

Bioenergy Applications in the Philippines

47th APEC EGNRET Meeting

October 10, 2016

Jakarta, Indonesia

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Philippines

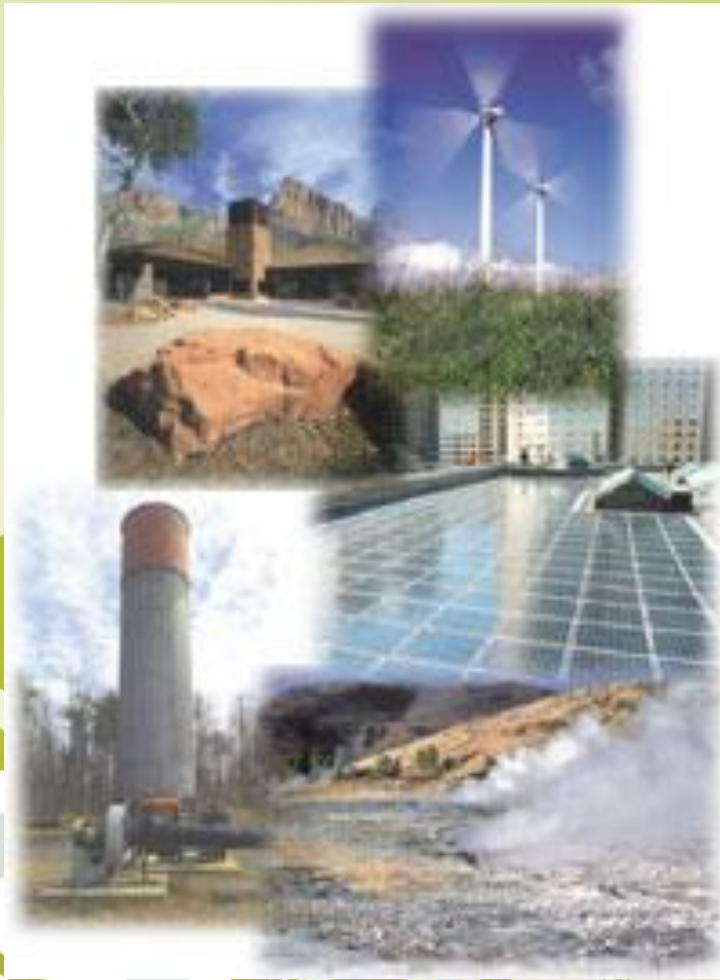


Outline of Presentation

- Renewable Energy Potential
- Governing Laws on Bioenergy
 - Biofuels Act of 2006
 - Renewable Energy Act of 2008
- Policy Directions and Mechanisms
- Where are we now
- Policies and Development Status
- Challenges
- Way Forward



Renewable Energy



- ▣ Biomass / Biofuels
- ▣ Geothermal
- ▣ Solar Power
- ▣ Hydropower
- ▣ Ocean
- ▣ Wind Power



Renewable Energy Potential



- Geothermal > 4,000 MW
- Wind resource > 76,600 MW
- Hydropower > 10,000 MW
- Solar > 5 kWh/m²/day
- Ocean > 170,000 MW
- Biomass > 500 MW (*bagasse & rice hulls only*)
 - Largest producer of coconut oil
 - Ranks 10th in world sugarcane production

Source: Philippine Department of Energy/REMB



BIOMASS RESOURCES CLASSIFICATION

Agricultural Wastes

- Rice hull
- Rice straw
- Bagasse
- Cane trash
- Coconut wastes
- Corn cob/trash
- Animal wastes

Energy Crops

- Bamboo / Bana
- Grass / King
- Grass/Napier
- Grass
- Plant Oils
- 2nd generation biofuels

Forest Residues

- Logs, trunks, leaves, chips, etc.
- Wood residues from saw mills

Municipal / Urban Wastes

- Landfills
- Sewers and Sewerage
- Biomethanation



R. A. No. 9367: The Biofuels Act of 2006

Provides fiscal incentives and mandate the use of biofuel-blended gasoline and diesel fuels

