The EVOSS platform can be accessed at www.evoss.ph.

2.3. Omnibus Guidelines Governing the Awarding and Administration of RE Contracts and Registration of RE Developers

The implementation of the Omnibus Guidelines supports the EODB and the EVOSS operation by streamlining the process for evaluating and awarding RE contracts and registering RE developers. The DOE will continue to monitor the number of applications and progress of projects awarded with RE contracts and make these information available to the public. Moving forward, continued enhancements of the said guidelines shall also be done to account for the developments in the rapidly evolving RE industry. The summary of RE Service and Operating Contract applications, including other RE-related updates, are regularly being posted in the DOE website through the QR Code.



2.4. RE Regulatory Support

The NREB identified the following regulatory concerns that should be revisited as the energy sector moves towards decarbonization, digitalization, and decentralization¹⁶:

2.4.1. Framework for Decentralized Power Systems

The ERC issued the first draft of the “Licensing Rules for Distributed Energy Resources (DER) and Microgrid Systems” in 2017. In the said draft, the ERC recognized *“the need to develop the DER Rules in view of the emergence of variable renewable energy resources and facilitate the entry of distributed energy resources into the transmission and distribution systems. Thus, it is necessary to create an additional category of license that will cover Distributed Generation Companies (DGCs) or those that will provide DER...”*¹⁷ The anticipated influx of DERs and DGCs will have an impact on DUs and their captive customers. Hence, a review of the present regulatory framework governing DUs is recommended. This is to avoid the unintended shifting of economic burden to captive customers, as more end-users migrate to the contestable market or participate in the net-metering and GEOP.

2.4.2. Reforms in the Transmission Regulatory Framework

The transmission requirements identified in the CREZ should be incorporated in the TDP and upon evaluation, be approved by the ERC. Moreover, NGCP’s implementation of projects in the TDP and their compliance to the obligations set forth in the RE Act should be part of their performance evaluation, in particular the regular reset review and calculation of the Maximum Allowable Revenue of the system operator. Section 20 of the RE Act mandates the grid operator to *“determine the maximum penetration limit of intermittent RE-based power plants to the grid, through technical and economic analysis.”*

¹⁶ NREB. 2020. Proposed 2020-2040 National Renewable Energy Program. Unpublished NREB report to the DOE.

¹⁷ Energy Regulatory Commission. *ERC Issues Draft DER Licensing Rules*. Retrieved from <https://www.erc.gov.ph/ContentPage/30805>

2.4.3. Updating Valuation Parameters for Least Cost Pricing

The current cost-based methodology adopted by the ERC in evaluating rates does not fit the cost characteristics of RE power plants. The existing methodology determines “*the reasonableness of the applicants’ proposed rates and approximate the same to its true cost of generation. [The ERC also takes] notes of the existing precedents and comparison with previously approved cases of similar technology.*”¹⁸ Hence, it does not reflect the common cost structure of RE plants primarily consists of fixed components, without any fuel cost, and minimal operations and maintenance expenditures. Aligning the least cost methodology approach of the ERC with the DOE’s levelized cost of electricity approach to energy planning is recommended.

2.5. Competitive Renewable Energy Zones

The CREZ Phase I was concluded in 2020 with the publication of the report entitled “Ready for Renewables - Grid Planning and Competitive Renewable Energy Zones (CREZ) in the Philippines”. Said report identified 25 CREZ with high-quality solar and wind resources across the Philippines with an estimated total capacity of 152,097 MW as shown in Table 9. It also included the potential for other RE sources such as geothermal, hydro, and biomass.

Table 9. Potential RE Power Generation Capacities identified by the CREZ Process

Grid	CREZ Capacity (MW)				
	Solar PV	Wind	Geothermal	Hydro	Biomass
Luzon	35,031	54,115	285	270,603	210
Visayas	11,876	25,429	40	1,917	71
Mindanao	11,203	14,443	40	382,514	93
Total	58,110	93,987	365	655,034	374

¹⁸ Statements by the Commission in page 46 of Decision, dated 28 May 2019, in ERC Case No. 2017-014RC.



Figure 18. CREZ Solar Resource Map



Figure 19. CREZ Wind Resource Map

The TDP, 2021 – 2040 Consultation Draft Report¹⁹ identified the associated transmission projects that can accommodate the 25 CREZ and other power generation projects (Table 10).

Table 10. CREZ - Associated Transmission Projects

CREZ	PV (MW)	WIND (MW)	Associated Transmission Project
LUZON			
L1	985	1,280	<ul style="list-style-type: none"> San Antonio 500 kV Substation Baras–San Antonio 500 kV Transmission Line
L2	651	654	<ul style="list-style-type: none"> Castillejos 230 kV Substation
L3	496	544	<ul style="list-style-type: none"> Western Luzon 500 kV Backbone
L4	1,046	1,047	<ul style="list-style-type: none"> Capas 230kV Substation
L5	536	531	<ul style="list-style-type: none"> Western Luzon 500 kV Transmission Line Stage 2 Palauig 500 kV Substation
L6	101	356	<ul style="list-style-type: none"> Balaoan–Laoag 500 kV Transmission Line Northern Luzon 230 kV Loop Transmission Line
L7	926	834	<ul style="list-style-type: none"> Northern Luzon 230 kV Loop Transmission Line Kabugao 500 kV Substation
L8	1,070	1,072	<ul style="list-style-type: none"> Kalinga–Kabugao 500 kV Transmission Line Kabugao 500 kV Substation
L9	1,109	1,239	<ul style="list-style-type: none"> Santiago–Nagsaag 500 kV Transmission Line Kalinga 500 kV Substation Santiago 500 kV Substation
L10	765	752	<ul style="list-style-type: none"> Pagbilao 500 kV Substation
L11	811	675	
L12	707	708	
L13	486	502	<ul style="list-style-type: none"> Luzon Visayas High-Voltage Direct Current (HVDC) Bipolar Operation
Mr1	130	386	<ul style="list-style-type: none"> Batangas–Mindoro Interconnection Project
Mr2	213	324	
Total	10,032	10,904	
VISAYAS			
B1	506	443	<ul style="list-style-type: none"> Cebu–Bohol 230 kV Interconnection Bohol–Leyte 230 kV Interconnection
N1	355	708	<ul style="list-style-type: none"> CNP 230 kV Backbone
N2	854	551	<ul style="list-style-type: none"> Cebu–Negros 230 kV Interconnection Line 3 and 4 Luzon–Visayas HVDC Bipolar Operation Mindoro–Panay Interconnection Project
Py1	579	693	<ul style="list-style-type: none"> CNP 230 kV Backbone Negros–Panay 230 kV Interconnection Line 2 Cebu–Leyte 230 kV Interconnection Lines 3 and 4
Py2	908	676	<ul style="list-style-type: none"> Luzon–Visayas HVDC Bipolar Operation Mindoro–Panay Interconnection Project Barotac Viejo–Unidos 230 kV T/L Project
S1	513	644	<ul style="list-style-type: none"> Calbayog–Allen T/L Project Cebu–Leyte 230 kV Interconnection Lines 3 and 4 Luzon–Visayas HVDC Bipolar Operation

¹⁹ Accessible at <https://www.ngcp.ph/Attachment-Uploads/Transmission%20Development%20Plan%202021%20-%202040%20Consultation%20Draft%20Report-2021-01-15-11-27-08.pdf>

CREZ	PV (MW)	WIND (MW)	Associated Transmission Project
			<ul style="list-style-type: none"> ▪ Kananga–Babatngon 230 kV T/L Project ▪ Borongan–Cataraman 138 kV T/L Project ▪ Babatngon–Borongan 138 kV T/L Project ▪ San Isidro–Cataraman 138 kV T/L Project ▪ Palo–Javier 230 kV T/L Project ▪ Cebu–Bohol 230 kV Interconnection ▪ Bohol–Leyte 230 kV Interconnection
Total	3,715	3,715	
MINDANAO			
Mn2	1	560	▪ Lala-Naga-Zamboanga 230 kV Transmission Line
Mn4	522	1,263	▪ Balo-I-Villanueva-Maramag 230 kV Transmission Line
Mn7	705	788	▪ Eastern Mindanao 230 kV Transmission Line
Mn8	969	1,472	▪ Kabacan Substation
Total	2,197	4,083	
PHILIPPINES			
Total	15,944	18,702	

The CREZ Phase II, which kicked-off last 27 January 2021, established three follow-on activities which are currently being undertaken by the DOE, together with the NGCP, TRANSCO, and ERC, and still with the support of USAID and NREL (Table 11).

Table 11. CREZ Phase II Activities

CREZ Phase II Activities	Objective
Activity 1: CREZ Implementation Support	To pursue the implementation of CREZ-related transmission projects identified in the TDP
Activity 2: Enhanced Load Modeling and Forecasting for Long-term Power Sector Planning	To derive a more comprehensive sectoral electricity demand projections for DOE's long-term power system planning
Activity 3: Improved Energy Storage and Modeling Considerations	To evaluate potential energy storage deployment pathways and to understand operational impacts and potential cost savings of energy storage for bulk power system applications

2.6. Energy Storage System and Smart Grid

Utilizing Energy Storage System (ESS) is an effective solution to manage RE's variability and intermittency. This technology is capable of storing and releasing energy when needed, resulting to optimized RE generation. To encourage the use of ESS, the DOE issued DC No. DC2019-08-0012²⁰ which recognized the benefits and applications of ESS in improving power system reliability, quality, and security. Complementing the ESS policy, the smart grid framework for the Philippine's electric power industry was

²⁰ Entitled, "Providing a Framework for Energy Storage System in the Electric Power Industry"

issued on 06 February 2020, through DC No. DC2020-02-0003²¹. Smart grid refers to an enhanced electrical grid that utilizes two-way and/or multi-way communication technologies with real-time monitoring, automation, and control systems. One of the main objectives of this policy is to support the high penetration of variable RE, along with the transformation of the current grid system into a secure, stable, flexible, sustainable, digitally-enabled, and interoperable system.

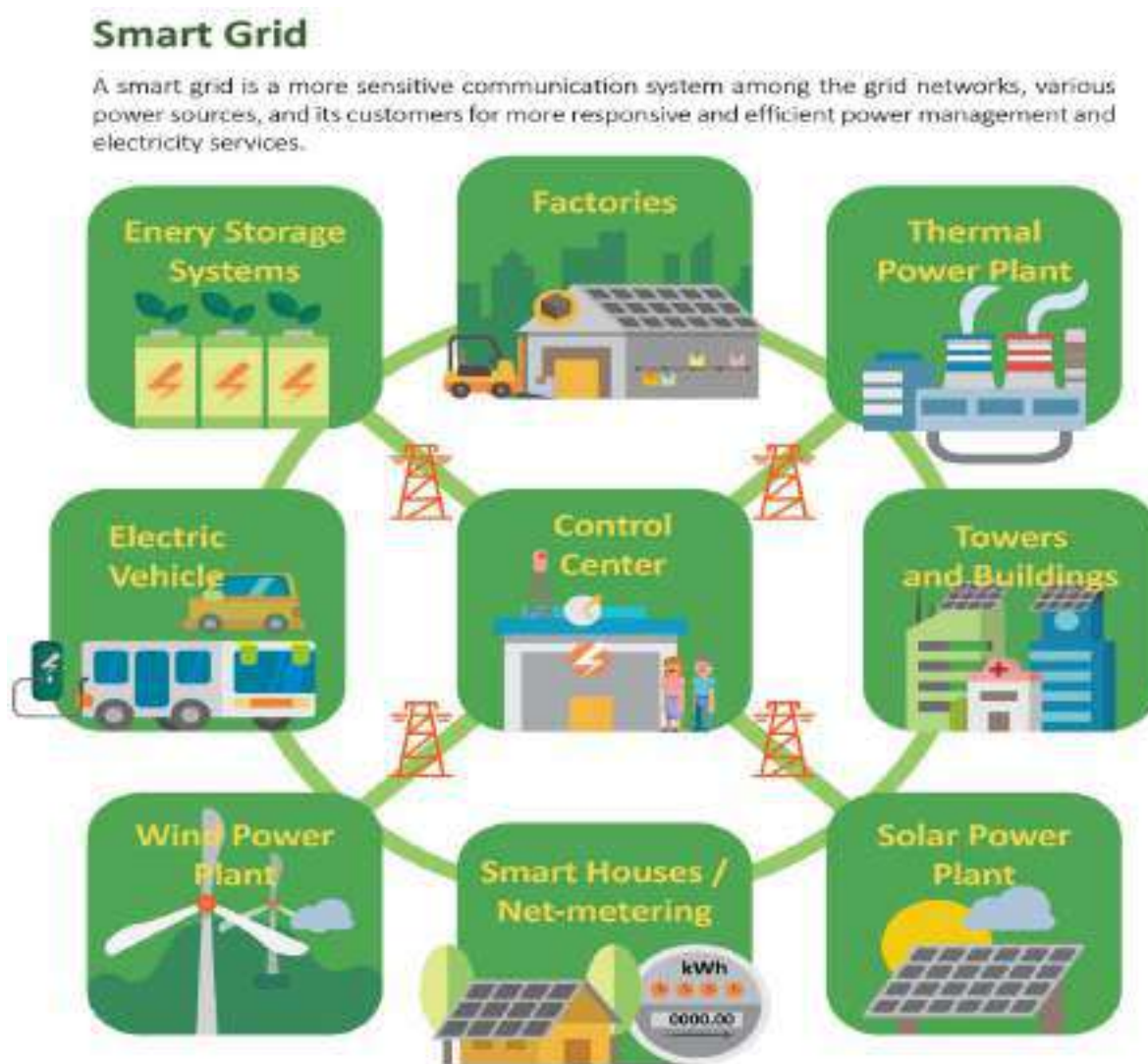


Figure 20. Smart Grid Representation

2.7. Renewable Energy Trust Fund

The DOE is closely coordinating with the Philippine Charity Sweepstakes Office, Philippine Gaming and Amusement Corporation, Department of Environment and Natural Resources, and the Department of Budget and Management to formulate a transparent and efficient mechanism for collecting the RETF. A special trust account was already created as the repository for RETF collections. The guidelines and

²¹ Entitled, "Providing a National Smart Grid Policy Framework for the Philippine Electric Power Industry and Roadmap for Distribution Utilities"

procedures for RETF sourcing, utilization, accounting, and audit, and the RETF Operations Manual are currently being developed.

