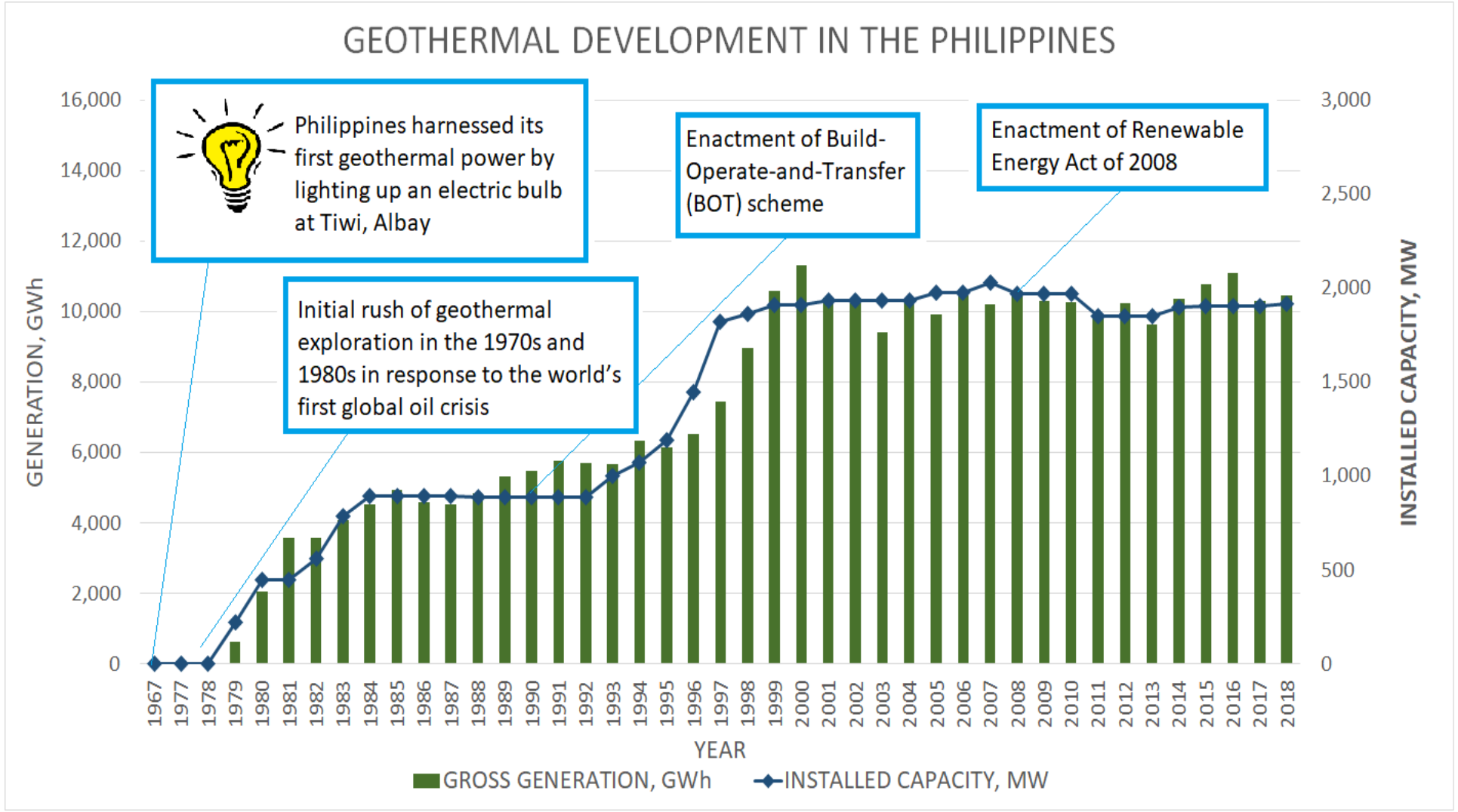
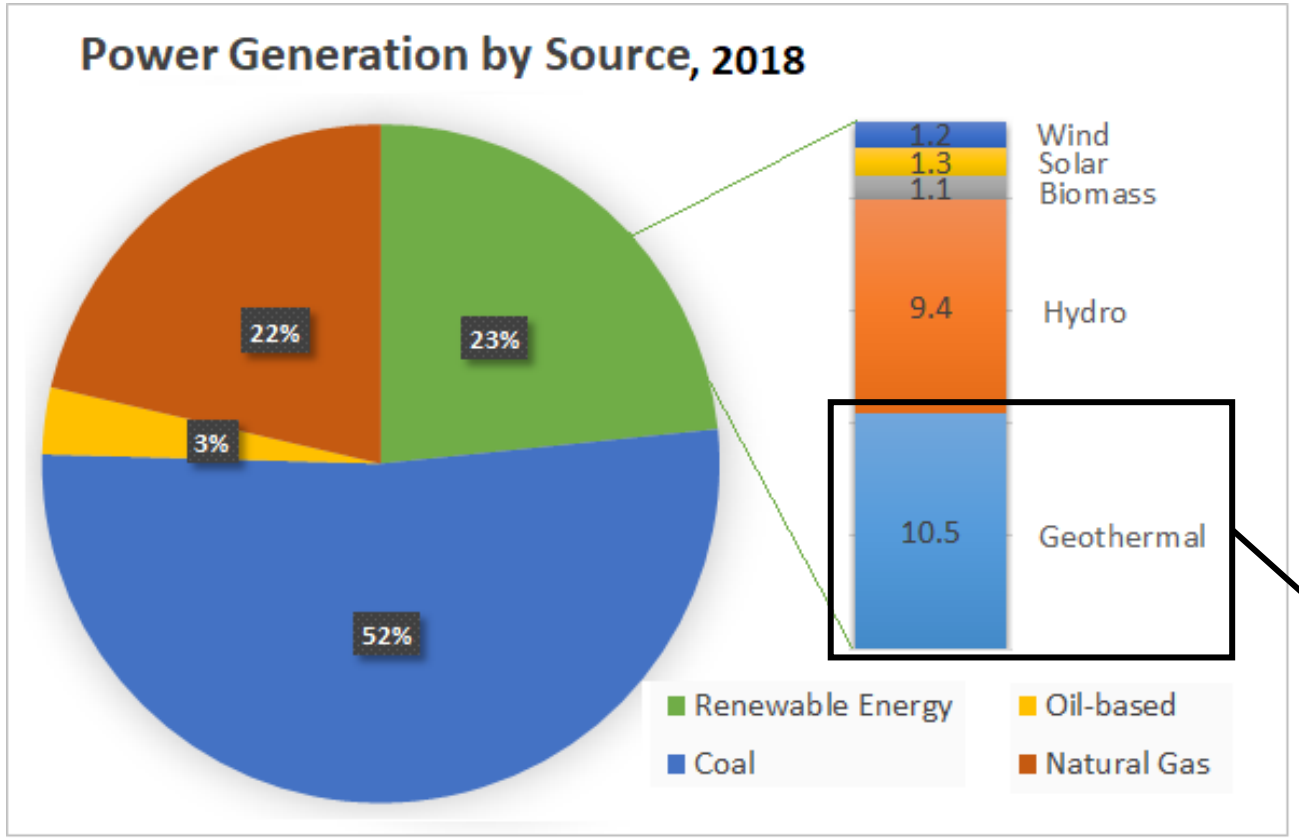
Renewable Energy Development in the Philippines: Emphasis on Geothermal Energy


GEOTHERMAL DEVELOPMENT IN THE PHILIPPINES
Philippines harnessed its first geothermal power by lighting up an electric bulb at Tiwi, Albay
Initial rush of geothermal exploration in the 1970s and 1980s in response to the world's first global oil crisis
Enactment of Build-Operate-and-Transfer (BOT) scheme
Enactment of Renewable Energy Act of 2008
GENERATION, GWh
INSTALLED CAPACITY, MW
YEAR
GROSS GENERATION, GWh
INSTALLED CAPACITY, MW

GEOTHERMAL PRODUCING FIELDS IN THE PHILIPPINES

1,918 MW
Total Installed Capacity

PHILIPPINE GEOTHERMAL PERFORMANCE FOR 2018



TOTAL INSTALLED CAPACITY (MW): 1918.16 MW

TOTAL GENERATION (GWh): 10,435 GWh

1 out of 10 light bulbs is powered by geothermal energy!!!