BIODIESEL

- 1% biodiesel blend in all gasoline stations on May 6, 2007
- 2% biodiesel blend on Feb. 6, 2009

BIOETHANOL

- Start of 5% by total volume mandate on Feb. 6, 2009
- 10% bioethanol blend to all gasoline on Feb. 6, 2012



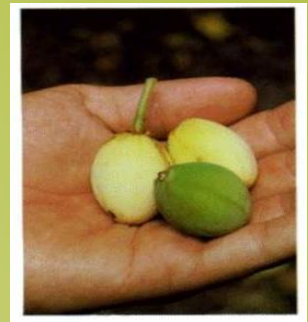
RA 9367: Biofuels Act of 2006

To achieve energy independence and fuel diversification while meeting environmental challenges through the utilization of agricultural-based feedstocks

Potential Diesel Displacement

- 140 million liters per year for B2

biodiesel



Potential Gasoline Displacement

- 400 million liters per year for E10

bioethanol



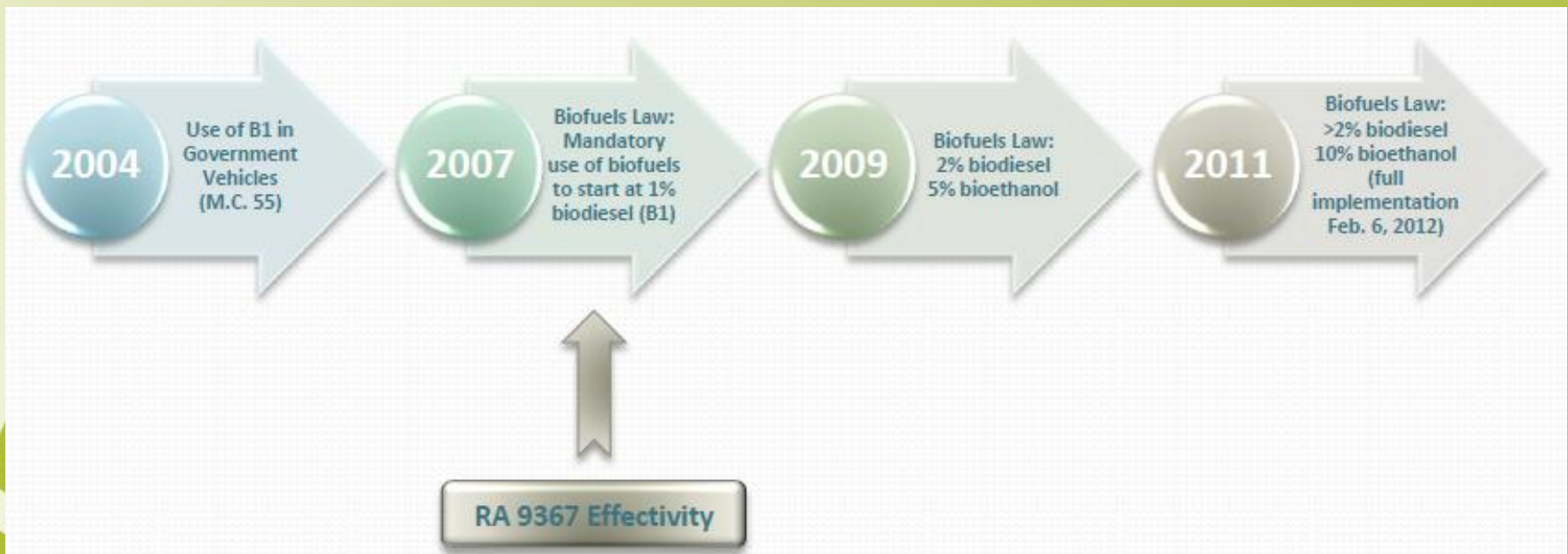
Creation of the National Biofuel Board

- Prepared the National Biofuels Program and same was approved by the National Biofuel Board on September 19, 2008
- Promulgated the Joint Administer Order No. 2008-1 providing guidelines for the production, transportation, storage, and handling of biofuels and biofuel-blends in the country.