2.8. Local Renewable Energy Planning

On 13 April 2020, the DOE and the Department of the Interior and Local Government (DILG) entered a joint memorandum²², also known as the LGU Energy Code, which provided the guidelines for LGUs to facilitate the implementation of energy projects and aims to:

- a. Establish, strengthen, and integrate national energy plans, programs, and policies into the local development plans;
- b. Harmonize, streamline, and fast-track the permitting process for energy projects;
- c. Maximize benefits of host communities from energy projects; and
- d. Implement other energy programs and projects to spur the development of LGUs

As such, LGUs, through its Local Development Councils, shall activate an Energy Sector Committee that will implement the following as prescribed in the Code:

- a. Spatial Plan – The LGUs shall identify and plot upstream conventional and/or RE resources, and downstream energy facilities within its area of jurisdiction.
- b. Development Plan – It must monitor and collect the benefits from energy projects (e.g., funds from the Energy Regulation 1-94 and the National Wealth Tax) and incorporate these benefits in its comprehensive development plans. The development plans of provinces, cities, municipalities, and barangays shall also include all local energy policies and programs covering energy safety and best practices, energy efficiency and conservation, and energy resiliency, to be integrated in the Regional Development Plans.
- c. Energy Regulatory Reforms – The LGUs shall streamline its permitting and approval process for energy-related projects within the EVOSS-prescribed period.
- d. Information, Education, and Communication Campaign – The LGU, in coordination with the DILG and DOE, shall educate its constituents on RE-related topics.

Formulating evidence-based local RE plans and integrating these in legislative and executive agendas involve a highly consultative approach where LGU's energy committees or technical working groups engage with RE stakeholders (i.e., ECs, RE project developers and integrators, and non-governmental organizations). To facilitate this, the DREAMS project conducts capacity building programs for Local RE Planning (LREP) with the provincial governments of Iloilo, Palawan, Lanao del Sur, and Oriental Mindoro,



Local RE planning facilitates implementation of the RE Act and the NREP at the local levels.

It supports RE project development by making the permitting process for RE projects more efficient, and proactively identifying and classifying appropriate lands for RE development.

LGUs are enjoined to incorporate RE in its plans for social services and livelihood, disaster risk management, and environmental conservation. This extends the benefits of RE to all, especially the marginalized.

²² DILG and DOE Joint Memorandum Circular No. 2020-01

and academic institution Mariano Marcos State University (MMSU). The LREP not only introduce RE concepts and mechanisms, but also serve as a platform for different institutions to collaborate for potential RE projects in their areas.

In Iloilo, assistance for socio-economic, resource, and other technical assessments contributed to the development of the Iloilo Provincial RE Plan. The plan includes potential RE projects which will be showcased in an RE investment forum: (i) solar PV systems for 13 district hospitals of Iloilo Province, (ii) an RE-powered water sufficiency project in Ajuy, Iloilo, and (iii) RE hybridization of the power supply for the tourism industry in Gigantes, Iloilo. Aside from LGUs, LREP may also engage research and academic institutions which play vital roles in wider RE dissemination and replication. Technical assistance was provided to the MMSU for the development of a Net Zero Energy Campus. The project aims to make the campus' carbon footprint zero through reducing energy demand and sourcing from on-site or off-site RE sources. To achieve this, the study identifies RE projects including solar-powered distillers for bioethanol production, and solar-powered aquatic life support system for the College of Aquatic Sciences and Applied Technology.

Part of LREP activities is the provision of trainings to enhance LGUs' knowledge and capability in identifying and developing RE projects over the short- to long- term period. RE 101 workshops have been conducted with RE stakeholders of Iloilo, Palawan, Oriental Mindoro, Lanao del Sur, and the entire Region 6 Western Visayas. Solar PV rooftop technical training for Iloilo's municipal engineers was also conducted, which will enable the wider integration and operation of the Net-Metering Program and solar technologies in the province.

Both technical assistance and capacity building LREP activities are being supported by the DOE-GEF-UNDP DREAMS project.



Photo 1. Top: RE Workshop and Payatas Biomass Facility Site Visit with Palawan and Iloilo RE Stakeholders held on October 14, 2019; Bottom: Region 6 Municipal Engineers and Development Officers Participating in Local RE Development Workshop During the Regional Development Council 6 RE Conference held on April 7-8, 2022

Finally, the LREP's local policy integration and capacity building activities enable actual RE applications. Examples of RE projects that emanated from the LREP process include (i) solar PV rooftop systems for the Iloilo Provincial Hospital, (ii) rehabilitation and grid interconnection of the Agbobolo micro-hydropower plant in Ajuy, Iloilo, (iii) direct current smart grid and solar-powered irrigation pump in Aborlan, Palawan, (iv) solar PV rooftop installations in public buildings of 15 LGUs in Oriental Mindoro, and (v) solar PV rooftop installations on 11 buildings of the Concepcion, Iloilo LGU compound, including the LGU's Rural Health Unit, Bureau of Fire Protection, and the gymnasium. These LREP-facilitated RE projects are also supported by the DREAMS project through the Support Facility for RE (SF4RE). The 1 million USD SF4RE supplies materials and funds services for local RE projects proposed by LGUs, ECs, non-profits, private RE developers and academic institutions.

Photo 2. Solar PV Rooftop Installations on Concepcion, Iloilo LGU Compound's Rural Health Unit building (Front) and Legislative Building (Back). Championed by the Concepcion LGU and Iloilo III Electric Cooperative, the SF4RE-supported project completed installation on 11 buildings in December, 2021.



2.9. Renewable Energy Safety, Health, and Environment Rules and Regulations



In line with the significant developments in the RE industry over the years, the DOE issued policies which provided the RESHERR for each RE technology on 11 June 2021. These include geothermal (DC2021-06-0016), hydropower (DC2021-06-0017), solar (DC2021-06-0018), wind (DC2021-06-0019) and biomass (DC2021-06-0020). These policies require all RE companies to designate an eligible safety officer and to be subject to random safety inspections by the DOE Renewable Energy Management Bureau (REMB).

Since 2020, the REMB is ISO²³ 9001:2015-certified for its processing of Geothermal Safety Officer's permits. The REMB also expanded the processing of the said permit to solar, wind, hydropower, and biomass facilities.

²³ International Organization for Standardization

2.10. Collaboration with Development Partners

Active collaboration with local and international development organizations cultivated local RE skills, facilitated the entry of innovative technologies and tools, and contributed to the overall vibrance of the country's RE industry. The following organizations have been providing technical and financial support in areas of policy formulation, research and development, and pilot demonstration projects deployment, among others.

Table 12. Summary of Development Partners for RE Development

Agency	Involvement
 <p>Agence Française Développement (AFD)</p>	<p>The AFD implements France's policies in the areas of development and international solidarity. Its mission is to contribute to the economic, social, and environmental progress of low and middle-income countries by providing loans, grants, expertise or technical assistance. Together with the World Bank Group (WBG), AFD is supporting the rehabilitation of the Agus Pulangi Hydropower Complex.</p>
 <p>Asian Development Bank (ADB)</p>	<p>The ADB is a regional development bank committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific. It has provided technical advisory services to the energy sector and implemented several pilot projects that aim to increase energy access. The ADB supported the Romblon solar-PV hybrid mini-grid, and the Malalison mini-grid with pay-as-you go smart metering model. It also conducted a study on the impacts and cost-implications of switching to more efficient biomass cookstoves.</p> <p>It is also working with the Philippine Government on the Energy Transition Mechanism (ETM) that aims to accelerate clean energy transition. The ETM is a blended-finance approach that seeks to retire existing coal plants and replace them with facilities utilizing cleaner energy sources. The ADB will support the establishment of enabling policies and business conditions to improve the program's governance, and carbon reduction and just transition goals.</p> <p>In addition, it is working closely with the DOE in developing the Geothermal De-Risking Roadmap of the Philippines to determine the country's geothermal energy potential and uses, and lower exploration drilling costs and risks by identifying, evaluating, and recommending key activities and mechanisms.</p>
 <p>CARBON TRUST Carbon Trust (CT)</p>	<p>The CT works with businesses, governments, and institutions around the world, helping them contribute to and benefit from a more sustainable future through carbon reduction, resource efficiency strategies, and commercializing low carbon businesses, systems, and technologies. In the Philippines, CT is working on the establishment of the Joint Industry Platform (JIP), in</p>

Agency	Involvement
	<p>coordination with the DOE. The JIP will convene the government, industry players, research institutions, and other stakeholders to collectively work on solutions to the barriers in offshore wind development.</p>
 <p>EU</p>	<p>The EU Delegation to the Philippines aims to strengthen EU-Philippine relations by promoting strong economic and trade ties, developing EU-Philippines dialogue, supporting the government in its peace efforts in Mindanao, and working with the Philippines to reach the UN Millennium Development Goals.</p> <p>The ASEP is a joint project of the DOE and EU that aimed to expand sustainable energy generation to meet the growing demand and provide energy access to the poor and marginalized sectors. Through the ASEP, the SPT was developed to assist the implementation of RPS in off grid areas by estimating the optimal share of RE resources.</p> <p>It also supported PURE in several sites as well as several off-grid electrification projects. The Project RE Livelihood and Youth is one of the seven awardees under the ASEP. Said project has energized two remote schools in Carnaza Island, Daanbantayan, Cebu with solar energy. It further aims to energize 16 off-grid public schools in Cebu, Bohol and Palawan.</p>
 <p>GIZ</p>	<p>The GIZ is Germany's leading provider of international cooperation services. In the Philippines, GIZ concentrates on areas related to peace and security, climate change and biodiversity, and economic and human development. It implemented the ASEP Technical Assistance and Capacity Building for Reform that includes capacity-building activities for electrification, initiatives for enhanced power sector management, and support for RE and energy efficiency programs.</p> <p>The GIZ leads the global C40 Cities Finance Facility (CFF) that supports cities in developing financially sound business proposals for low-carbon and climate-resilient infrastructure projects. In the Philippines, the CFF supports Quezon City's initiative to install grid-tied solar PV rooftop systems to 50 public schools. It also leads the ongoing CASE Project that aims to support an evidence-based energy transition for Southeast Asian countries, including the Philippines, in line with the Paris Agreement goals.</p>
 <p>Global Green Growth Institute (GGGI)</p>	<p>The GGGI is a treaty-based international and inter-governmental organization that mobilizes green finance commitments to support low-carbon and climate-resilient economic development. It is working with the provincial government of Bataan in developing a solar PV farm in Mariveles and deploying electric vehicles.</p>

Agency	Involvement
 <p>Great Basin Center for Geothermal Energy (GBCGE)</p>	<p>Funded by the US Department of Energy, the GBCGE provides international capacity building activities to identify, explore, and develop geothermal energy across countries, which include the Philippines.</p>
 <p>Japan International Cooperation Agency (JICA)</p>	<p>The JICA promotes international cooperation by supporting the socioeconomic development, recovery, or economic stability of developing regions. The JICA supports the Philippines' energy sector in areas related to energy access, industry development, and job creation. It also supported RE development for electrification, hydropower resource assessments, and hydropower project development in Laguna, Ifugao, and Isabela.</p>
 <p>Nationally Appropriate Mitigation Action (NAMA) Facility</p>	<p>The Philippines was given grant funding from the NAMA Facility, through its NAMA Support Project, to explore the potential of tidal stream energy hybrid systems. The DOE, together with the Climate Change Commission, and Frankurt School of Finance & Management will act as the steering committee of the program entitled "Decarbonisation of Electricity Generation on Philippine Islands (Using Tidal Stream and Solar PV)". The DOE will represent the Philippines in the NAMA Facility and oversee the implementation of the said program. The NAMA Facility is an international climate finance program that promotes ambitious measures to reduce GHG emissions. It is funded (7th Call Project Cycle) by the United Kingdom, Germany, Denmark, and the European Commission.</p>
 <p>Organization for Economic Co-operation and Development (OECD)</p>	<p>The OECD, in collaboration with the DOE, launched the Clean Energy Finance and Investment Mobilisation (CEFIM) Programme last December 2021. It aims to support the country in accelerating finance and investment for clean energy, particularly RE and energy efficiency and conservation (EE&C), through the creation of the "Clean Energy Finance and Investment Roadmap of the Philippines". It will bring the government and private sector stakeholders together to identify and address bottlenecks complicating or constraining finance and investment in the Philippines. The roadmap will outline opportunities to tailor market and policy interventions to unlock further private finance, taking into account current market conditions with COVID-19 as well as emerging trends and investor expectations as global financial markets look for more climate-aligned investments.</p>