GEOTHERMAL CAPACITY ADDITIONS SINCE ENACTMENT OF RA9513

First Geothermal Capacity installation since RE Law enactment – the ***20 MW Maibarara Geothermal Power Project (MGPP)*** was able to convert into commercial operations on February 8, 2014.

Other Geothermal Capacity additions:

*Expansion / rehabilitation projects:

30 MW Nasulo Geothermal Power Plant – July 21, 2014

10 MW Bacman 1 rehabilitation project – Feb. 25, 2015

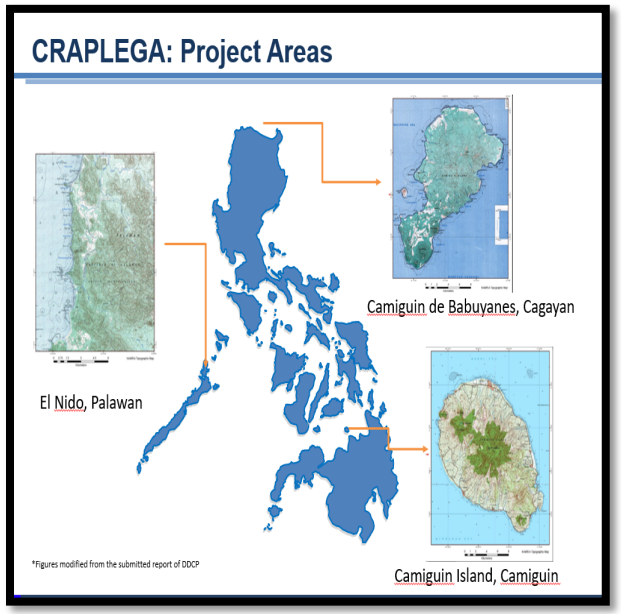
12 MW Maibarara expansion project – April 30, 2018

GEOTHERMAL DEVELOPMENT ISSUES AND CONCERNS

- Environmental and socio-cultural concerns in protected areas and ancestral lands which affect investment decisions
- High cost of development for low-to-medium enthalpy and acidic resource
- Low-level awareness on non-power applications of geothermal energy
- Numerous permits and long permitting process causes delays in the implementation of the project.

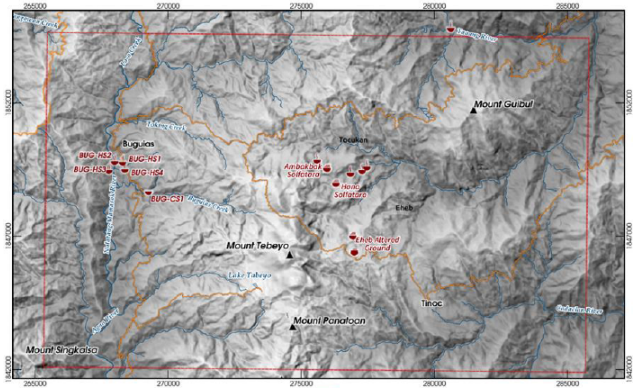
Geothermal Energy Development in the Philippines

Status of Locally-Funded Projects (CRAPLEGA)

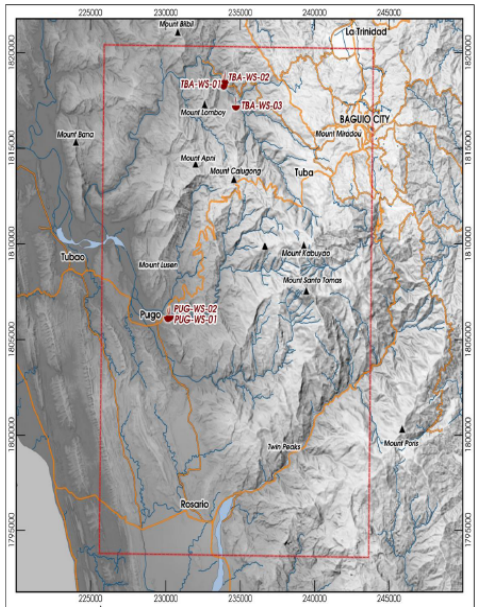


Project Name:	ACTIVITIES	PERIOD											
		2015				2016				2017			
		1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Comprehensive Resource Assessment of Philippine Low-Enthalpy Geothermal Areas	**PLANNING STAGE**												
	Field supplies and equipment procurement process												
	Data package preparation for contract-out service for intergrated geoscientifc survey for three candidate areas												
	Awarding of Bid			★									
	Inception workshop												
	LGU coordination/IEC												
	EXPLORATION STUDIES												
	Pre-survey activities												
Legend:	Literature review and evaluation												
	Remote sensing and aerial photo interpretation												
Camiguin Island, Camiguin	Report submission												
	Detailed Surface Exploration												
Camiguin de Babuyanes, Cagayan	Geological survey												
	Geochemical survey												
El Nido, Palawan	Geophysical survey												
	Final Conceptual model and Pre-FS report												
★ Awarding of Contract	Project completion and presentation of results.												
	Exit meetings												