President Benigno S. Aquino III unveils the logo to signal the opening of the PIBEC Exhibit of the National Biofuels Board One-Stop Shop (NBB-OSS) at the Manila Hotel on January 12, 2012

Biofuels Implementation Plan



Targeted Biofuels Blend, 2013-2030*



BIOFUELS MANDATE IMPLEMENTATION

BIODIESEL

Supply:

- 11 Accredited Producers with annual total capacity of 584.9 million liters
- 2 Pending Projects with a potential capacity of 89.4 million liters

Feedstock used:

- Coconut oil (current)
- Jatropha, used cooking oil, microalgae (under study)

BIOETHANOL

Supply:

- 10 Accredited Producers with annual total capacity of 282.4 million liters
- 3 production facilities to be on-stream between 2016-2018 with additional capacity of 149 million liters/year

Feedstock used:

- Sugar Cane, Molasses (current)
- Sweet sorghum, cassava, nipa sap, macroalgae (under study)



Biofuels Production

Current Mandate: B2, E10

Targets: B10 and E20 by 2020, B20 and E85 by 2025

Renewable Energy	Capacity (in Million Liters)								No. of Projects Monitored as of 2015
	As of 2014				As of 2015				
	Construction*	Operational	Production	Sales	Construction*	Operational	Production	Sales	
Biodiesel	-	584.9	171.6	163.5	-	584.9	204.0	200.6	11
Bioethanol	38.0	222.1	115.1	118.9	104.0	282.1	128.2	122.9	12
TOTAL	38.0	807.0	286.7	282.4	104.0	867.0	332.2	323.5	23

* With Certificate of Registration of Notice to Proceed Construction



90 ML Chemrez Technologies Inc., Biodiesel Plant
(Bagumbayan, Quezon City)



54 ML Green Future Innovation Inc., Bioethanol Plant
(San Mariano, Isabela)



Activities Under the Biofuels Program

- **Actual On-Road Test For Higher Biodiesel Blend**
 1. Formulation of test protocol with DOST-PCIEERD, PCA, TUP, UP-NCTS
 2. Actual test covering initial 2,000 km for two new vehicle models
- **New Projects Currently Being Implemented**
 1. Romblon Electric Cooperative (ROMELCO) – “18kW Sitio Bagong Silang Biomass Gasifier Project in Brgy. Alad, Romblon, Romblon
 2. Mariano Marcos State University – *“Establishment of a Community-Based Bioethanol Industry and Continued R&D on the Feasibility of Hydrous Bioethanol as Biofuel Blend”*
 3. University of the Philippines Foundation Inc. – *“Economic Impact Study on Increasing the Biodiesel Blend to 5% (B5)”*



Monitoring of Biofuels Production Plants



Monitoring of Biofuels Production Plant



CBP



R. A. No. 9513: The Renewable Energy Act of 2008



Accelerate the development of the country's renewable energy resources by providing fiscal and non-fiscal incentives to private sector investors and equipment manufacturers / suppliers.



Policy Directions

- Accelerate the exploration and development of renewable energy resources
 - achieve energy self-reliance
 - ✓ to reduce the country's dependence on fossil fuels
 - ✓ minimize the country's exposure to price fluctuations
 - adoption of clean energy to mitigate climate change
 - promote socio-economic development in rural areas
- Increase the utilization of renewable energy by providing fiscal and non fiscal incentives;



Policy Mechanisms

- Lowering of investment costs
 - Fiscal Incentives
 - ✓ Income Tax Holiday and Low Income Tax Rate
 - ✓ Reduced Government Share
 - ✓ Duty-free Importation of Equipment and VAT-zero Rating
 - ✓ Tax Credit on Domestic Capital Equipment
 - ✓ Special Realty Tax Rate on Equipment and Machinery
 - ✓ Cash Incentive for Missionary Electrification
 - ✓ Exemption from Universal Charge
 - ✓ Payment of Transmission Charges
 - ✓ Tax Exemption on Carbon Credits