Agency	Involvement
 <p>United Kingdom (UK) Government</p>	<p>The UK Government funded the Association of Southeast Asian Nations (ASEAN) Low Carbon Energy Programme (LCEP) that aims to drive inclusive growth and poverty reduction through increased energy efficiency, adoption of low carbon energy, and green finance. The Technical Assistance Programme for Energy Efficiency Pilot Projects is currently ongoing that also includes support for offshore wind development.</p>
 <p>UNDP</p>	<p>The UNDP has been committed to help the Philippines achieve the SDGs, as well as national development priorities set forth in the UN Philippines Partnership Framework for Sustainable Development and the Philippine Development Plan. The DREAMS Project is being implemented by the DOE, in partnership with the GEF and UNDP, which aims to reduce GHG emissions through the commercialization of RE and removal of barriers to entry for RE investments.</p> <p>In 2019, the DOE and DREAMS Project published the “EMPOWERED: Renewable Energy Decade Report” to celebrate the tenth year of the RE Act implementation. The DREAMS also established the SF4RE that provide partial grants to RE systems to encourage local investments. It also supports the development of local RE plans of selected LGUs in the country and the operationalization of PREMS.</p>
 <p>United Nations Industrial Development Organization (UNIDO)</p>	<p>The UNIDO promotes industrial development for poverty reduction, inclusive globalization, and environmental sustainability. It implements the Renewable Energy Technology to Increase Value-Added of Seaweeds in Tawi-Tawi Project in partnership with the World Wide Fund for Nature and Association of Isolated Electric Cooperatives, with funding from the EU. The project will construct a solar PV hybrid mini-grid with ESS in the seaweed farming communities of Tawi-Tawi.</p>
 <p>United Nations Office for Project Services (UNOPS)</p>	<p>The UNOPS is the operational arm of the UN which focuses on bringing peace and security and humanitarian and development solutions to achieve the SDGs. It will support the PEMC in building the ESS market and is looking at approaches to derisk investments on wind, solar, and ocean energy.</p>
 <p>USAID</p>	<p>The USAID has been supporting the Philippines in developing infrastructure, increasing agricultural productivity and economic growth, promoting sustainable environmental management, improving health and nutrition, and</p>

Agency	Involvement
	<p>fostering democracy and decentralization. It implemented key energy programs and projects namely the Alliance for Mindanao Off-grid Renewable Energy Program, Climate Change and Clean Energy Project, and Building Low Emission Alternatives to Develop Economic Resilience and Sustainability Project.</p> <p>Together with the NREL, which is United States' (US) primary laboratory for RE and energy efficiency research and development, the USAID supports the ongoing Philippines' CREZ study. In addition, its current Energy Secure Philippines (ESP) Project aims to spur inclusive economic growth and resilient development by increasing private investments to promote advanced technology deployment and boost energy sector resilience. Currently, the ESP is supporting the DOE in developing GEAP implementing strategies and framework.</p>
 <p>WBG</p>	<p>The WBG is one of the largest sources of funding and knowledge for developing countries. Currently, it is assisting the DOE in formulating the Philippine Offshore Wind Roadmap that aims to identify high development areas and provide opportunities and policy recommendations for offshore wind, among others.</p>

3. Renewable Energy for Off-Grid and Productive Uses of RE Strategies

The government's Total Electrification Program (TEP) aims to provide electricity to all households by 2040. As of 31 December 2020, the national electrification level stood at 94.5%, which means that about 1.2 million out of the 22.9 million households still do not have access to electricity²⁴. The TEP focuses on three strategies namely household, grid, and off-grid electrification. Household and grid electrification involve the provision of house wiring subsidies to unenergized households (Nationwide Intensification of Household Electrification) and extension of distribution lines to unserved areas (NEA's Sitio Electrification Program and Barangay Line Enhancement Program). Meanwhile, off-grid strategies include the deployment of standalone solar PV systems and mini-grids. The NPC-SPUG is the primary electricity service provider in off-grid and missionary areas. However, these areas are also open for private sector participation through the QTP and NPP program²⁵ of the government.

Tariffs²⁶ in off-grid and missionary areas are subsidized through the UCME. To rationalize the UCME and improve the operational efficiency of off-grid power systems, the DOE issued DC2019-01-0001 entitled "Prescribing the Omnibus Guidelines on Enhancing Off-Grid Power Development and Operation" on 25 January 2019. Said guidelines prescribed the phasing-out of UCME by exploring other sources of funding

²⁴ DOE. 2020. Philippine Energy Plan 2020-2040. Using the 2015 Population Census as baseline

²⁵ The QTP provides electricity services in areas waived by the DU. On the other hand, the NPP takes over the assets of the NPC-SPUG to provide power to the area.

²⁶ Tariffs in off-grid and missionary areas are usually higher as electricity is mainly produced using more expensive oil-based fuels.

for subsidies, including annual appropriation to the NPC for all missionary electrification activities²⁷. Given this, deploying RE systems can be the most technically and economically viable solution for unenergized areas. Despite the challenges in advancing RE in off-grid areas (e.g., small demand size and high upfront costs of deploying RE mini-grids), the declining price of RE components and the rise of new and innovative business models provide opportunities for cleaner energy transition in these parts of the country.

RE for RE: Renewable Energy for Rural Electrification

Many families in remote and isolated areas still do not have access to electricity. They often rely on kerosene for lighting or operate diesel generator sets. Both take up a significant share of their household income.

In many remote islands, the limited access to electricity also limits social services, such as street lighting, piped-in water, and essential health services. This further aggravates the disadvantaged situation of the Filipinos living in this area.

Renewable energy is an affordable and cleaner solution for rural electrification. Past programs have deployed RE systems, such as solar PV home systems and battery charging stations, as well as RE-mini-grids to supply electricity services. While much has been achieved, many more families live without power.

There are several channels for providing electricity to unelectrified areas. The Qualified Third Party scheme allows the private sector to provide power generation and distribution services to areas waived by ECs/DUs. New Power Producers can take over the operation of existing NPC-SPUG sites in missionary areas. Other emerging business models can be explored and scaled, such as the pay-as-you-go model. Productive End-use of RE, such as solar water pumps or RE-powered cold storage, can be deployed.

The opportunities for RE in rural electrification abound. Through innovation and commitment, inherent technical and business challenges in rural electrification can be addressed.



²⁷ Rule 10 and Rule 11 of DC2019-01-0001 Prescribing the Omnibus Guidelines on Enhancing Off-Grid Power Development and Operation

3.1. Expanded Household Electrification Program

The NEA implements the Expanded Household Electrification Program, through the PV Mainstreaming Program, which deploys solar home systems (SHS) to isolated households far from the DU's network. The SHS is composed of a 50 Wp solar panel, 24 Ah battery, 4 LED bulbs, transistor radio, flashlight, and charging cables for mobile phones. More than 5,000 households have already been provided with SHS. The PV Mainstreaming Program is supported by the EU-ASEP.

3.2. RE Program for the Agriculture and Fisheries Sector²⁸

The DOE and the Department of Agriculture (DA) signed a Memorandum of Agreement on 06 August 2020 to develop and implement a comprehensive RE Program for the Agriculture and Fisheries Sector (REPAFS) towards energy and food security. It has five main components, namely, the promotion of RE technologies, research and development, formulation and enforcement of standards on RE-powered machineries and facilities, human resource development, and provision of assistance to local manufacturers, fabricators, and suppliers of RE equipment and components.

The DA's current program on food security includes solar-powered irrigation and fertigation systems, research and development using biomass for agri-fishery mechanization and modernization, and the promotion of biogas in livestock farms for lighting, cooking, or pollution control. As of 15 March 2022, the program has conducted several webinars on solar PV technologies and water pumping systems, and evaluated two project proposals. Meanwhile, the accreditation of local RE equipment and component manufacturers, fabricators, and suppliers is ongoing to encourage technology innovation and business incubation. The REPAFS was already subjected to public consultations and is currently being finalized.

3.3. Productive Uses of Renewable Energy

Technologies deployed under this program deliver energy for livelihood and social services particularly in off-grid or underserved areas. The systems, which in many cases replace hard manual labor, can augment household income by enhancing livelihood productivity and efficiency, and producing higher-value products. Other PURE systems provide vital social services related to health, water supply, and safety. These include RE-powered cold storage for medicines and vaccines, solar and wind streetlights, and solar water pumps. In off-grid areas, PURE builds community resilience and opens income-generating opportunities. Local RE planning can support LGUs identify opportunities for RE to serve their communities using PURE.

The ASEP has implemented various PURE projects as enumerated in Table 13. The DREAMS' implemented PURE projects are under the SF4RE and enumerated in Table 14.

²⁸ Retrieved from <https://www.doe.gov.ph/press-releases/doe-sec-cusi-signs-moa-da-boost-energy-and-food-security>



Photo 3. Solar PV-Powered Agricultural Machinery installed by ASEP

Table 13. List of ASEP PURE Projects

Location	Technology	Incremental Income PhP / month
Mahayag, Mindanao	Crop dryer, corn mill 2kW solar PV + 10kWh battery	420
New Mabuhay, Mindanao	2 Abaca spindle 1.3kW solar PV + 8kWh battery	641
Pangasinan	Rice mill 2.3kW solar PV + 10kWh battery	850
Don Salvador Benedicto, Negros Occidental	Pineapple leaves fiber decorticating machine Solar PV + battery	On-going computation



Photo 4. Solar PV Powered Potable Water System in Goa, Camarines Sur Supported by DREAMS

3.4. Support Facility for Renewable Energy

The SF4RE is a US\$1 million facility under the DREAMS project which provides technical services or goods for projects in areas with limited investor interest but will generate high economic returns. The approved SF4RE projects are shown in Figure 21.

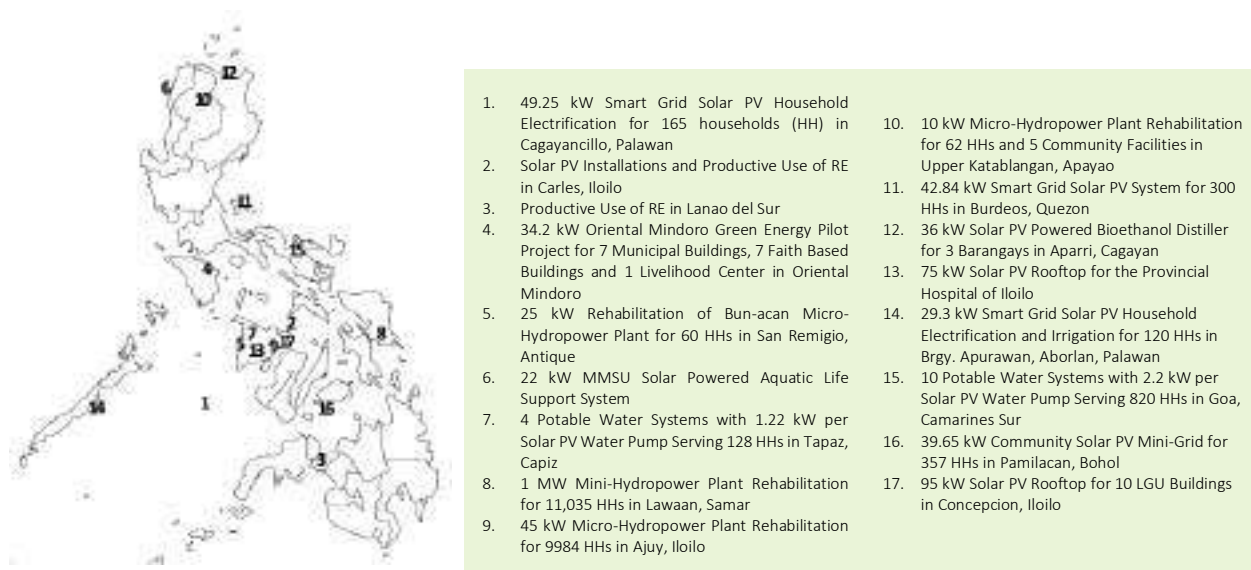


Figure 21. SF4RE Projects

These projects demonstrate RE's potential application to pursue varied purposes, especially in off-grid areas. The SF4RE projects' objectives, enumerated in Table 14, include the following:

- A. Rural household electrification;
- B. PURE/ livelihood development;
- C. RE delivery of social services;
- D. Compliance and promotion of RE Act; and
- E. Climate resiliency.

Local RE stakeholders such as ECs, LGUs, RE developers, academic institutions, and civil society organizations champion these projects not only as proponents and beneficiaries, but also as co-financing partners. Many of these local RE stakeholders are also engaged in the DREAMS' capacity building for Local RE Planning program. Table 14 also lists SF4RE's proponents and partners.

Table 14. Summary of SF4RE Projects, Partners and Objectives

Name, Beneficiaries, and Location	Installed Capacity	Proponents & Partners	Purpose				
			A	B	C	D	E
Smart Grid Solar PV Household Electrification for 165 HHs in Cagayancillo, Palawan	49.25 kW	Palawan Electric Cooperative and Cagayancillo LGU					
Solar PV Installations and Productive Use of RE in Carles, Iloilo	Under development	Carles LGU, and Iloilo III Electric Cooperative					
Productive Use of RE in Lanao del Sur	Under development	Lanao del Sur Provincial Government					
Oriental Mindoro Green Energy Pilot Project for 7 Municipal Buildings, 7 Faith Based Buildings and 1 livelihood center in Oriental Mindoro	34.2 kW	Oriental Mindoro Provincial Government, WeGen Laudato Si Inc., and Apostolic Vicariate of Calapan - Diocesan Social Action Center					
Rehabilitation of Bun-aan Micro-Hydropower Plant for 60 HHs and Irrigation Project in San Remigio, Antique	25 kW	Antique Provincial Government, San Remigio LGU, Baranggay Panpanan I LGU					
MMSU Solar Powered Aquatic Life Support System	22 kW	Mariano Marcos State University (MMSU)					
Solar PV Powered Potable Water Systems for 128 HHs in Tapaz, Capi	6.48 kW	Tapaz LGU					
Mini-hydropower Plant Rehabilitation for 11,035 HHs in Lawaan, Samar	1 MW	Eastern Samar Electric Cooperative					
Micro-Hydropower Plant Rehabilitation for 9984 HHs in Ajuy, Iloilo	45 kW	Ajuy LGU, and Iloilo III Electric Cooperative					
Micro-Hydropower Plant Rehabilitation for 62 HHs and 5 Community Facilities. in Upper Katablangan, Apayao	10 kW	Katablangan Indigenous Farmers Association					

Name, Beneficiaries, and Location	Installed Capacity	Proponents & Partners	Purpose				
			A	B	C	D	E
Smart Grid Solar PV System for 300 HHs in Burdeos, Quezon	42.84 kW	Entrepreneurs du Monde and Quezon II Electric Cooperative	☑	☑			
Solar PV powered Bioethanol Distiller for 3 barangays in Aparri, Cagayan	36 kW	Aparri LGU and MMSU		☑	☑		☑
Solar PV Powered Potable Water Systems for 820 HHs in Goa, Camarines Sur	20 kW	Goa LGU		☑	☑		
Solar PV Rooftop for the Provincial Hospital of Iloilo	75 kW	Iloilo Provincial Government and Iloilo II Electric Cooperative		☑	☑	☑	
Smart Grid Solar PV Household Electrification and Irrigation for 120 HHs in Brgy. Apurawan, Aborlan, Palawan	29.3 kW	Aborlan LGU and Palawan Electric Cooperative	☑	☑		☑	☑



Photo 5. Construction of SF4RE Community Solar PV Project in Off-Grid Pamilacan Island, Baclayon, Bohol

3.5. Microgrids

On 21 January 2022, RA No. 11646 entitled “An Act Promoting the Use of Microgrid Systems to Accelerate the Total Electrification of Unserved and Underserved Areas Nationwide”, also known as “Microgrid Systems Act” was signed. Section 2(d) of this Act declared the policy of the State to “provide a competitive environment for different kinds of energy sources while prioritizing low-cost, indigenous,

renewable, and environment-friendly sources of energy”. Hence, its implementation is expected to spur the development and utilization of RE, particularly in off-grid areas.