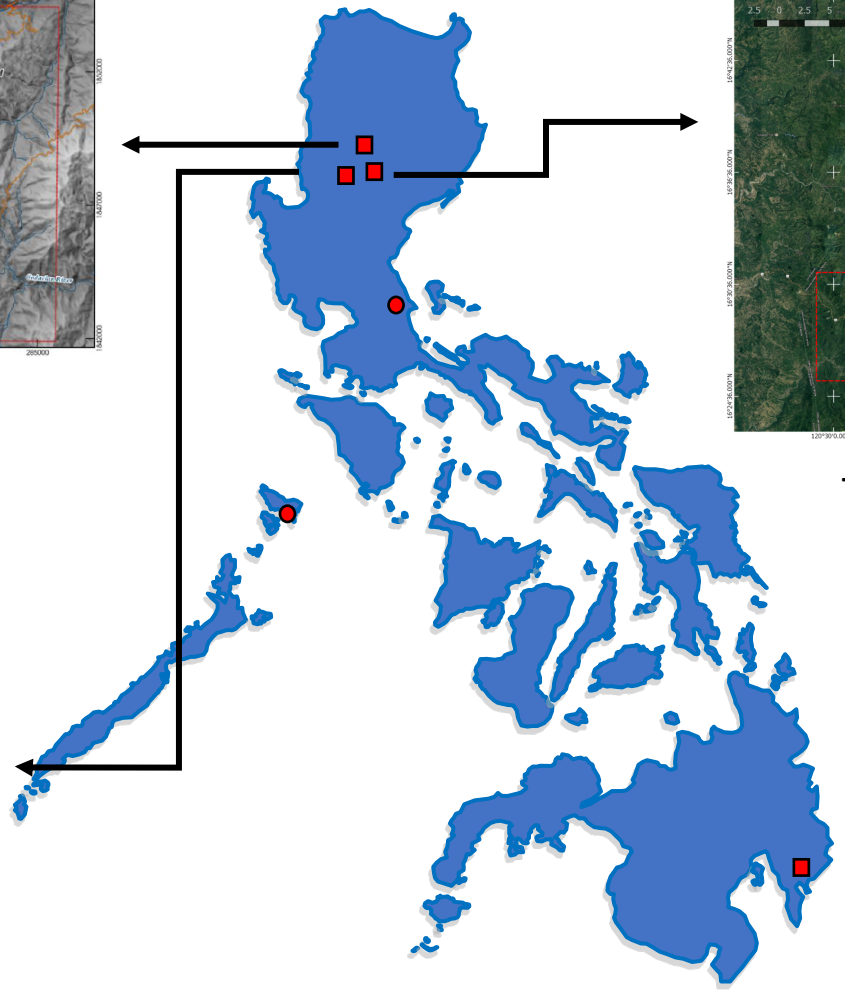
PGRIA: 2019 Project Areas

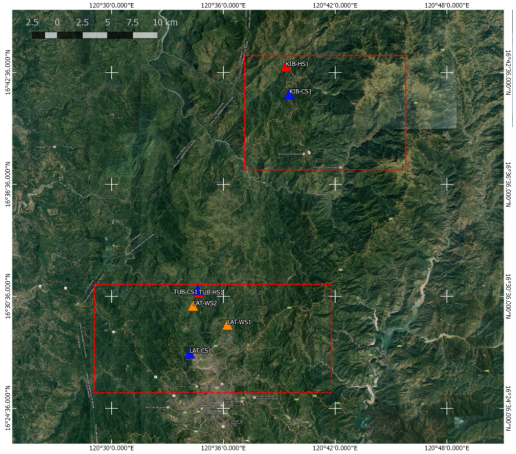


Buguias-Tinoc



Pugo-Tuba



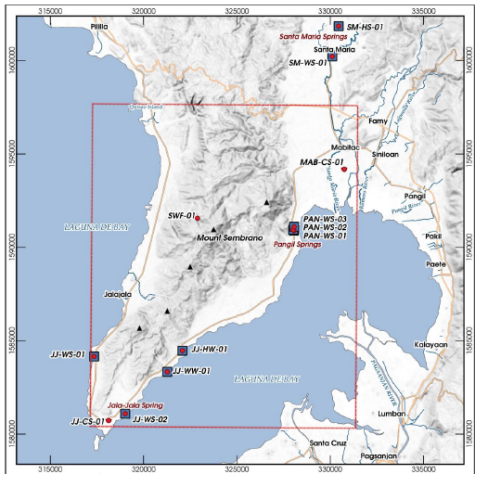


Tublay-La Trinidad-Kibungan

*Figures modified from PGEI report

PGRIA: 2019 Project Areas

Coron



Mt. Sembrano

Mati-Lupon-Tarragona

*Figures modified from PGEI report

MOA between Philippines and New Zealand on Geothermal Energy Cooperation

- The MOA aims to further strengthen and enhance the cooperation between the two countries on geothermal energy cooperation through government-level collaboration and the facilitation of private sector activities.

- The MOA paved the way for the continuous exchange of experiences and technical assistance in the field of geothermal energy exploration, development and utilization through capacity building and share of information, knowledge and current trends on geothermal energy.

- The MOA is effective until October 2020.

MOU between Taipei Economic and Cultural Office in the Philippines (TECO) and Manila Economic and Cultural Office in Taipei (MECO) on Geothermal Energy Cooperation

- The MOU for the Geothermal Development Cooperation was signed in during the 22nd JEC held in Taiwan in October 2016.

- Various consultation meetings were conducted by geothermal power companies form the Philippines and Taiwan

- The Philippine is committed to provide technical assistance and share its expertise to help develop Taiwan's geothermal resources. In addition, the Philippines is willing to help Taiwan in crafting its policies in relation to geothermal development.

- MOU will expire on October 28, 2019, however meeting will be conducted to discuss extension.

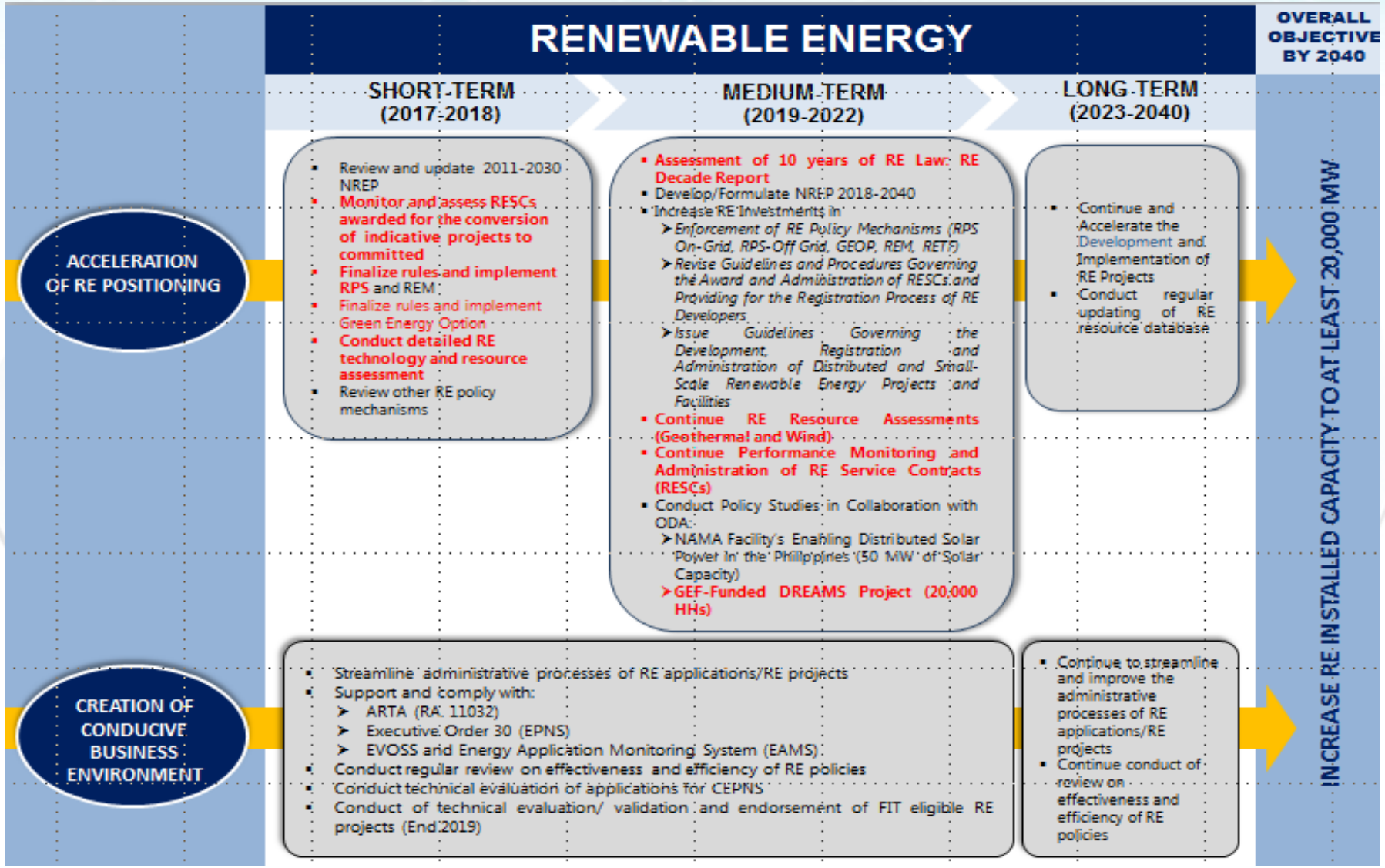
The 1st Philippine Geothermal Conference

Organized by the National Geothermal Association of the Philippines, held on 2-3 October 2018 at the Marquis Events Place, Taguig, Metro Manila.