Policy Mechanisms

- Enhanced Competitiveness
 - Mandatory Utilization of RE Resources
 - ✓ Biofuels Mandate
 - ✓ Renewable Portfolio Standard (RPS)
 - ✓ Feed-In Tariff (FIT)
 - Provision of Interconnection / Ancillary Services
 - Other Market Options
 - ✓ Net Metering Concept
 - ✓ Green Energy Option



NREP ROADMAP (2010-2030)

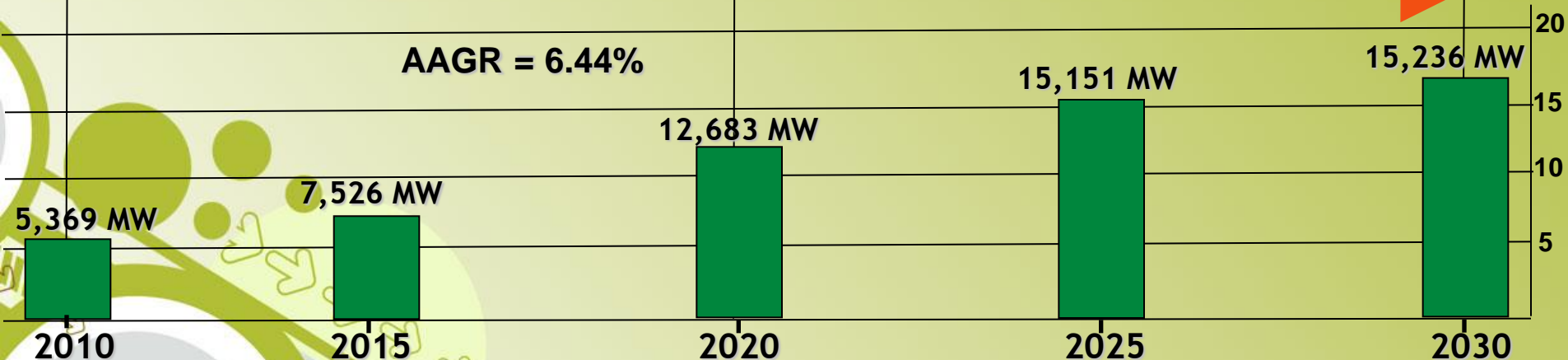
- 2012 - Full implementation of RA 9513
- 2015 - Target additional biomass capacity of 277 MW is reached
- 2018 - Commissioning of the 1st OTEC facility
- 2020 - Solar grid parity is attained

- Target additional RE capacities are reached by:
 - 2022 - Wind : 2,345 MW
 - 2023 - Hydro : 5,398 MW
 - 2025 - Ocean : 75 MW
 - 2030 - Solar : 284 MW*
 - Geothermal : 1,495 MW
- 2025 - Wind grid parity is attained

2010

IMPLEMENTATION OF NREP SECTORAL SUB-PROGRAMS

2030



Note: The National Renewable Energy Program (NREP) is currently under review of NREB to reflect developments on RE sector and the DOE's issuances of new Installation targets.