Utilizing RE hybrid mini-grids can provide additional compliance to the RPS mandates, and produce reliable 24/7 electricity services to end-users. Renewable energy hybrid mini-grids are technically proven systems with a thriving local expertise engaged in design, construction, operation, and maintenance. Box 1 presents some examples of existing RE mini-grids in the country.

Box 1. RE Mini-Grids Operated by ECs

Romblon Electric Cooperative (ROMELCO) hybridized its diesel mini-grid in Cobrador Island with a 30kWp solar PV and 180-kW ESS. The additional solar PV capacity allowed ROMELCO to provide 24/7 electricity services, compared to the 8 hours per day when only diesel generator is running. Further, the tariff rate was reduced to half from P30/kWh to P15/kWh²⁹, and the number of connections increased from 161 to 260 households³⁰. Antique Electric Cooperative (ANTECO) also developed a 50kWp solar PV hybrid mini-grid with 273kWh battery that allowed it to provide 24/7 services to Malalison Island. It also implemented a prepaid billing system using smart meters on the island. The four QTPs all use solar PV hybrid mini-grids to serve in their areas. New business models are also emerging such as mesh solar grids implemented by Busuanga Island Electric Cooperative. Solar PV home systems are connected, forming a mesh grid, and automatically redistributes excess energy where it is needed using a smart controller. The mesh grid provides reliable electricity services in the island barangay of San Isidro. The success of this business model lies on innovative technologies and strong partnerships among the service provider, EC, and local community.

The NEA supports ECs in developing their RE mini-grids, through its Expanded Sitio Electrification Program. As of date, the said program has been assisting at least six ECs in developing their feasibility studies for various island sites. Meanwhile, the NPC plans to build new RE-hybrid mini-grids with a cumulative capacity of 1.2MW on its unelectrified areas. It is also set to install a total of 595kWp solar PV in four existing diesel-powered mini-grids located in Cuaming, Bohol (55kWp), Palumbang, Catanduanes (40kWp), Sabtang, Batanes (250kWp), and Itbayat, Batanes (250kWp). There are still other missionary areas, open for QTPs and NPPs, where RE mini-grids can be deployed.

4. Resource Specific Programs

4.1. Offshore Wind Energy Resource Development

In 2019, the study of WBG entitled “Going Global: Expanding Offshore Wind To Emerging Markets” estimated a total of 178 GW wind energy potential within 200 km from shoreline. Of which, 18 GW is from fixed foundation wind turbine generators (WTGs) and 160 GW is from floating-type WTGs. Guimaras Strait is found suitable for fixed foundation WTGs, while the north of Luzon, off the coast of north and south of Mindoro Island, including Manila area, are excellent areas for floating-type WTGs.

²⁹ The Cobrador mini-grid was partially funded by grant funds from ROMELCO’s partners.

³⁰ ADB. 2019. “Guidebook for Deploying Distributed Renewable Energy Systems”. Metro Manila

As shown in Figure 22, the study also produced the Offshore Wind Energy Atlas of the Philippines that indicates offshore wind energy resource and indicative development zones.

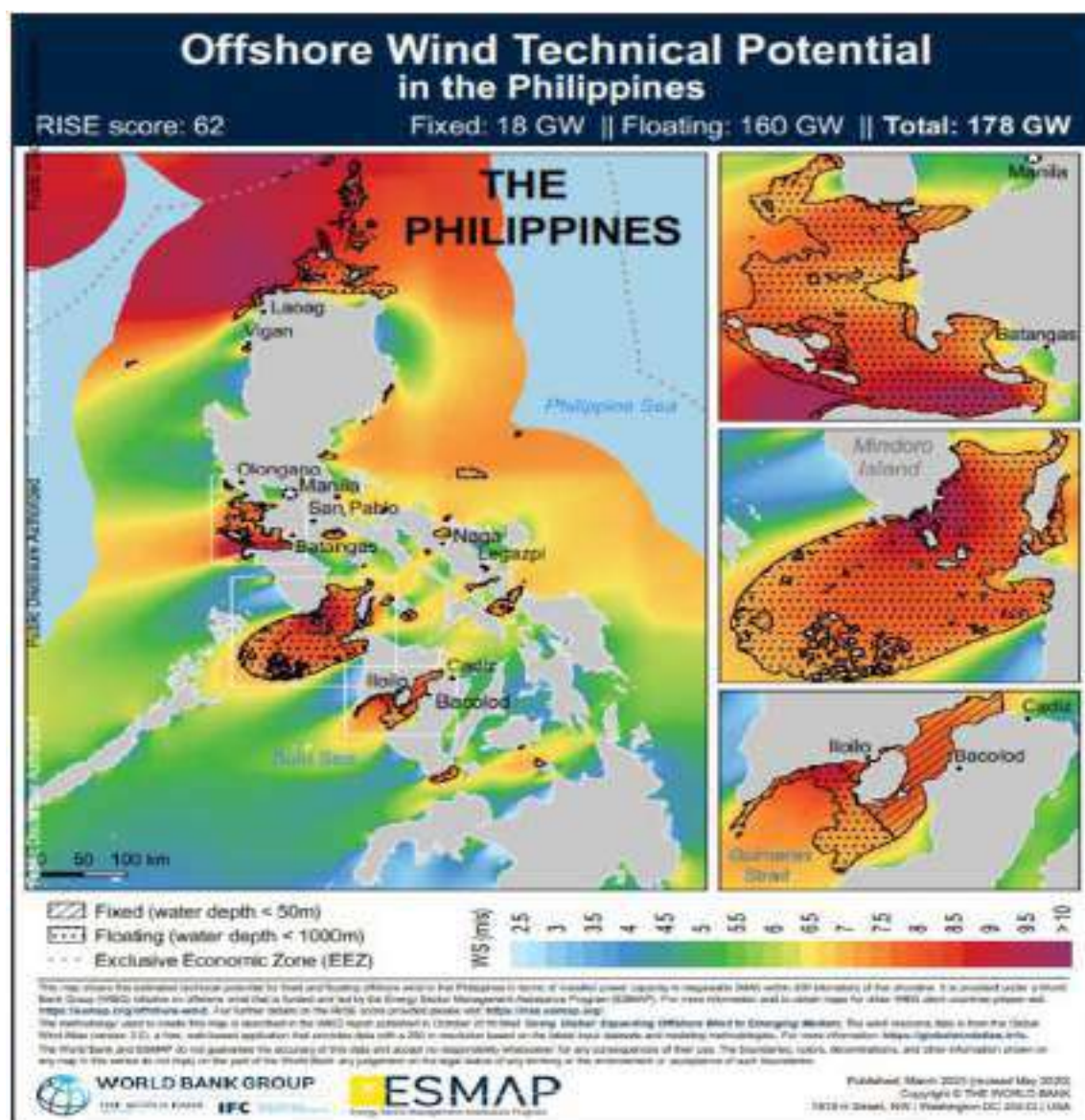


Figure 22. Offshore Wind Energy Atlas of the Philippines

On 20 April 2022, the WBG, in cooperation with the DOE, launched and published the “Offshore Wind Roadmap for the Philippines” which provided strategic analysis of offshore wind development potential in the country and rolled-out the opportunities and challenges under different hypothetical growth scenarios. Said roadmap intends to aid the Philippine Government in formulating policies, regulations, processes, and infrastructure to support this new industry. As of March 2022, the DOE awarded 30 Wind Energy Service Contracts with an aggregate potential capacity of 20.81 GW mainly in Luzon and Visayas.

The UK Government’s ASEAN LCEP has also been supporting the DOE by creating and engaging an expert panel in a series of dialogues regarding key considerations in developing offshore wind projects. The CT, together with the DOE and industry experts and players, also established the Philippine Offshore Wind

Joint Industry Platform. It will serve as one of the mechanisms for the successful delivery of key recommendations under the Offshore Wind Roadmap for the Philippines. Among the priority areas for implementation in the initial phase of the platform include Marine Spatial Planning, permitting and consenting, and grid integration and planning.

4.2. Waste-to-Energy

Waste-to-Energy refers to the process of converting waste into usable heat, electricity, or fuel. Advancing WTE is an effective solution to manage huge volumes of municipal solid wastes in the country while producing energy throughout the process. On 17 February 2022, the DOE issued DC No. DC2022-02-0002³¹ which aims to promote biomass WTE facilities by providing specific policy support. This include the issuance of RECs to MPs procuring energy from eligible biomass WTE facilities, recommendation for a minimum 20-year PSA between a DU and eligible biomass WTE facilities, and its exemption from the CSP. The DOE will conduct a comprehensive study to further assess the potential and viability of biomass WTE technologies in the Philippines.

4.3. Expanded Rooftop Solar Program

The DOE is looking at the implementation of the ERSP which aims to augment power supply from RE, particularly solar. The ERSP provides opportunities to electricity end-users and solar PV developers and installers to contribute to the growth of RE by utilizing available rooftop spaces for solar energy production. It will not only empower electricity end-users to produce electricity, but will also enable them to use it or sell the excess generation to the grid, beyond the current limit of 100 kW under the net metering program. The DOE is currently conducting studies to determine the appropriate policy and regulatory framework for the ERSP. Among others, expanding net metering to include capacity aggregation and allowing business establishments to be RE developers and power generators, which will enable peer-to-peer energy trading or selling in the WESM, are some of the business models being explored.

4.4. Financial and Technical Assistance Agreement for Geothermal Projects

Geothermal energy development has been relatively stagnant for the past decades attributed, in part, to the high cost of exploration and pre-development activities. Exploratory drilling is expensive at approximately USD 6M per well, with only a 20-30% chance to be viable for development. Several geothermal service contracts were terminated because local project developers were unable to conduct exploratory activities primarily due to cost constraints and risk issues. Given this, the government has allowed 100 percent³² foreign ownership of large-scale geothermal projects, provided that:

- i. It has an initial investment of at least USD 50M, and
- ii. It should be under a Financial and Technical Assistance Agreement (FTAA), as defined by the Constitution.

³¹ Entitled "Prescribing the Policies and Programs to Promote and Enhance the Development of Biomass Waste-to-Energy (WTE) Facilities

³² This exemption is set since the Philippine Constitution requires 60 percent Filipino ownership for the exploration, development, and use of natural resources.

With the FTAA, a foreign company enters an agreement with the government, through the President of the Philippines. The development of geothermal resources must be exclusively done through an OCSP, where both local and foreign entities may participate.

4.5. Emerging RE technologies

The DOE will pursue the development of other emerging technologies to augment the country's RE supply base. As earlier noted, the country was given grant funding from the NAMA Facility to explore the potential of ocean and tidal stream energy. Meanwhile, research and development activities which aim to examine the viability of hydrogen as an efficient energy storage and carrier are ongoing. An initial study conducted in 2020 identified green hydrogen, using RE as fuel, as one of the options for hydrogen production in the country³³. To further investigate hydrogen energy's viability, two Memorandum of Understanding with leading Australian and Japanese companies were signed by the DOE³⁴.

The Department of Science and Technology extends support to the development and commercialization of innovative technologies through its grant programs for the academe and micro, small and medium enterprises. The RETF can also provide additional funding for these technology solutions.

³³ Undertaken through the issuance of Special Order No. 2020-11-0041 entitled "Directing the Creation of a Hydrogen and Fusion Energy Committee (HFEC) to Make a Study on Hydrogen and Fusion Energy including Infrastructure Development Methods and Strategies, Prepare a Framework on their Inclusion in the Energy Mix and for Other Purposes"

³⁴ Retrieved from <https://www.doe.gov.ph/press-releases/doe-signs-mou-start-scientific-research-hydrogen-potential-ph> and <https://www.doe.gov.ph/press-releases/cusi-pushes-rd-hydrogen-energy?withshield=2>

B. ROADMAP

Fully implementing the RE policies and programs, increasing financing support, and developing emerging and underutilized RE technologies, will be the priority for the short- and medium-term planning periods as depicted in Figure 23 and Figure 24. For the long-term, an advanced power system equipped with smarter grids and backed by a robust ancillary market and strong local RE industry and workforce is envisioned.