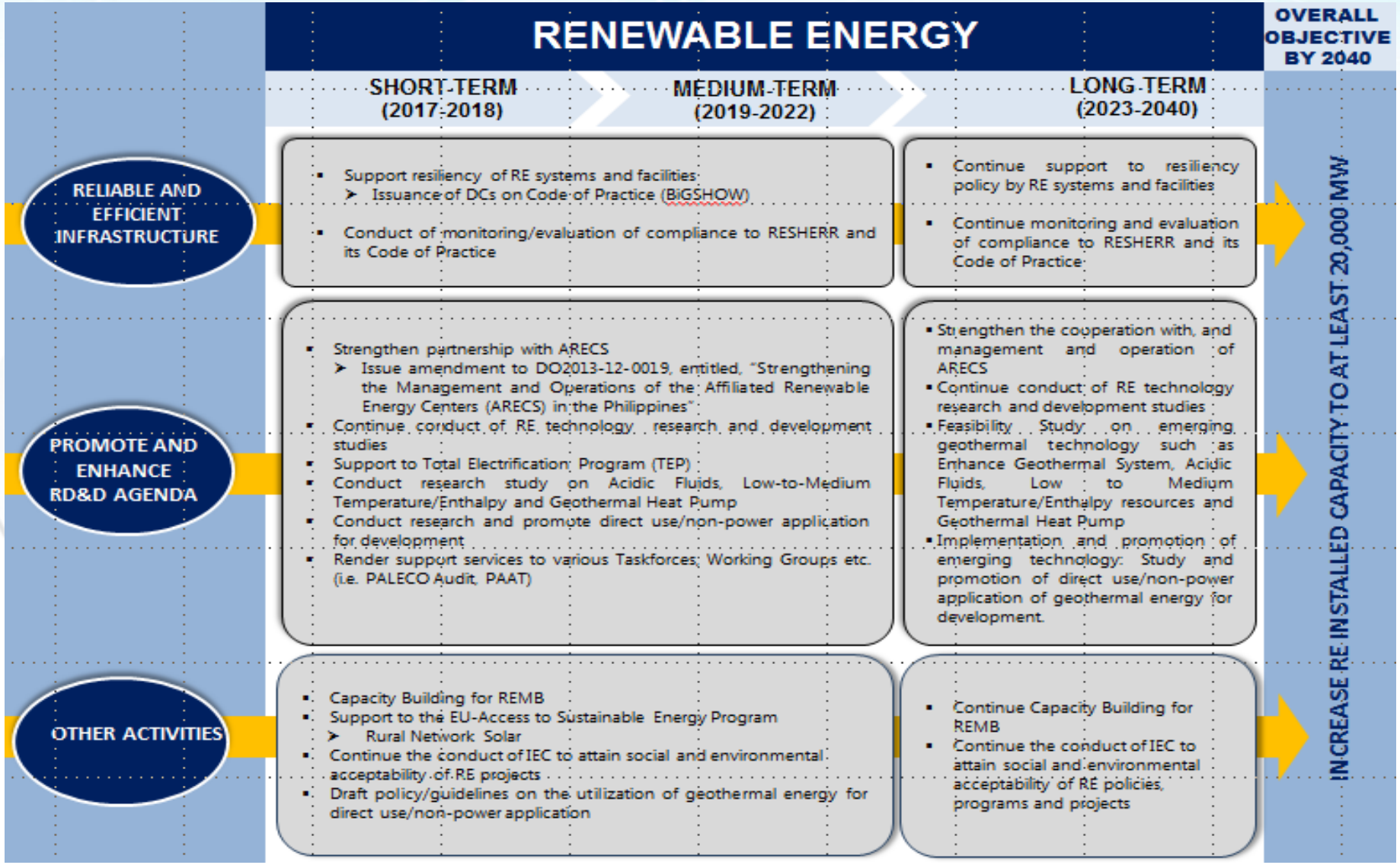
With the theme “Beyond Conventional: Tapping New Geothermal Frontiers”, the technical presentations focused on novel technologies such as utilization of acidic wells, exploitation of low to medium enthalpy resources, and advanced exploration and reservoir modeling techniques.

Participants in the 1st PGC include local geothermal developers, and experts from Indonesia, Taiwan, New Zealand, US, China, and Australia.