Source: Philippine Department of Energy/NREP



Department of Energy

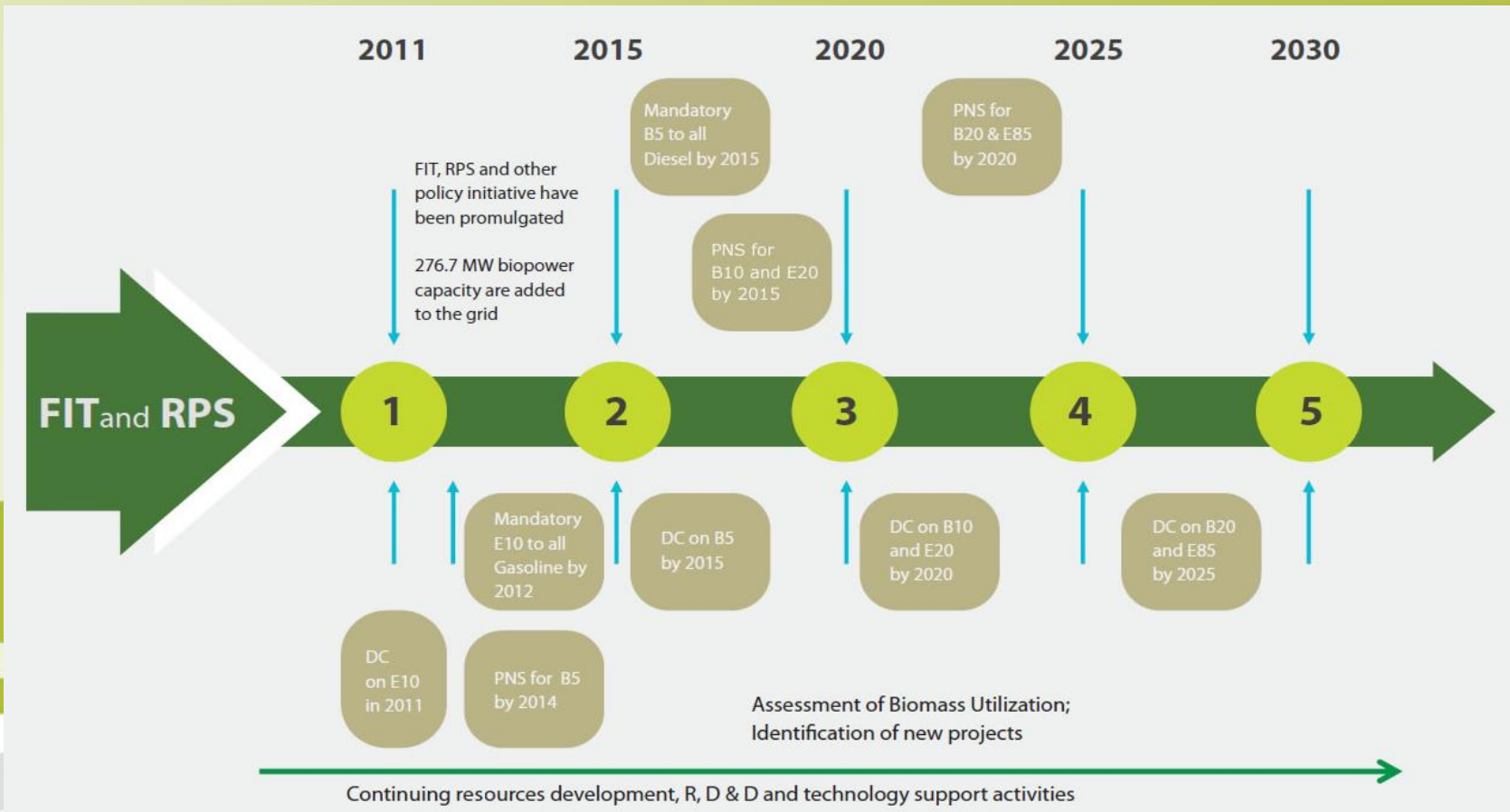
Government Policy

National Renewable Energy Program

- Increase RE-based capacity by 200% within the next 20 years (2011-2030)
- Increase non-power contribution of RE to the energy mix by 10 MMBFOE in the next ten years
- Be the number one geothermal energy producer in the world (additional 1,495 MW)
- Be the number one wind energy producer in Southeast Asia (up to 2,500 MW)
- Double hydro capacity (additional 5,400 MW)
- Expand contribution of;
 - biomass - 265 MW
 - solar - at least 280 MW
 - ocean energy – at least 10 MW