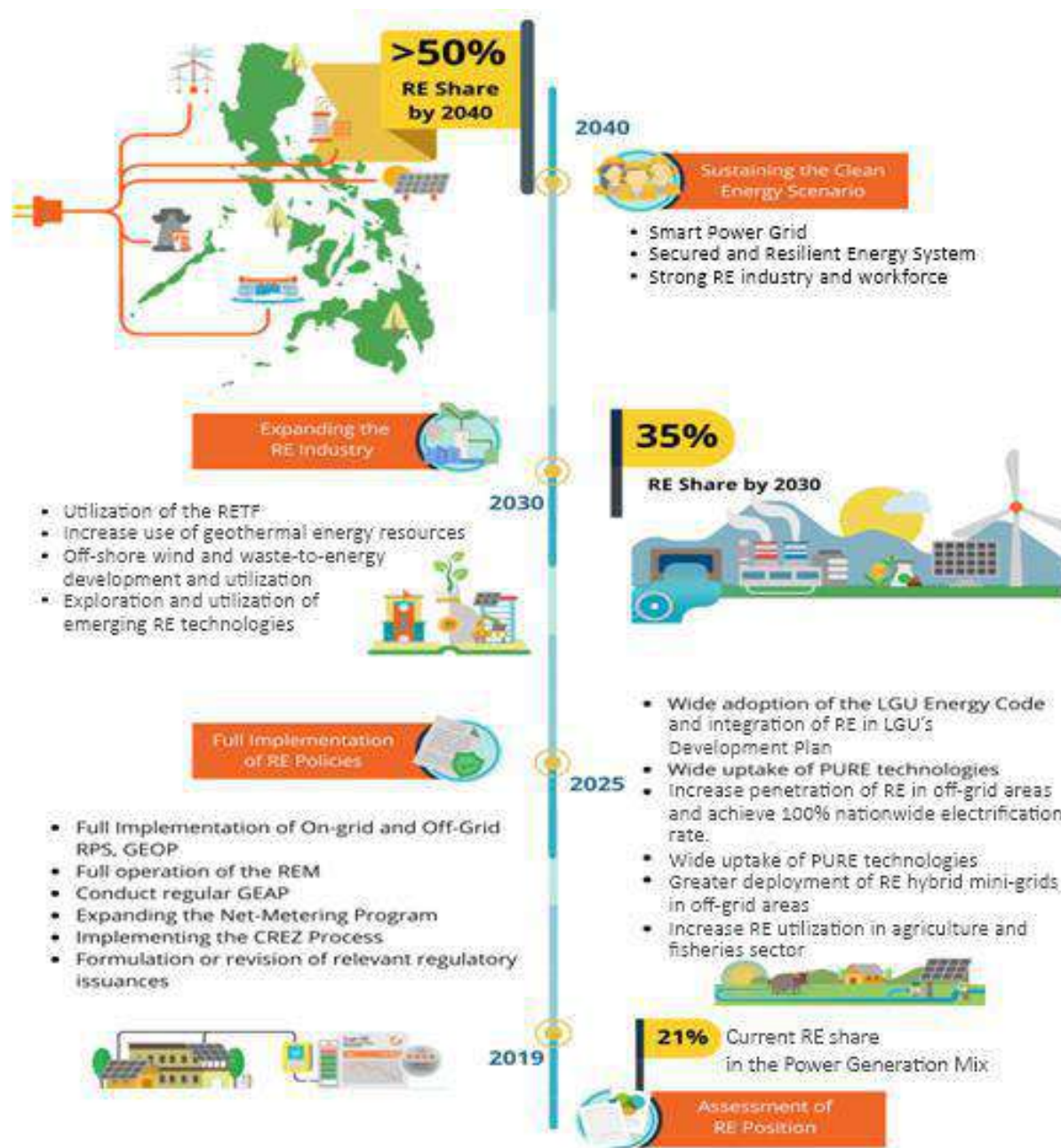


Figure 23. NREP, 2020-2040 Roadmap



Figure 24. Priority Activities for the First Five Years of the NREP, 2020-2040 Implementation

IV. Investment Themes and Financing Renewable Energy

A. Renewable Energy Investment Themes

Following are major areas in the RE industry where the private sector can participate. Business opportunities in the RE value chain, which include the supply or manufacturing of equipment and components, engineering, procurement, and construction, operation and maintenance, and technical advisory services, among others, are likely to expand.



Figure 25. RE Investment Themes

B. FINANCING RENEWABLE ENERGY

Financing has been an integral component of the growth of the RE industry. The Bangko Sentral ng Pilipinas (BSP) stressed the vital role that the financial sector plays in the matter of climate change and sustainability³⁵. On March 2020, the BSP released its Sustainable Finance Framework that sets granular expectations on the *“integration of sustainability principles, including those covering environment and social risk areas, in the corporate governance and risk management frameworks as well as in the strategic objectives and operations of banks”*. The framework further promotes green financing to facilitate the flow of funds towards green economic activities and climate change mitigation and adaptation projects, such as RE projects³⁶.

As mentioned in Chapter I, more than PhP 217B has been invested in RE projects since the promulgation of the RE Act. Implementing the RPS and other RE policies opens new financing opportunities for local commercial and development banks and other financial institutions. The Development Bank of the Philippines (DBP) and Land Bank of the Philippines (LandBank) are among the frontrunners in financing RE utility-scale and PURE projects (Box 2). Commercial banks have also offered innovative financing products in support of RE projects and companies, including for small and medium enterprises. The rise of green bond offerings has been encouraging and a testament to the growing interest and confidence in environmental projects. The Philippines issued the first green bond in the ASEAN in 2016 which is the AP Renewables’ USD 226M deal. As of August 2020, over USD 2.5B worth of green bonds has been issued and most of the proceeds were allocated to RE. AC Energy of Ayala Corporation is the top issuer with green bonds ranging from USD 75M to USD 400M. Four commercial banks namely the Bank of the Philippine Islands (BPI), Rizal Commercial Banking Corporation (RCBC), China Bank, and BDO Unibank have also issued green bonds in various currencies (Table 15)³⁷.

Table 15. Philippines Green Bond Issuances for RE

Issuer	Amount	Issue Date	Issuer Type	Use of Proceeds
Ayala Corporation (AC Energy Financing International Ltd.)	USD 60M	Jun 2020	Non-Financial Corporate	Energy
Ayala Corporation (AC Energy Financing International Ltd.)	USD 400M	Dec 2019	Non-Financial Corporate	Energy
BPI	CHF 100M (USD 108.6M)	Aug 2019	Financial Corporate	Energy, Buildings, Water, Waste
BPI	USD 300M	Sept 2019	Financial Corporate	Energy, Buildings, Water, Waste
Ayala Corporation (AC Energy Financing International Ltd.)	USD 110M	Feb 2019	Non-Financial Corporate	Energy
RCBC	PHP 15B (USD 309M)	Feb 2019	Financial Corporate	Energy, Buildings, Transport, Waste
Ayala Corporation (AC Energy Financing International Ltd.)	USD 75 M	Jan 2019	Non-Financial Corporate	Energy
Ayala Corporation (AC Energy Financing International Ltd.)	USD 225 M	Jan 2019	Non-Financial Corporate	Energy

³⁵ Retrieved from <https://www.bsp.gov.ph/Pages/MediaAndResearch/Speeches/2019/November/692.aspx>

³⁶ BSP. 2020. Circular No. 1085 Sustainable Finance Framework

³⁷ Climate Bonds Initiative, 2020, “Green Infrastructure Investments Opportunities: Philippines 2020 Report”, Asian Development Bank, ASEAN Catalytic Green Finance Facility, Securities and Exchange Commission Philippines

Issuer	Amount	Issue Date	Issuer Type	Use of Proceeds
China Banking Corp.	USD 150 M	Oct 2018	Financial Corporate	Energy, Buildings, Water, Waste
BDO Unibank	USD 150 M	Dec 2017	Financial Corporate	Energy, Buildings, Water
Aboitiz Equity Ventures (AP Renewables)	PHP 10.7 B (USD 220.4M)	Feb 2016	Non-Financial Corporate	Energy

Source: Climate Bonds Initiative

Meanwhile, risk-sharing financing mechanisms for RE projects, such as guarantees, remain limited. These risk-sharing products can be pivotal in securing financing. With the expansion of net-metering, opportunities for end-user financing for solar PV rooftop installations will also grow. There are also immense financing opportunities for off-grid rural electrification projects, such as RE mini-grids. Hence, exploring innovative financing and business models for RE-based power generation in remote, isolated, and missionary areas will gain importance. These areas have thinner demand profiles and volatile financial viability; however, serving these areas is the core of *AmBisyon Natin 2040* and will lead to significant socio-economic impacts. The COVID-19 pandemic affected RE investments in the past two years. As such, investors may be driven to a more conservative direction, given the sudden downturn of the economy. However, this may also be the opportune time to accelerate the green energy transition, as RE offers the best platform for recovery by creating jobs and opening business opportunities.

Box 2. Philippine Development Banks' RE Financing Programs

LandBank's Climate SMART Financing Programs³⁸

LandBank's Climate SMART program offers various financing products that support initiatives for climate change mitigation, adaptation, and resiliency. The Renewable and Efficient Alternative Energy Financing Program is LandBank's primary financing program for RE and energy efficiency projects. The program can extend up to 80% of the total project cost for private proponents, and up to 90% for government entities. Loans may be applied for project preparation, such as feasibility studies, detailed engineering design, and assessment studies (e.g., RE resource assessment), as well as for working capital and capital expenditures of proposed RE power generation projects. Its Go Green Inclusive Financing for SMEs and LGUs Program (GO GREEN) supports SMEs and LGUs save on electricity expenses using solar PV energy systems and other eligible energy saving products. It extends up to 90% of the project cost and only the object of financing will serve as the collateral. LandBank is also the first Philippine Direct Access Entity (DAE) of the Green Climate Fund (GCF). As a DAE, it can access the GCF to support climate change adaptation and mitigation interventions through the provision of appropriate financing instruments.

DBP's Green Financing Program³⁹

DBP has integrated environmental considerations in its operations and provides financing and technical assistance to ecologically sound projects. The Green Financing Program is DBP's umbrella program that aims to assist strategic sectors, industries and LGUs, incorporate climate change adaptation and mitigation measures, as well as disaster risk reduction strategies. Eligible RE projects include RE power generation, methane capture, WTE and waste-to-fuel, and rooftop solar PV for energy cost savings. The program can extend up to 80% of the project cost for private borrowers, and up to 90% of the total project cost for LGUs and other government entities.

³⁸ Retrieved from <https://www.landbank.com/loans/business-loan/powerwaterutilities/go-green-inclusive-financing-program>

³⁹ Retrieved from <https://www.dbp.ph/developmental-banking/environment-initiatives/green-financing-program/>

1. Renewable Energy Fiscal Incentives

The RE Act prescribed various fiscal incentives for RE project developers, suppliers, and manufacturers as enumerated in Figure 26.



Figure 26. Fiscal Incentives for RE

On 13 February 2020, the Guidelines on the Duty-Free Importation and Monitoring of the Utilization of RE Machinery, Equipment, Materials, and Spare Parts and their Transfer and Other Disposition was issued through DOE DC No. DC2020-02-0005. The guidelines adhere to the provisions of the RE Act which stipulates the exemption from tariff duties of the importation of RE machinery and spare parts and all shipments necessary for manufacturing or fabricating RE equipment and components. In addition, the DOE DC No. DC2021-12-0042⁴⁰ amending Sections 13 (E) and 18 (C) of DC 2009-05-008 or the IRR of the RE Act was issued on 24 December 2021. Said sections pertain to RE Developer's availment of the 10% corporate income tax rate (CIT) and the issuance of Certificate of Endorsement (COE) by the DOE, respectively. The amended Section 13 (E) defined the process for availing the CIT and the issuance of the corresponding COE, required the submission of Sworn Undertaking indicating that the savings generated from the reduced CIT were passed-on to electricity end-users in the form of lower power rates, and prescribed compliance monitoring of RE developers. Meanwhile, Section 18 (C) was amended requiring RE developers to secure COE per importation of RE equipment, materials, parts, and components.

⁴⁰ Entitled "Prescribing Amendments to Sections 13(E) and 18(C) of Department Circular No. DC2009-05-0008, Entitled Rules and Regulations Implementing Republic Act No. 9513, otherwise known as "The Renewable Energy Act of 2008"

2. Clean Energy Finance and Investment Mobilization Programme

To effectively implement the program, the CEFIM Philippine Steering Committee, and Technical Working Groups for RE and EE&C were created in 2022 through DOE DO No. DO2022-02-0003 and Special Order No. SO2022-02-0005. The CEFIM Programme is expected to deliver 4 broad activities as follows:

- a. **Clean Energy Finance and Investment Roadmap** to support the country's economic recovery plans and clean energy ambition through the identification of innovative financing solutions and effective investment vehicles to deepen local capital markets, bring in investors, and attract international capital towards clean energy;
- b. **Implementation of Support Activities** through the development of the Clean Energy Finance and Investment Database, and Clean Energy Finance Training Programme;
- c. **Investor Dialogues** to facilitate matchmaking opportunities and multi-stakeholder dialogues with domestic and foreign investors and financial institutions to help unlock finance and investment in clean energy; and
- d. **Regional Peer-Learning Activities** will be pursued together with Indonesia, Vietnam, Thailand, and other ASEAN countries.

3. End-User Financing for Rooftop Solar PV Systems

End-user financing facilitates the increased adoption of rooftop solar PV systems for net metering in the residential sector. The Pag-IBIG⁴¹ Fund extends multi-purpose loans to its qualified members to assist them with their financial and home improvement needs. The installation of rooftop solar PV can be qualified as a home improvement, making it easier for homeowners to participate in the net metering program. Development and commercial banks, as well as microfinance institutions, also offer similar end-user financing products that could support the deployment of solar PV systems. Some RE system providers also offer various schemes, such as the leasing model, that entails lower up-front costs for end-users.

4. Foreign Participation Limits in RE Projects

The ownership and operation of RE facilities, including the availment of fiscal and non-fiscal incentives, remain exclusive for local companies with at least 60% of capital owned by Filipinos. However, in 2019 and 2020, the local capitalization requirement for biomass and WTE⁴², and large-scale geothermal power plants with an initial investment of at least USD 50M and under FTAA⁴³, were lifted thereby allowing greater foreign participation in RE development.