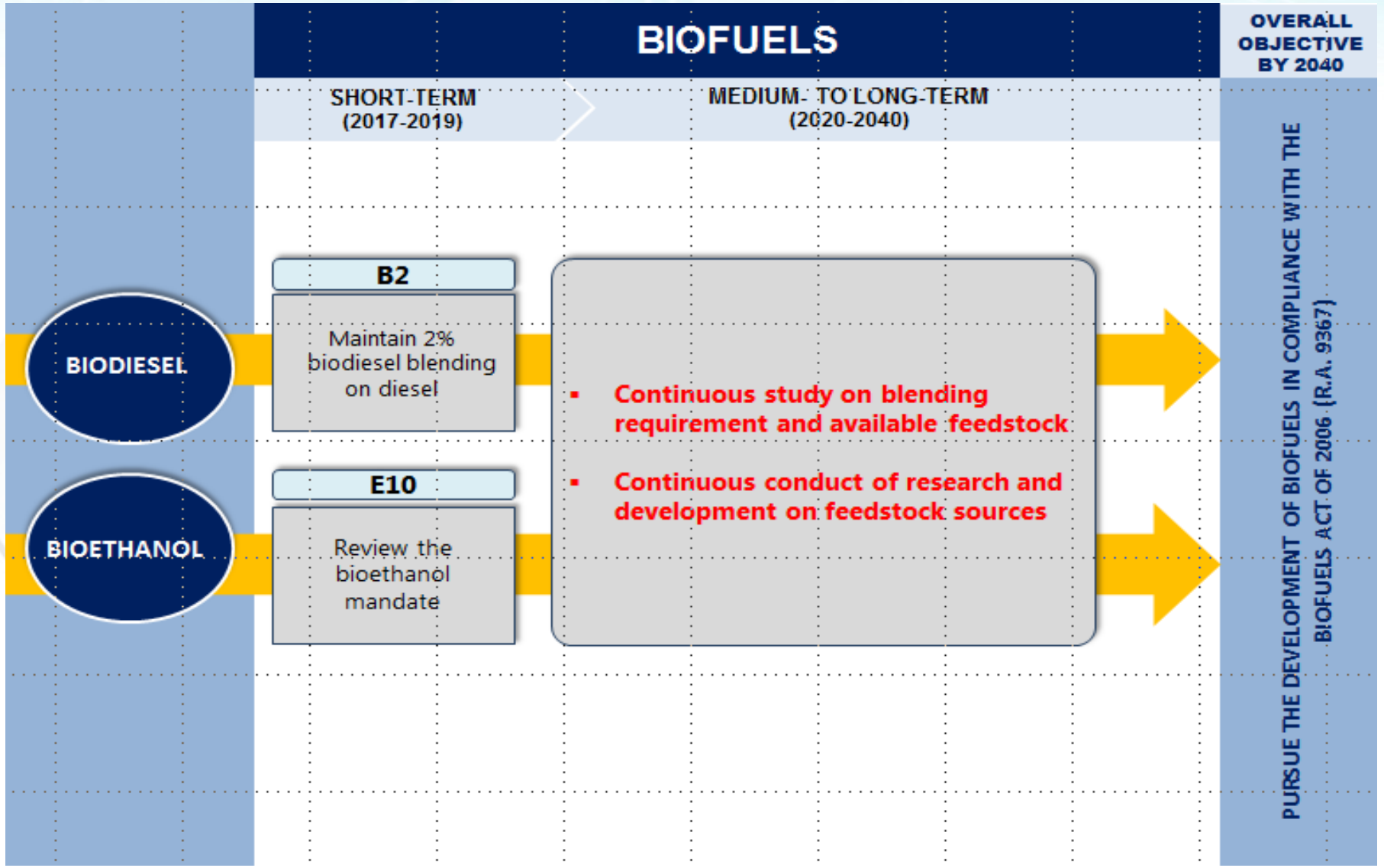
RE Sectoral Roadmap



RE Sectoral Roadmap



RE Sectoral Roadmap



Where We Are Now …

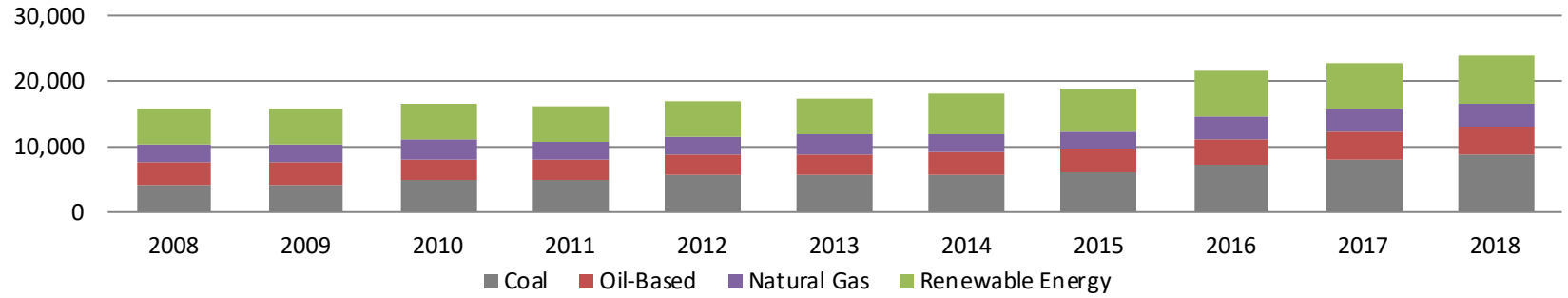
SUMMARY OF RE SERVICE CONTRACTS UNDER R.A. 9513

(as of July 2019)

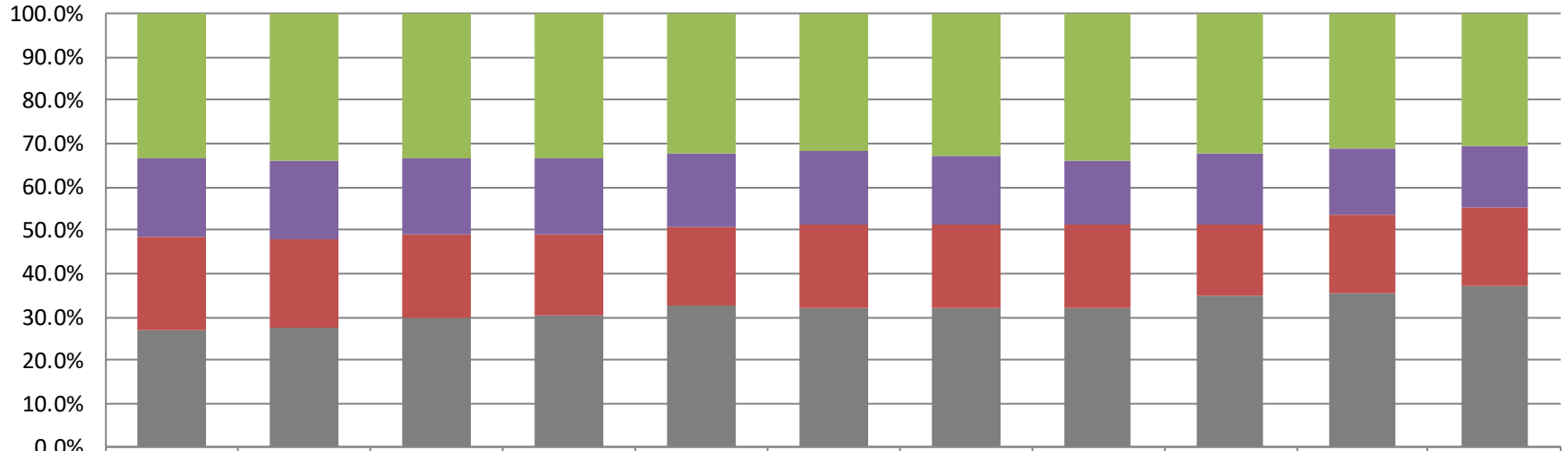
RESOURCE	PRE-DEVELOPMENT STAGE		DEVELOPMENT STAGE		COMMERCIAL OPERATION/ OPERATIONAL	
	No.	Capacity (MW)	No.	Capacity (MW)	No.	Capacity (MW)
Biomass	-	-	3	6.10	18	294.81
Geothermal	12	265.00	-	-	7	864.53
Solar	199	14,178.05	17	511.52	41	925.34
Hydro	176	7,747.63	167	3,130.87	52	1,016.42
Ocean	7	26.00	-	-	-	-
Wind	55	1,839.10	7	537.15	7	426.90
TOTAL	**449**	**24,055.78**	**194**	**4,185.64**	**125**	**3,528.00**

Where We Are Now ...

Installed Generating Capacity in MW, Total Philippines



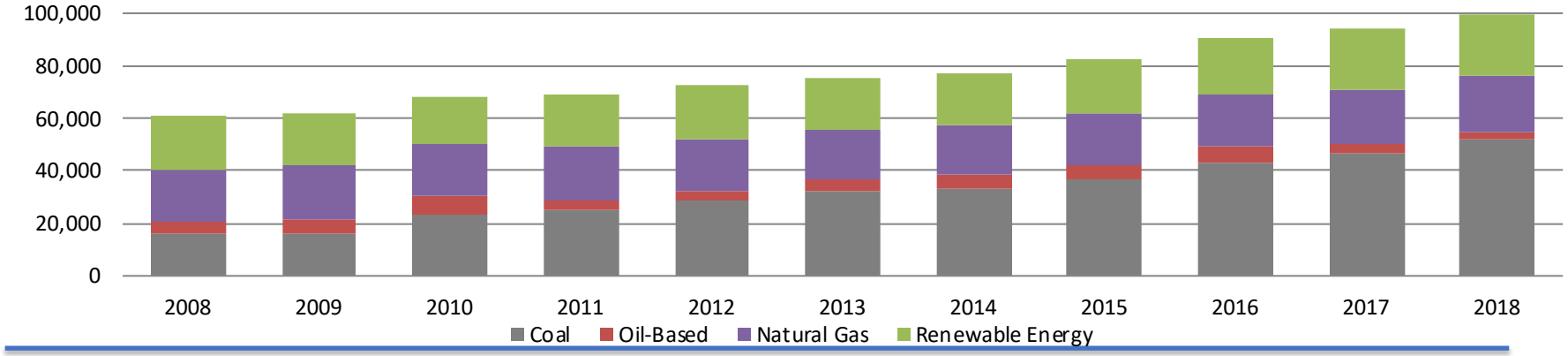
Installed Generating Capacity in % Share, Total Philippines