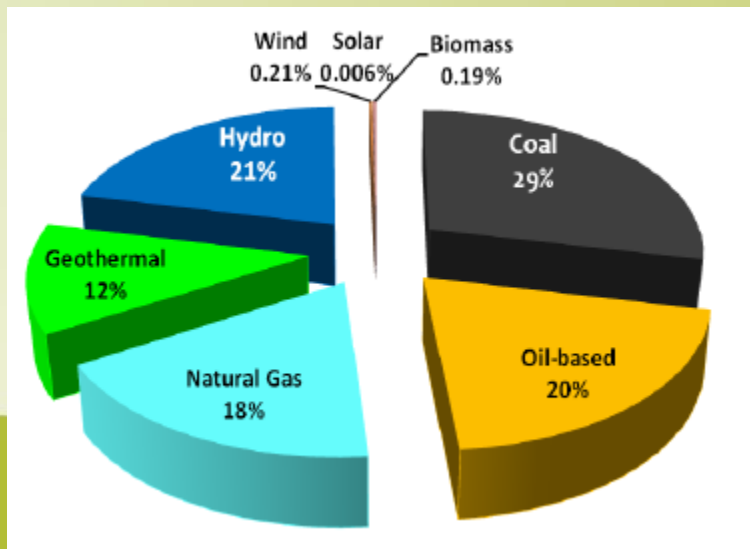
BIOMASS SECTOR ROADMAP, 2011-2030



Where are we now?

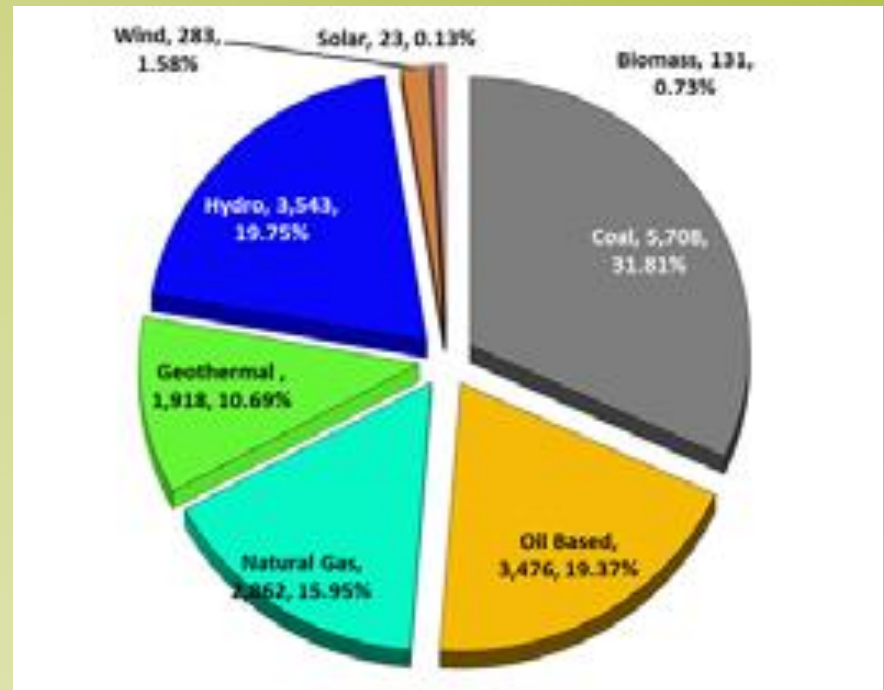
2010 and 2014 Total Installed Capacity Mix (MW)

2010



Total Installed Capacity = 15,881 MW
RE Capacity Share = 5,304.25 MW
% RE Share = 33.4 %

2014



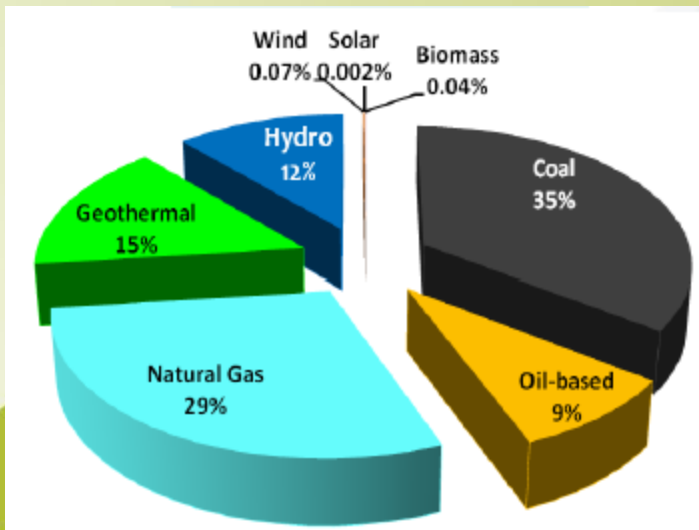
Total Installed Capacity = 17,944 MW
RE Capacity Share = 5,900 MW
% RE Share = 32.88 %



Where are we now?