⁴¹ Pagtutulungan sa Kinabukasan: Ikaw, Bangko, Industria at Gobyerno

⁴² Pursuant to the Omnibus Guidelines

⁴³ Pursuant to DC No. DC2020-11-0024 entitled "Adopting the Guidelines Governing the 3rd Open and Competitive Selection Process (OCSP3) in the Award of Renewable Energy Service Contract, and for Other Purposes"

RENEWABLE ENERGY FACILITIES AS OF 2021



Table 16. Additional Biomass Capacities Under the RE Act

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
1	Luzon	II	Isabela	San Mariano	Bagasse-Fired Cogeneration Power Plant	Green Future Innovations Inc.	19.00
2	Luzon	II	Isabela	Alicia	Rice Husk-Fired Biomass Power Plant Project	Isabela Biomass Energy Corporation	20.00
3	Luzon	II	Isabela	Burgos	15 MW Rice Husk-Fired Biomass Power Plant	Cagayan Biomass Energy Corporation	15.00
4	Luzon	III	Nueva Ecija	San Jose City	Rice Husk-Fired Biomass Power Plant Project	San Jose City I Power Corporation	12.00
5	Luzon	III	Bataan	Samal	MW Bataan 2020 Rice Husk-Fired Biomass Power Plant	Bataan 2020 Inc.	12.50
6	Luzon	III	Nueva Ecija	Talavera	12 MW Rice Husk-Fired Biomass Power Plant Project	Green Innovations for Tomorrow Corporation	12.00
7	Luzon	III	Tarlac	Tarlac City	Biogas Power Plant	Asian Carbon Neutral Power Corporation	2.00
8	Luzon	III	Nueva Ecija	San Jose City	Rice Husk-Fired Biomass Power Plant (Phase II)	San Jose City I Power Corporation	12.00
9	Luzon	III	Bataan	Orani	12 MW Biomass Power Plant Project	Cleangreen Energy Corporation	12.00
10	Luzon	III	Nueva Ecija	Llanera	12-MW Biomass Power Plant	Grass Gold Renewable Energy Corporation	12.00
11	Luzon	III	Nueva Ecija	Talavera	18 MW Biomass Power Plant	Green Innovations for Tomorrow Corporation	6.00
12	Luzon	III	Nueva Ecija	San Jose City	6 MW Multi-Feedstock Biomass Power Plant Project	V. S. Gripal Power Corporation	6.00
13	Luzon	IV-A	Rizal	Rodriguez	Montalban Landfill Methane Recovery and Power Generation Facility	Montalban Methane Power Corporation	8.325

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
14	Luzon	IV-A	Laguna	San Pedro	4 MW San Pedro Landfill Methane Recovery and Power Generation Facility	Bacavalley Energy Inc.	4.00
15	Luzon	IV-A	Batangas	Lian	8.8 MW Distillery Waste-Fired Biomass Power Plant	Aseagas Corporation	8.80
16	Luzon	IV-A	Batangas	Nasugbu	Bagasse-Fired Cogeneration Power Plant	Central Azucarera Don Pedro, Inc.	31.875
17	Luzon	NCR	Metro Manila	Quezon City	Payatas Landfill Methane Recovery and Power Generation Facility	Pangea Green Energy Philippines, Inc.	0.876
18	Luzon	NCR	Metro Manila	Quezon City	Payatas Landfill Methane Recovery and Power Generation Facility (Phase II: 640 kW)	Pangea Green Energy Philippines, Inc.	0.624
19	Luzon	V	Camarines Sur	Pili	5 MW BBEC Rice Husk-Fired Biomass Power Plant Project	Bicol Biomass Energy Corporation	5.00
20	Visayas	VI	Negros Occidental	Talisay City	Bagasse-Fired Cogeneration Power Plant	First Farmers Holding Corp.	21.00
21	Visayas	VI	Negros Occidental	San Carlos City	8 MW SCBI Multi-Feedstock Cogeneration Power Plant	San Carlos Bioenergy Inc.	8.00
22	Visayas	VI	Iloilo	Passi City	Bagasse-Fired Cogeneration Power Plant	Central Azucarera de San Antonio	15.00
23	Visayas	VI	Negros Occidental		Bagasse-Fired Biomass Cogeneration Power Plant Project-Phase 2	Universal Robina Corporation	30.00
24	Visayas	VI	Negros Occidental	Kabankalan	46 MW URC Bagasse-Fired Biomass Cogeneration Power Plant Project-Phase 1	Universal Robina Corporation	16.00
25	Visayas	VI	Negros Occidental	Silay City	Bagasse Cogeneration Power Plant	Hawaiian Philippine Company	12.00

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
26	Visayas	VI	Negros Occidental	Victorias City	Bagasse-Fired Cogeneration Power Plant	Victorias Milling Company Inc.	34.00
27	Visayas	VI	Negros Occidental		28.58 MW Biomass Power Plant	Hawaiian-Philippine Company	20.58
28	Visayas	VI	Negros Occidental	Victorias City	63 MW Biomass Expansion Project	Victorias Milling Company, Inc.	40.00
29	Visayas	VI	Negros Occidental	Binalbagan	48.5 MW Biomass Cogeneration Plant Project	BISCOM, Inc.	48.50
30	Visayas	VII	Negros Oriental	Bais City	25 MW Biomass Cogeneration Plant	Central Azucarera de Bais	25.00
31	Mindanao	X	Bukidnon	Maramag	Biomass Cogeneration Plant	Crystal Sugar Company, Inc.	35.90
32	Mindanao	ARMM	Maguindanao	Sultan Kudarat	Rice Husk-Fired Biomass Power Plant	Lamsan Power Corporation	15.00
33	Mindanao	ARMM	Maguindanao	Buluan	Multi-Feedstock Biomass Power Plant	Green Earth Enersource Corporation	3.50
34	Mindanao	XII	South Cotabato	Tantangan	Biomass Cogeneration Plant	Biotech Farms, Inc.	5.96
35	Mindanao	XII	South Cotabato	Banga	Biomass Cogeneration Plant	Biotech Farms, Inc.	3.90
36	Mindanao	XII	South Cotabato	Banga	12.39 MW Biogas Power Plant	Biotech Farms, Inc.	8.45
37	Mindanao	XII	South Cotabato		6 MW Biomass Power Plant	Surallah Power Generation, Inc.	6.00
Total							550.04

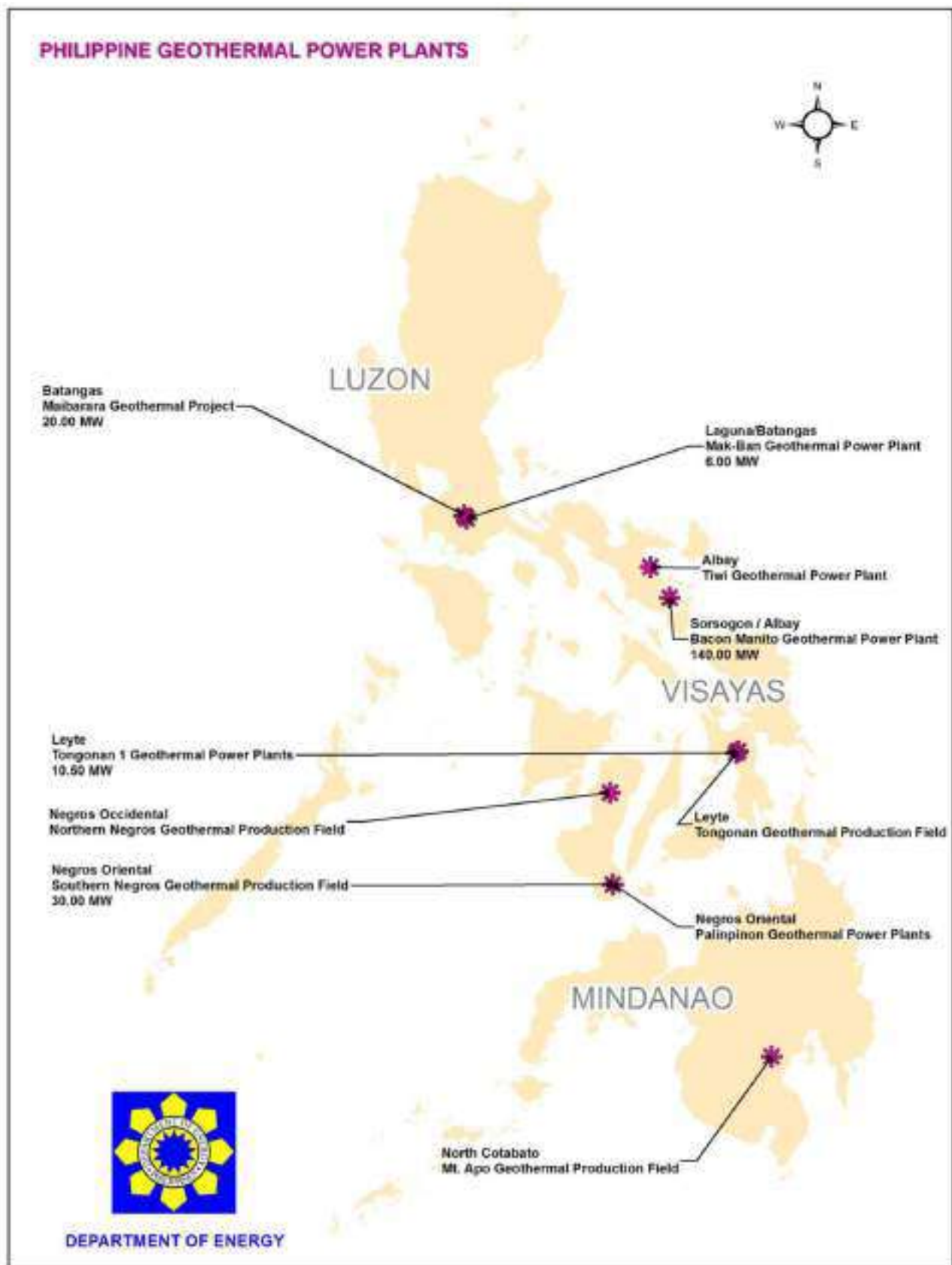


Figure 28. Map of Geothermal Power Plants in the Philippines

Table 17. Additional Geothermal Capacities Under the RE Act

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
1	Luzon	IV-A	Batangas	Santo Tomas	Maibarara 1 Geothermal Power Plant	Maibarara Geothermal Inc.	20.00
2	Luzon	IV-A	Batangas	Santo Tomas	Maibarara 2 Geothermal Power Plant	Maibarara Geothermal Inc.	12.00
3	Luzon	V	Sorsogon/ Albay		Bacon Manito Geothermal Power Plant	Bac-man Geothermal Inc.	60.000 60.000 20.000 10.000
4	Visayas	VII	Negros Oriental	Valencia	Southern Negros Geothermal Production Field -Nasulo Geothermal Power Plant	Energy Development Corporation	30.00
5	Visayas	VIII	Leyte	Kananga	Tongonan 1 Geothermal Power Plant	Green Core Geothermal, Inc.	41.000 41.000 41.000 10.5
Total							345.5

Table 18. Legacy Geothermal Power Plants with Service/Operating Contracts

No.	Project Name	Province	City / Municipality	Owner / Service Contractor	Installed Capacity (MW)		
1	Tiwi Geothermal Power Plant	Albay	Tiwi	AP Renewables, Inc.	60.000		
					60.000		
					55.000		
					55.000		
2	Mak-Ban Geothermal Power Plant	Laguna	Bay	AP Renewables, Inc.	57.000		
					57.000		
		Laguna	Calauan		63.200		
					63.200		
		Laguna	Calauan		55.000		
					55.000		
		Laguna	Bay		20.000		
					20.000		
		Batangas	Sto. Tomas		20.000		
					20.000		
3	Northern Negros Geothermal Production Field	Negros Occidental	Bago, Murcia	Energy Development Corporation	3.000		
							3.000
					Laguna	Bay	3.000
							3.000
4	Palinpinon Geothermal Power Plants	Negros Oriental	Valencia	Green Core Geothermal Inc.	3.730		

No.	Project Name	Province	City / Municipality	Owner / Service Contractor	Installed Capacity (MW)
					34.120
					34.120
					34.120
					34.120
					5.500
					77.500
					77.500
			Ormoc City		77.500
5	Tongonan Geothermal Production Field	Leyte		Energy Development Corporation	16.700
			Kananga		60.000
					60.000
					60.000
					6.500
					6.500
					6.500
					6.500
					6.500
					6.500
6	Mt. Apo Geothermal Production Field	North Cotabato	Kidapawan City	Energy Development Corporation	54.240
					54.240
Total					1,763.07



Table 19. Additional Solar Capacities Under the RE Act

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
1	Luzon	I	Ilocos Norte	Burgos	Burgos Solar Power Project Phase I	Energy Development Corporation	4.10
2	Luzon	I	Ilocos Norte	Burgos	Burgos Solar Power Project Phase II	Energy Development Corporation	2.66
3	Luzon	I	Ilocos Norte	Currimao	Currimao Solar Power Project	Mirae Asia Energy Corporation	20.00
4	Luzon	I	Ilocos Norte	Sarrat	Sarrat Solar Power Project	Bosung Solartec, Inc.	1.00
5	Luzon	III	Pampanga	Mexico	Pampanga Solar Power Project Phase I	RASLAG Corp.	10.00
6	Luzon	III	Pampanga	Mexico	Pampanga Solar Power Project II	RASLAG Corp.	13.14
7	Luzon	III	Bataan	Hermosa	Hermosa Solar Power Project	YH Green Energy Incorporated	14.51
8	Luzon	III	Bataan	Mariveles	Bataan Solar Power Project	Next Generation Power Technology Corp. (NGPT)	18.00
9	Luzon	III	Bataan	Morong	Morong Solar Power Project	SPARC Solar Powered Agri-Rural Communities Corporation	5.02
10	Luzon	III	Bataan	Morong & Hermosa	Sta. Rita Solar Power Project Phase I	Jobin-Sqm, Inc.	7.14
11	Luzon	III	Bulacan	San Ildefonso	Bulacan III Solar Power Project	Bulacan Solar Energy Corp.	15.00
12	Luzon	III	Bulacan	San Rafael	San Rafael Solar Power Project	SPARC Solar Powered Agri-Rural Communities Corporation First	3.82
13	Luzon	III	Nueva Ecija	Cabanatuan City	Cabanatuan Solar Power Project	Cabanatuan Renewable Ventures, Inc.	10.26
14	Luzon	III	Pampanga	Clark Special Economic Zone	Clark Solar Power Project	Enfinity Philippines Renewable Resources Inc.	22.33