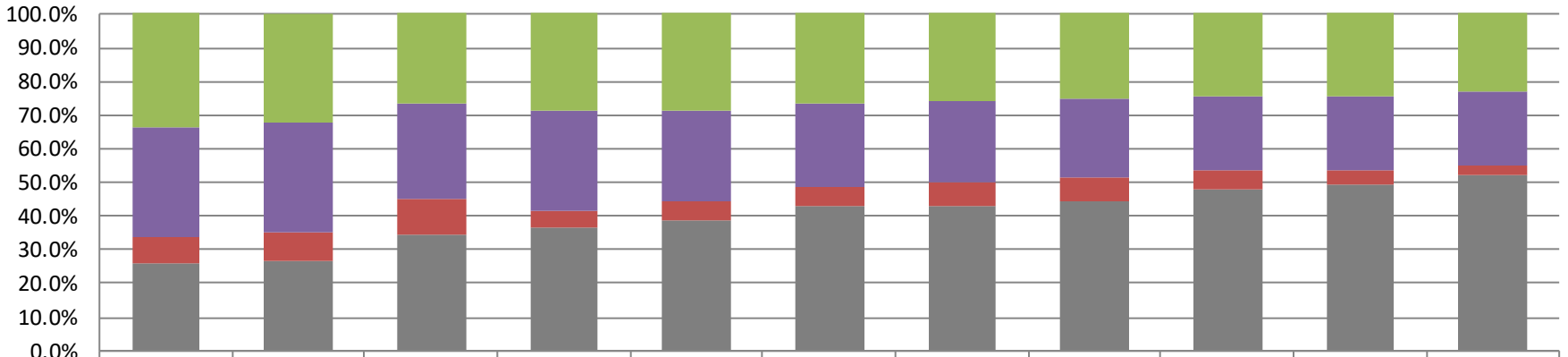
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Renewable Energy	33.7%	34.0%	33.2%	33.4%	32.4%	32.0%	32.9%	33.7%	32.5%	31.1%	30.3%
Natural Gas	18.1%	18.1%	17.5%	17.7%	16.8%	16.5%	15.9%	15.3%	16.0%	15.2%	14.5%
Oil-Based	21.4%	20.5%	19.5%	18.5%	18.1%	19.4%	19.4%	19.2%	16.9%	18.3%	18.0%
Coal	26.9%	27.4%	29.8%	30.4%	32.7%	32.1%	31.8%	31.8%	34.6%	35.4%	37.1%

Where We Are Now …

Power Generation by Source in GWh, Total Philippines



Power Generation by Source in % Share, Total Philippines



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Renewable Energy	33.9%	32.6%	26.3%	28.7%	28.5%	26.4%	25.6%	25.4%	24.2%	24.6%	23.4%
Natural Gas	32.2%	32.1%	28.8%	29.8%	26.9%	25.0%	24.2%	22.9%	21.9%	21.8%	21.4%
Oil-Based	8.0%	8.7%	10.5%	4.9%	5.8%	6.0%	7.4%	7.1%	6.2%	4.0%	3.2%
Coal	25.9%	26.6%	34.4%	36.6%	38.8%	42.6%	42.8%	44.5%	47.7%	49.6%	52.1%

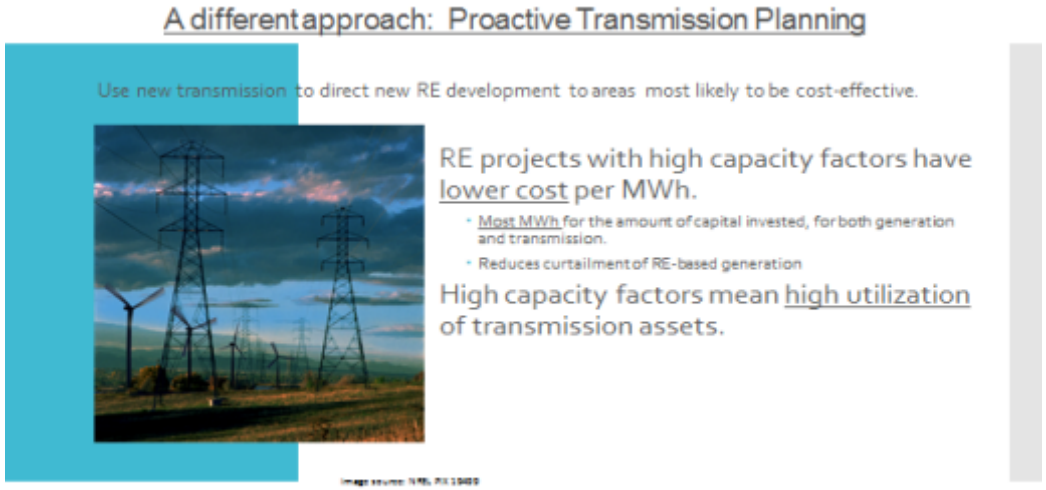
Status of 2019 Major Activities

Philippine Competitive Renewable Energy Zone (CREZ) Project

<u>The REZ Transmission Planning</u> process is a proactive approach to plan, approve, and build transmission infrastructure connecting REZs to the power system.

- **Helps increase the share of RE resources while maintaining reliability and economics.**
- **Focuses on large-scale wind and solar that when developed insufficient quantities warrant transmission system expansion**

The REZ process has regulatory weight, such that new transmission lines carry the presumption that they will be used and useful.



A REZ is a geographical area that enables the development of profitable, cost-effective, grid-connected RE (large-scale).

A REZ has:

- High-quality RE resources:
- Suitable topography and land-use designations: &
- Demonstrated interest from developers.

All of these support cost-effective RE development.