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
15	Luzon	III	Tarlac	Tarlac City , San Jose and Capas	Armenia Solar Power Project	nv vogt Philippines Solar Energy Three, Inc. (nv vogt 3)	8.84
16	Luzon	III	Tarlac	Tarlac City and Victoria	Dalayap Solar Power Project	nv vogt Philippines Solar Energy Four, Inc. (nv vogt 4)	7.48
17	Luzon	III	Tarlac	Tarlac City	Tarlac Solar Power Project	PetroSolar Corporation	50.07
18	Luzon	III	Zambales	Palauig	Palauig Solar Power Project	SPARC Solar Powered Agri-Rural Communities Corporation	5.02
19	Luzon	III	Bataan	Morong & Hermosa	Sta. Rita Solar Power Project Phase II	Jobin-Sqm, Inc.	25.197
20	Luzon	III	Pampanga	Mabalacat	Dau Solar Power Plant	Solar Pacific Citysun Corporation	0.238
21	Luzon	III	Tarlac	Concepcion	Concepcion 1 Solar Power Plant	Solar Philippines Tarlac corporation	100.613
22	Luzon	III	Bulacan	San Miguel	San Miguel Solar Power Project	Powersource First Bulacan Solar Inc.	80.923
23	Luzon	IV-A	Cavite	Rosario and General Trias	Cavite Economic Zone Solar Power Project	Majestics Energy Corporation	41.30
24	Luzon	IV-A	Laguna	Binan City	Central Mall Biñan Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	0.700
25	Luzon	IV-A	Batangas	Calatagan	Calatagan Solar Power Project	Solar Philippines Calatagan Corporation	63.30
26	Luzon	IV-A	Batangas	Lian	Lian Solar Power Project	Absolut Distillers, Inc.	2.04
27	Luzon	IV-A	Laguna	Sta. Rosa	CW Home Depot Solar Power Project	CW Marketing & Development Corporation	1.675
28	Luzon	IV-B	Palawan	Puerto Princesa	Palawan Solar Power Project	Sabang Renewable Energy Corp.	1.458

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
29	Luzon	IV-B	Romblon	Odiongan	Tumingad Island Solar Power Project	Suweco Tablas Energy Corporation	5.880
30	Luzon	NCR	Metro Manila	Quezon City	SM North Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	1.50
31	Luzon	NCR	Metro Manila	Valenzuela City	Valenzuela Solar Power Project	Valenzuela Solar Energy Inc.	8.50
32	Luzon	NCR	Metro Manila	Pasay City	SM Mall of Asia Solar Power Project	Solar Philippines Commercial Rooftop Projects, Inc.	2.686
33	Luzon	NCR	Metro Manila	Valenzuela City	Ecopark Isla Solar Power Project	Ecopark Energy of Valenzuela Corp.	4.700
34	Luzon	NCR & III	Metro Manila and Bulacan	Valenzuela City and Obando-Meycauayan	Ecopark Tagalog Solar Power Project	Ecopark Energy of Valenzuela Corp.	16.000
35	Visayas	VI	Negros Occidental	Kabankalan City	Kabankalan Solar Power Project	Solar Pacific Citysun Corporation	0.605
36	Visayas	VI	Negros Occidental	Victorias City	Victorias Solar Power Project	Solar Pacific Citysun Corporation	0.635
37	Visayas	VI	Aklan	Malay	Boracay Solar Power Project	Solar Pacific Citysun Corporation	0.36
38	Visayas	VI	Aklan	Kalibo	Kalibo Solar Power Project	Solar Pacific Citysun Corporation	0.22
39	Visayas	VI	Iloilo	Iloilo City	Gaisano Iloilo Solar Rooftop Project	EDC Siklab Power Corporation	1.03
40	Visayas	VI	Negros Occidental	Bacolod City	CityMall Mandalangan Solar Power Plant	Solar Pacific Citysun Corporation	0.634
41	Visayas	VI	Negros Occidental	San Carlos City	San Carlos Solar Power Plant Phase I-A (SACASOL I-A)	San Carlos Solar Energy Inc.	13.00
42	Visayas	VI	Negros Occidental	San Carlos City	San Carlos Solar Power Project I-B (SACASOL I-B)	San Carlos Solar Energy Inc.	9.00
43	Visayas	VI	Negros Occidental	San Carlos City	San Carlos Solar Power Project Phase I-C and I-D (SACASOL I-C&I-D)	San Carlos Solar Energy Inc.	23.00

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
44	Visayas	VI	Iloilo	Iloilo City	Miag-ao Solar Power Project	Cosmo Solar Energy, Inc.	5.67
45	Visayas	VI	Negros Occidental	Bais City	Bais Solar Power Project	Monte Solar Energy Inc.	18.00
46	Visayas	VI	Negros Occidental	Cadiz City	Cadiz Solar Power Project	Helios Solar Energy Corp.	132.50
47	Visayas	VI	Negros Occidental	La Carlota City	Islasol Solar Power Project (ISLASOL II)	Negros Island Solar Power Inc. (ISLASOL)	32.00
48	Visayas	VI	Negros Occidental	Manapla	Manapla Solar Power Project	Negros Island Solar Power Inc. (ISLASOL)	48.00
49	Visayas	VI	Negros Occidental	San Carlos City	SACASUN Solar Power Project	San Carlos Sun Power Inc.	58.98
50	Visayas	VI	Negros Occidental	Silay City	Silay Solar Power Project	Silay Solar Power, Inc.	25.01
51	Visayas	VII	Negros Oriental	Dumaguete City	Dumaguete Solar Power Project	Solar Pacific Citysun Corporation	0.265
52	Visayas	VII	Cebu	Toledo	Toledo Solar Power Project	First Toledo Solar Energy Corp.	60.00
53	Visayas	VIII	Leyte	Ormoc	Ormoc Solar Power Project	Phil. Solar Farm-Leyte, Inc.	30.00
54	Visayas	VIII	Leyte	Palo	Palo Solar Power Project	Sulu Electric Power and Light (Phils.), Inc.	49.81
55	Mindanao	X	Misamis Oriental	Villanueva	Kirahon Solar Power Project	Kirahon Solar Energy Corporation	1.082 12.5
56	Mindanao	X	Bukidnon	Kibawe	Kibawe Solar Power Project	Asian Greenenergy Corp.	10.49
57	Mindanao	XI	Davao del Sur	Digos City	Digos Solar Power Project	Enfinity Philippines Renewable Resources Fourth, Inc.	28.59
58	Mindanao	XI	Davao del Norte	Tagum City	Tagum Solar Power Project	Solar Pacific Citysun Corporation	1.11
59	Mindanao	XII	South Cotabato	Surallah	Centrala Solar Power Project	nv vogt Philippines Solar Energy One, Inc.	6.23
60	Mindanao	XII	South Cotabato	General Santos City	Santos Solar Power Plant	Astronergy Development GenSan Inc.	24.96
Total							1,169

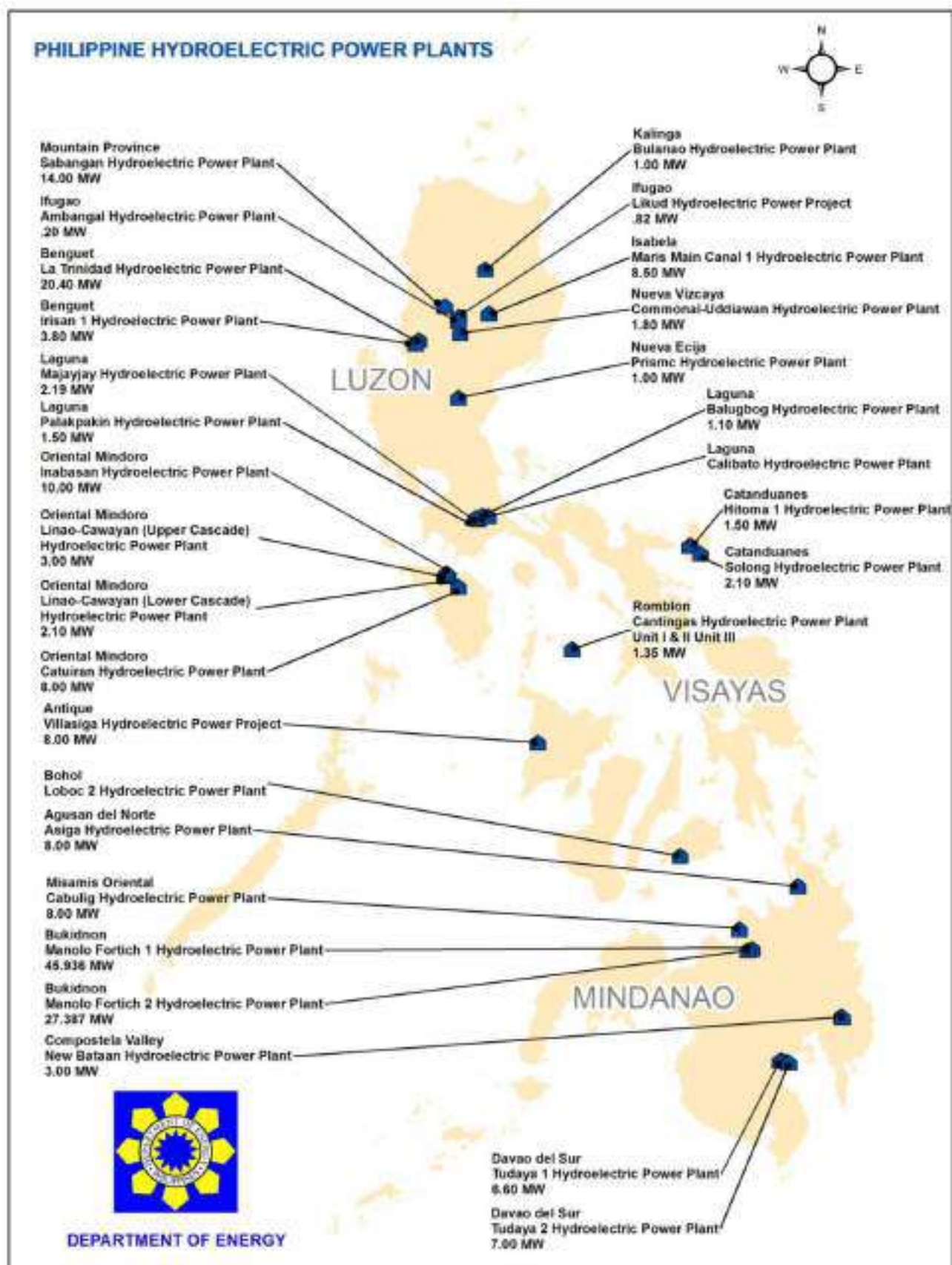


Figure 30. Map of Hydropower Power Plants in the Philippines

Table 20. Additional Hydropower Capacities Under the RE Act

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
1	Luzon	CAR	Ifugao	Kiangan	Ambangal Hydroelectric Power Plant	Provincial Government of Ifugao	0.20
2	Luzon	CAR	Benguet	Tuba	Irisan 1 Hydroelectric Power Plant	Hedcor, Inc.	3.80
3	Luzon	CAR	Mountain Province	Sabangan	Sabangan Hydroelectric Power Project	Hedcor Sabangan, Inc.	14.00
4	Luzon	CAR	Ifugao	Asipulo & Kiangan	Likud Hydroelectric Power Project	Provincial Government of Ifugao	0.82
5	Luzon	CAR	Kalinga	Tabuk	Bulanao Hydroelectric Power Plant	DPJ Engineers and Consultants	1.00
6	Luzon	CAR	Benguet	La Trinidad	La Trinidad Hydroelectric Power Plant	Hedcor, Inc.	20.40
7	Luzon	II	Nueva Vizcaya	Solano	Commonal-Uddiawan Hydroelectric Power Plant	Smith Bell Mini-Hydro Corp.	1.80
8	Luzon	II	Isabela	San Mateo	Lateral B Hydroelectric Power Plant	National Irrigation Administration	0.045
9	Luzon	II	Isabela	Ramon	Maris Main Canal 1 Hydroelectric Power Plant	SN Aboitiz Power - Magat, Inc.	8.50
10	Luzon	III	Nueva Ecija	Rizal	Prismc Hydroelectric Power Plant	PNOC-Renewables Corporation	1.00
11	Luzon	IV-A	Laguna	Nagcarlan	Balugbog Hydroelectric Power Plant	Philippine Power and Development Company	1.10
12	Luzon	IV-A	Laguna	San Pablo City	Palakpakin Hydroelectric Power Plant	Philippine Power and Development Company	1.50
13	Luzon	IV-A	Laguna	Majayjay	Majayjay Hydroelectric Power Plant	Majayjay Hydropower Corporation	2.19
14	Luzon	IV-A	Laguna	San Pablo City	Calibato Hydroelectric Power Plant	Philippine Power and Development Corporation	0.30

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
15	Luzon	IV-B	Romblon	San Fernando, Sibuyan Island	Cantingas Hydroelectric Power Plant Unit I & II	Cantingas Mini-Hydro Power Corporation	0.90
					Unit III		0.45
17	Luzon	IV-B	Oriental Mindoro	Baco	Linao-Cawayan (Lower Cascade) Hydroelectric Power Plant	Oriental Mindoro Electric Cooperative, Inc.	2.10
18	Luzon	IV-B	Oriental Mindoro	Baco	Linao-Cawayan (Upper Cascade) Hydroelectric Power Project	Oriental Mindoro Electric Cooperative, Inc.	3.00
19	Luzon	IV-B	Oriental Mindoro	San Teodoro	Inabasan Hydroelectric Power Plant	Ormin Power, Inc.	10.00
20	Luzon	IV-B	Oriental Mindoro	Naujan	Catuiran Hydroelectric Power Plant	Catuiran Hydropower Corporation	8.00
21	Luzon	V	Catanduanes	Caramoran	Hitoma 1 Hydroelectric Power Plant	Sunwest Water & Electric Company, Inc.	1.50
22	Luzon	V	Catanduanes	San Miguel	Solong Hydroelectric Power Plant	Sunwest Water & Electric Company, Inc.	2.10
23	Visayas	VI	Antique	Bugasong	Villasiga Hydroelectric Power Project	Sunwest Water and Electric Company 2, Inc.	8.00
24	Visayas	VII	Bohol	Loboc	Loboc 2 Hydroelectric Power Plant	Sta. Clara Power Corporation	1.20
25	Mindanao	X	Misamis Oriental	Claveria	Cabulig Hydroelectric Power Plant	Mindanao Energy Systems, Inc.	8.00
26	Mindanao	X	Bukidnon	Santiago	Manolo Fortich 1 Hydroelectric Power Plant	Hedcor Bukidnon, Inc.	45.936
27	Mindanao	X	Bukidnon	Santiago	Manolo Fortich 2 Hydroelectric Power Plant	Hedcor Bukidnon, Inc.	27.387

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
28	Mindanao	XI	Davao del Sur	Sta. Cruz	Sibulan B Hydroelectric Power Plant	Hedcor, Inc.	26.00
29	Mindanao	XI	Davao del Sur	Sta. Cruz	Sibulan A Hydroelectric Power Plant	Hedcor, Inc.	16.50
30	Mindanao	XI	Davao del Sur	Sta. Cruz	Tudaya 1 Hydroelectric Power Plant	Hedcor Sibulan, Inc.	6.60
31	Mindanao	XI	Davao del Sur	Sta. Cruz	Tudaya 2 Hydroelectric Power Plant	Hedcor Tudaya, Inc.	7.00
32	Mindanao	XI	Compostela Valley	New Bataan	New Bataan Hydroelectric Power Plant	Euro Hydro Power (Asia) Holdings, Inc.	3.00
33	Mindanao	XIII	Agusan del Norte	Santiago	Asiga Hydroelectric Power Plant	Asiga Green Energy Corporation	8.00
Total							240.98

Table 21. Hydropower Legacy Plants with Service / Operating Contracts

No	Plant Name / Profile	Province	Municipality	Owner/Service Contract Holder	Installed Capacity (MW)
1	Agusan	Bukidnon	Manolo Fortich	FG Bukidnon Power Corporation	1.60
2	Ambuklao	Benguet	Bokod	SN Aboitiz Power - Benguet, Inc.	104.55
3	Amlan	Negros Oriental	Dumaguete City	Amlan Hydroelectric Power Corporation	0.80
4	Ampohaw	Benguet	Sablan	HEDCOR, Inc.	8.00
5	Bakun AC	Ilocos Sur	Alilem	Luzon Hydro Corporation	70.00
6	Barit 1	Camarines Sur	Buhi	People's Energy Services, Inc.	1.80
7	Bineng 3	Benguet	La Trinidad	HEDCOR, Inc.	4.50
8	Binga	Benguet	Itogon	SN Aboitiz Power - Benguet, Inc.	140.00
9	Bubunawan	Bukidnon	Baungon	Bubunawan Power Company Inc.	7.00
10	Cantingas	Romblon	San Fernando	Romblon Electric Cooperative, Inc.	1.35
11	F. L. Singit	Benguet	Bakun	HEDCOR, Inc.	5.90
12	Hitoma 1	Catanduanes	Caramoran	Sunwest Water & Electric Company, Inc.	1.50
13	Irisan 3	Benguet	Tuba	HEDCOR, Inc.	1.20
14	Loboc	Bohol	Loboc	Sta. Clara Power Corporation	1.20
15	Lon-oy	Benguet	Bakun	HEDCOR, Inc.	3.60
16	Lower Labay	Benguet	Bakun	HEDCOR, Inc.	2.40
17	Magat	Ifugao/Isabela	Alfonso Lista/Ramon	SN Aboitiz Power - Magat, Inc.	360.00

No	Plant Name / Profile	Province	Municipality	Owner/Service Contract Holder	Installed Capacity (MW)
18	Magat A	Isabela	Ramon	I-Magat Renewable Energy Corporation	1.30
19	Masiway	Nueva Ecija	Pantabangan	First Gen Hydro Power Corporation	12.00
20	Panoon	Bukidnon	Impasugong	Gerphil Renewable Energy, Inc.	0.23
21	Pantabangan	Nueva Ecija	Pantabangan	First Gen Hydro Power Corporation	120.80
22	Sal-angan	Benguet	Itogon	HEDCOR, Inc.	2.40
23	Sevilla	Bohol	Sevilla	BOHECO 1 Sevilla Mini Hydro Corporation	2.50
24	Sibulan A	Davao del Sur	Sta. Cruz	HEDCOR Sibulan, Inc.	16.50
25	Sibulan B	Davao del Sur	Sta. Cruz	HEDCOR Sibulan, Inc.	26.00
26	Solong	Catanduanes	San Miguel	Sunwest Water & Electric Company, Inc.	2.10
27	Talomo 1	Davao City	Calinan	HEDCOR, Inc.	1.00
28	Talomo 2	Davao City	Tugbok	HEDCOR, Inc.	0.60
29	Talomo 2A	Davao City	Tugbok	HEDCOR, Inc.	0.65
30	Talomo 2B	Davao City	Tugbok	HEDCOR, Inc.	0.30
31	Talomo 3	Davao City	Catalunan Pequeno	HEDCOR, Inc.	1.92
32	Upper Cawayan (Cawayan 1)	Sorsogon	Sorsogon	Sunwest Water & Electric Company, Inc. - Sorsogon II Electric Cooperative, Inc.	0.60
Total					904.30

Table 22. Hydropower Legacy Plants Without Contract

No.	Plant Name	Province	Municipality	Owner / Operator	Installed Capacity (MW)
1	Agua Grande - Mabogabog	Ilocos Norte	Pagudpod	Ilocos Norte Electric Cooperative, Inc.	4.50
2	Agus I	Lanao del Sur	Marawi City	Power Sector Assets and Liabilities Management Corp.	80.46
3	Agus II	Lanao del Sur	Saguiaran	Power Sector Assets and Liabilities Management Corp.	180.00
4	Agus IV	Lanao del Sur	Nangka	Power Sector Assets and Liabilities Management Corp.	158.10
5	Agus V	Lanao del Sur	Iligan City	Power Sector Assets and Liabilities Management Corp.	55.25
6	Agus VI	Lanao del Sur	Iligan City	Power Sector Assets and Liabilities Management Corp.	219.00

No.	Plant Name	Province	Municipality	Owner / Operator	Installed Capacity (MW)
7	Agus VII	Lanao del Sur	Iligan City	Power Sector Assets and Liabilities Management Corp.	54.00
8	Angat	Bulacan	Norzagaray	Angat Hydropower Corporation	246.00
9	Baligatan	Isabela	Ramon	National Irrigation Administration	6.00
10	Balongbong	Catanduanes	Bato	First Catanduanes Electric Cooperative, Inc.	1.80
11	Basak	Cebu	Dumanjug	Cebu 1 Electric Cooperative, Inc.	0.50
12	Botocan	Laguna	Majayjay	CBK Power Company Limited	23.00
13	Caliraya	Laguna	Lumban	CBK Power Company Limited	35.00
14	Casecnan	Nueva Ecija	Pantabangan	California Energy Casecnan Water and Energy Company, Inc.	165.00
15	Inarihan	Camarines Sur	Naga	Bicol Hydro Corporation	0.96
16	Janopol	Bohol	Balilihan	Bohol I Electric Cooperative, Inc.	5.00
17	Kalayaan Phase I & II	Laguna	Kalayaan	CBK Power Company Limited	736.00
18	Mantayupan	Cebu	Barili	Cebu 1 Electric Cooperative, Inc.	0.50
19	Matutinao	Cebu	Dumanjug	Cebu 1 Electric Cooperative, Inc.	0.72
20	Pulangi IV	Bukidnon	Maramag	Power Sector Assets and Liabilities Management Corp.	255.00
21	San Juan River	Laguna	Kalayaan	Kalayaan Ice Plant	0.15
22	San Luis	Aurora	San Luis	LGU-San Luis, Aurora	0.80
23	San Roque	Pangasinan	San Manuel	San Roque Power Corporation	411.00
Total					2,638.74

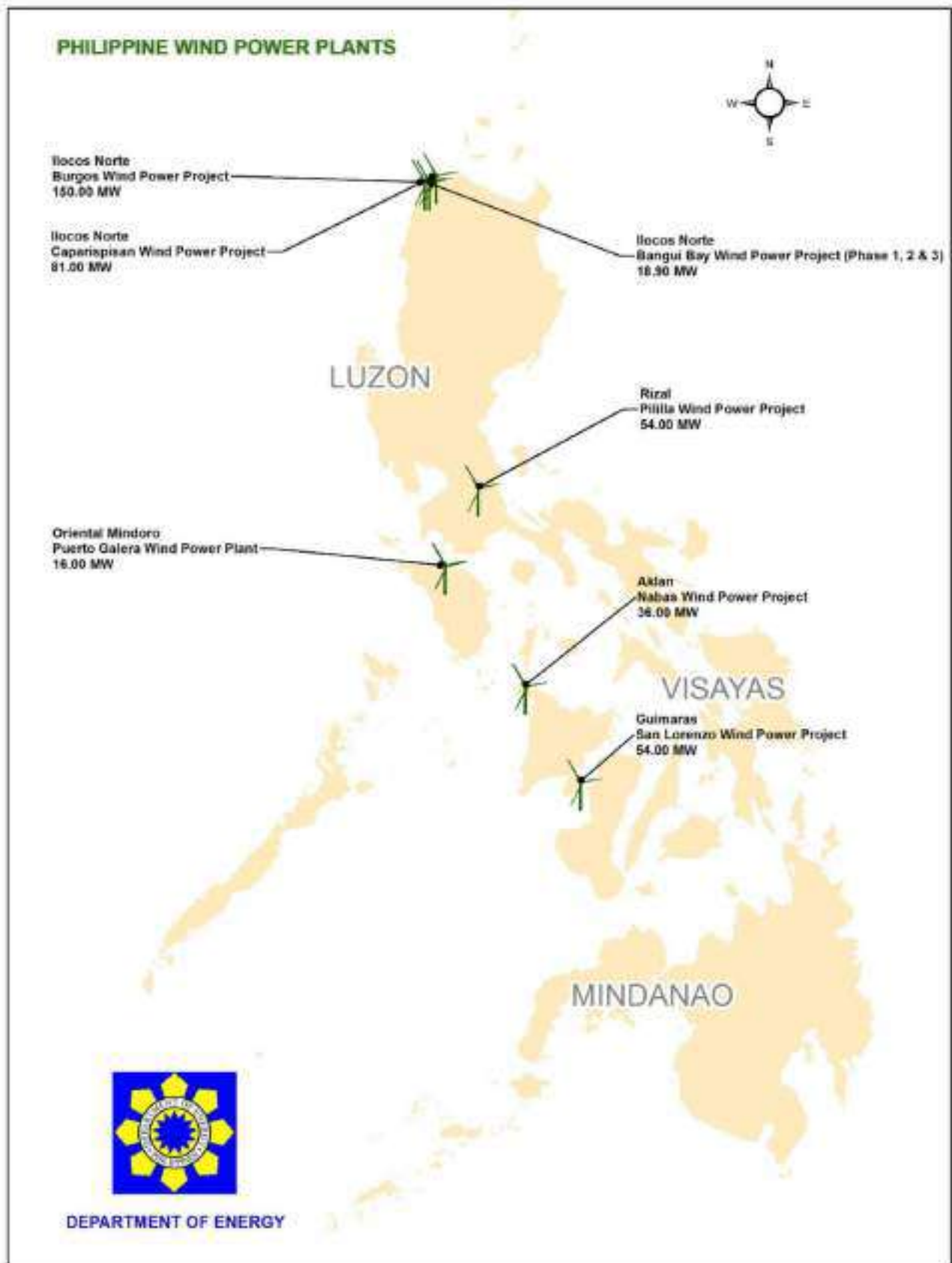


Figure 31. Map of Wind Power Plants in the Philippines

Table 23. Additional Wind Capacities Under the RE Act

No.	Island / Grid	Region	Province	City / Municipality	Project Name	Company Name	Installed Capacity (MW)
1	Luzon	I	Ilocos Norte	Burgos	Burgos Wind Power Project	EDC Burgos Wind Power Corporation	150.00
2	Luzon	I	Ilocos Norte	Pagudpud	Caparispisan Wind Power Project	North Luzon Renewable Energy Corporation	81.00
3	Luzon	I	Ilocos Norte	Bangui	Bangui Bay Wind Power Project (Phase 1, 2 & 3)	NorthWind Power Development Corporation	Phase 1 – 24.750 MW Phase 2 - 8.250 MW Phase 3 - 18.900 MW
4	Luzon	IV-A	Rizal	Pililla	Pililla Wind Power Project	Alternergy Wind One Corporation	54.00
5	Luzon	IV-B	Oriental Mindoro	Puerto Galera	Puerto Galera Wind Power Plant	Philippine Hybrid Energy Systems, Inc.	16.00
6	Visayas	VI	Guimaras	San Lorenzo	San Lorenzo Wind Power Project	Trans-Asia Renewable Energy Corporation	54.00
7	Visayas	VI	Aklan	Nabas, Malay	Nabas Wind Power Project	PetroWind Energy Inc.	36.00
Total							442.90

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DEPARTMENT OF ENERGY

Energy Center, Rizal Drive Corner 34th Street, Bonifacio Global City

Taguig City, Philippines, 1632

Tel. Nos.: 8840-2173; 8479-2900 local 207, 338, 415

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