Status of 2019 Major Activities

Philippine Competitive Renewable Energy Zone (CREZ) Project

Accomplishments and Timeline of the Process

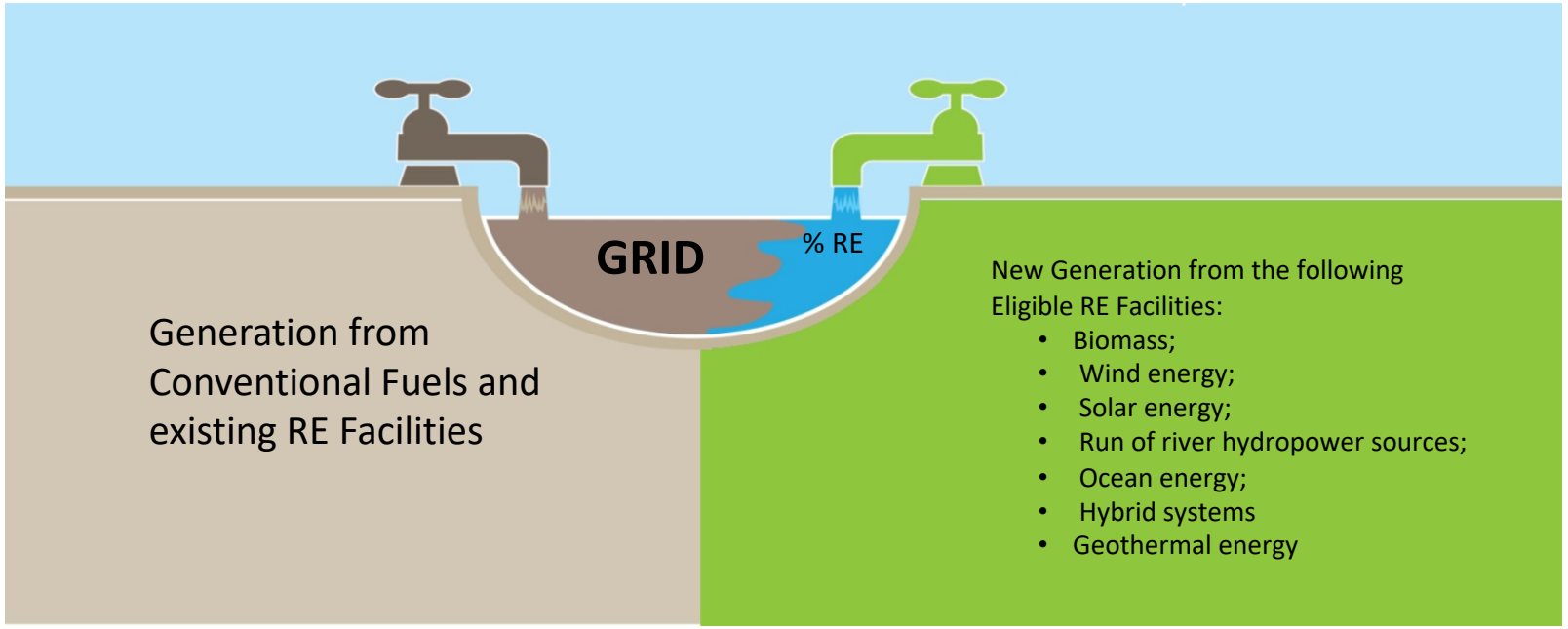
Goal of the Technical Exchange at NREL Office:

- Work along side with NREL experts to identify and characterize a set of implementable transmission development plans that could provide transfer capacity to deliver the power from the candidate CREZ to load throughout the Philippines.

TAC goal is to reach 20 GW target or 40 GW (aspirational).

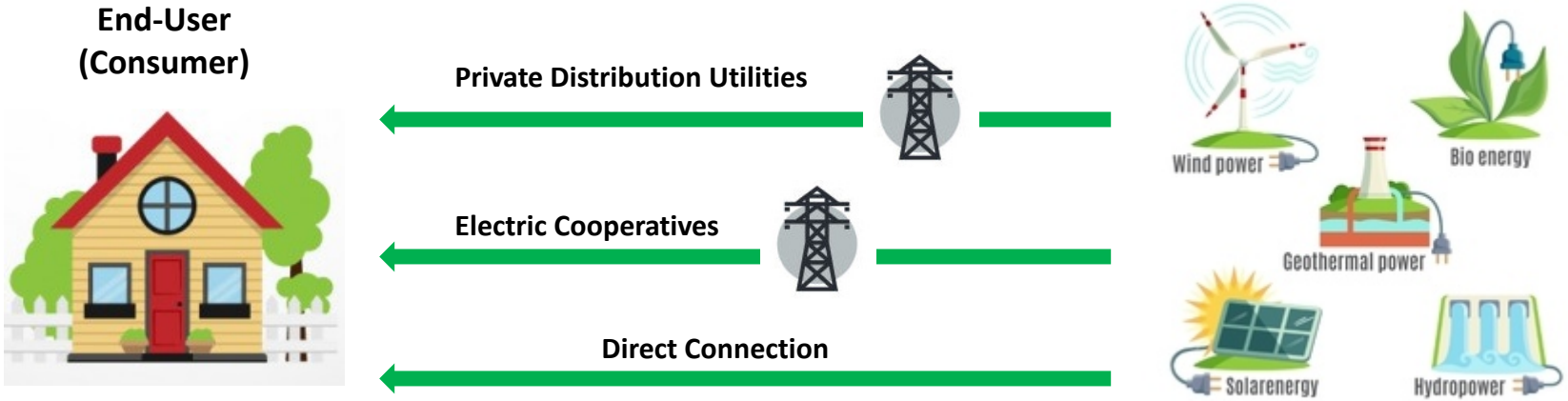
Renewable Portfolio Standards (RPS) for On-grid

- Mandated minimum percentage of RE generation to the total supply of electricity for on-grid areas.
- Full Implementation: January 2020
- Renewable Energy Market Rules – for issuance



Green Energy Option Program

- A Renewable Energy Policy Mechanism which shall provide an end-user the option to choose RE Resources as their source of energy.
  - Guidelines in the issuance of Operating Permit of RE Suppliers – for approval



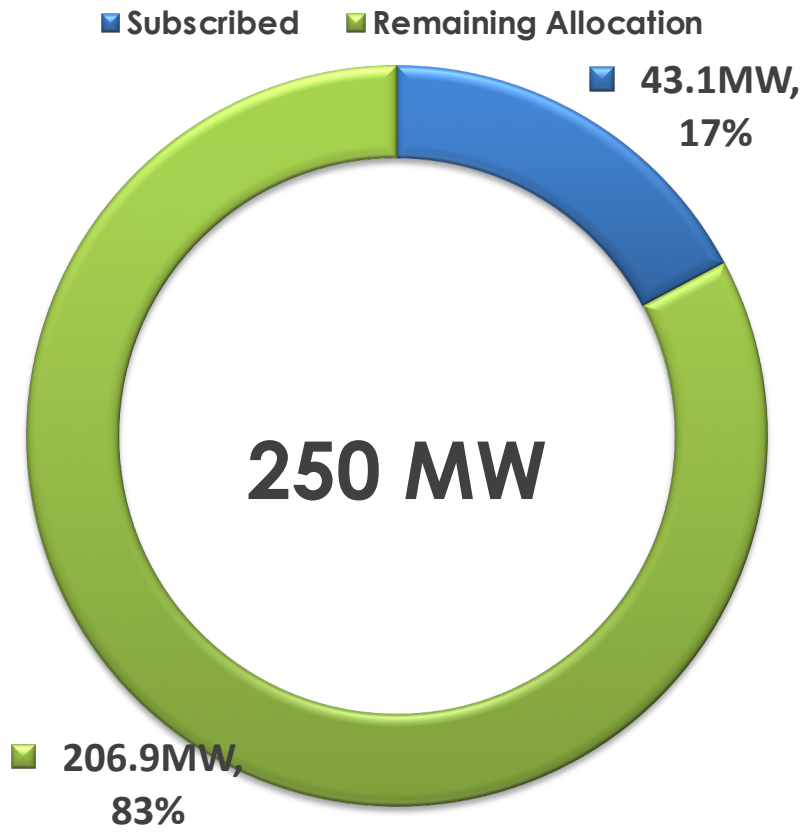
Feed-in-Tariff (FIT) System

- The DOE extended the FIT System for biomass and ROR Hydro until end-2019

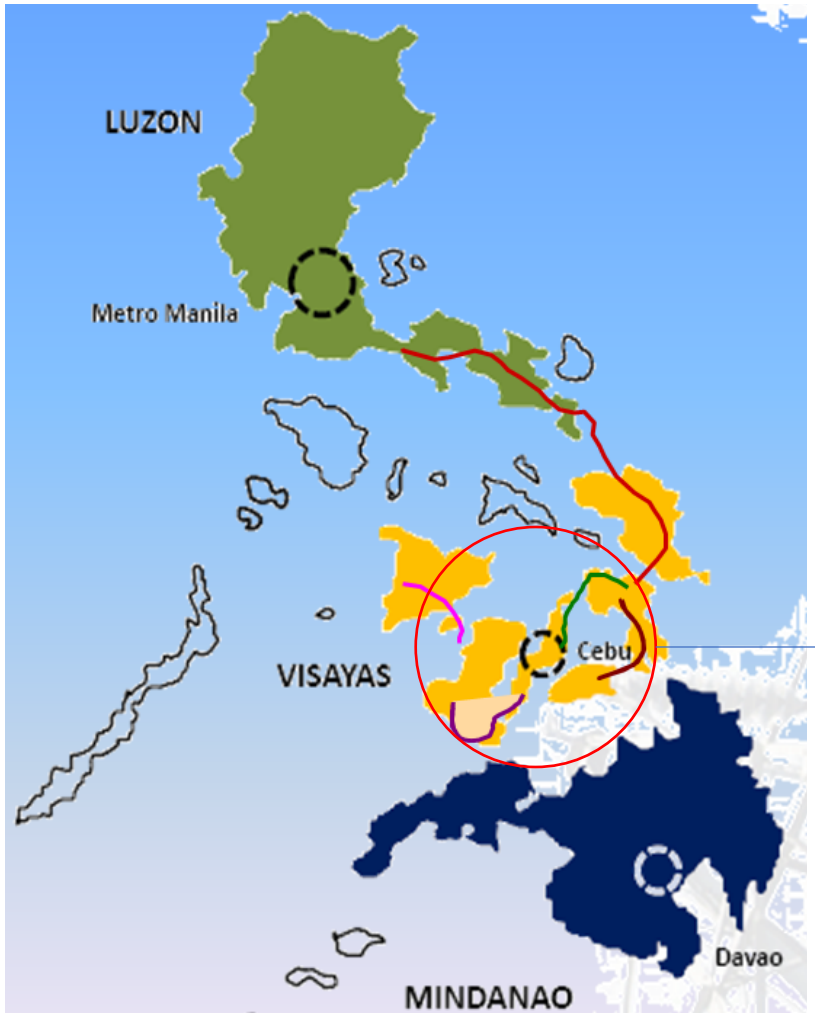
- NREB endorsed request of Hydro Developers to allow completion of installation target

TECHNOLOGY	FIT Rate (PhP/kWh)	DEGRESSION RATE	INSTALLATION TARGET
Biomass	6.63	0.5% after 2 years	200
Wind	8.53	0.5% after 2 years	250
Solar	9.68	6 % after 1 year	50
ROR Hydro	5.90	0.5% after 2 years	250

Overall Status of Installation Target for Hydropower



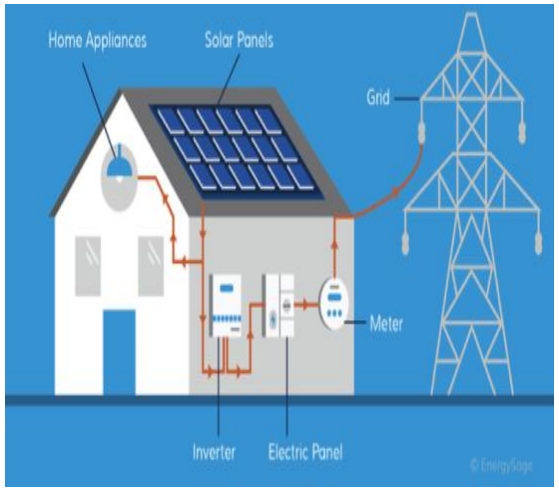
Challenges in Visayas



- Grid Congestion brought about by limited transmission line capacity
- NGCP to upgrade grid by 2020

Net Metering for RE

As of February 14, 2019, a total of 2,232 Qualified End-Users were registered with total rated capacity of 17, 569.6 kW



On-Going Policy Enhancement/ Technical Assistance Study on Distributed PV:

- In collaboration with USAID Clean Power Asis, NREL, LBNL and Chulalongkorn University (Thailand)
- Study Areas:
  - Customer Economic Impacts;
  - Utility Revenue and Rate Impacts; and
  - Technical Impacts.

Status of Locally-Funded Projects

PROJECT	STATUS
Philippine Geothermal Resource Inventory and Assessment	Monitored geological and geochemical survey by PGEI in the following geothermal areas: • Mati-Lupon-Traggona • Coron • La Trinidad-Kibungan-Tublay
R&D Projects on Biomass and Biofuels	Conducted techno economic and viability study for other biofuel feedstock and monitored the following R&D projects and activities: • MMSU Nipa sap project • UPLB Project entitled "Lie Cycle Assessment in Terms of Carbon Debt and Payback Check Analyses, Carbon Savings and Energetics Studies of Biodiesel Production from Coconut Oil in the Philippines" • DOST-ITDI project entitled "Characterization/Performance Testing of the Biodiesel/Diesel blends from Combined Feedstock of Various and Used Cooking Oils" • 18kW Biomass Gasifier Project in Brgy. Alad, Romblon, Romblon
Wind Resource Assessment Project	Identified two (2) potential areas as candidate for detailed wind resource assessment in Dingalan, Aurora and Batangas. Continuous collection and management of wind energy data for the following sites: • Brgy. Poblacion, Pantabangan, Nueva Ecija • Brgy. Malasin, San Jose City, Nueva Ecija • Brgy. Malacapas, Dasol, Pangasinan • Brgy. Ibis, Bagac, Bataan • Brgy. Puro, Magsingal, Ilocos Sur

Status of ODA-Funded Projects

PROJECT	OUTCOME	STATUS
Development of Renewable Energy Applications Mainstreaming and Market Sustainability (DREAMS) *Promote and facilitate the commercialization of the renewable energy (RE) markets through the removal of barriers to increase investment in RE based power generation projects*	Enforcement of a supportive policy and regulatory environment for leveraging investment in RE development and applications at the local level	Supporting the ff policies: 1. RESHERR Code of Practice 2. GEOP Guidelines 3. REM Rules 4. Updating of NREP 2011-2030 to NREP 2020-2040. 5. Omnibus Guidelines for RE applications
	Strengthened institutional capacity that leads to increased RE investment at the local level	Ongoing Initiatives: 1. Localized RE Planning with 8 LGUs in Palawan and Iloilo to generate RE projects that will benefit at least 20,000 households in far flung and off-grid areas 2. Establishment of a RE knowledge platform
	Capitalized RE market leads to an increased share of RE based power capacity	Ongoing Initiative: Establishment of the Philippine Renewable Energy Market System (PREMS)
	Enhanced confidence of project developers on the viability of RE projects at the local level	Ongoing Initiatives: 1. Establishment of a Project Preparatory Fund (US$ 1 million) to leverage investments for RE projects 2. RE technicians' certifications
Access to Sustainable Energy Program (WB and EU)	Post-Harvest Use of Renewable Energy	Two sites (Mindanao and Luzon) have been awarded with farming equipment powered by RE

New Policy Initiatives

- Energy Resiliency Policy
  - "Adoption of Resiliency Planning and Program in the Energy Industry to Mitigate Adverse Effects Brought About by Disasters"
  - Promotes planning and investment to ensure nation's energy infrastructure continues to deliver while anticipating and reducing vulnerabilities

March 2018 – Forged agreement with Philippine Institute of Volcanology and Seismology (PHIVOLS) on Energy Resiliency

RECENT POLICY ISSUANCES

Laws on Energy Virtual One-Stop-Shop System and Ease of Doing Business – aimed to streamline permitting process in all branches of government

Department Circular on Omnibus Guidelines in the Award and Administration of RE Contracts and the Registration of RE Developers – open biomass and WTE development to foreign corporations, among others.

Thank You!

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