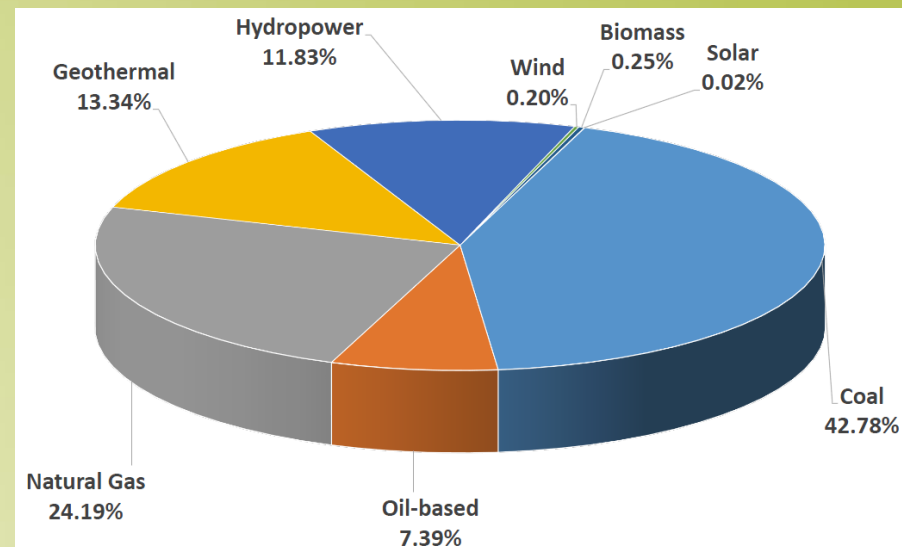
2010 and 2014 Total Generation Mix (GWh)

2010



Total Generation = 65,795 GWh
RE Generation Share = 17,830.4 GWh
% RE Share = 27.1%

2014



Total Generation = 77,261 GWh
RE Generation Share = 19,809.7 GWh
% RE Share = 25.64 %



Summary Renewable Energy Projects under RE Law (as of June 2016)

RESOURCES	AWARDED PROJECTS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydro Power	352	1	7,053.15	1.50	141.49	-
Ocean Energy	7	-	26.00	-	-	-
Geothermal	41	-	610.00	-	1,906.19	-
Wind	56	1	1,180.80	-	426.90	0.006
Solar	129	16	3,820.24	4.286	893.24	3.218
Biomass	40	22	229.07	13.77	295.07	141.86
Sub-Total	624	43	12,853.57	9.706	3,628.39	169.40
TOTAL	667		12,863.28		3,797.79	



RE Capacity Addition Historical Development

RE Installations from 2009-2015 under RA 9513

RESOURCES	2009-2015		Own-Use		Total	
	No. of Projects	Installed Capacity (MW)	No. of Projects	Installed Capacity (MW)	No. of Projects	Installed Capacity (MW)
Biomass	19	295.07	18	141.86	37	436.93
Geothermal	3	60.00	-	-	3	60.00
Solar	7	144.40	-	-	7	144.40
Hydropower	11	47.37	-	-	11	47.37
Ocean Energy	-	-	-	-	-	-
Wind	6	393.90	-	-	6	393.90
TOTAL	46	940.74	18	141.86	59	1082.60

Capacity Addition since the enactment of RE Law = 1,082.60 MW

Installed Capacity under Net-Metering (recorded) = 1.984.41 MWp

TOTAL = 1,082.60 MW



INSTALLED CAPACITY TARGETS, in MW

Under the National Renewable Energy Program

	EXISTING	ADDITIONAL		
	2015	2016-2020	2021-2025	2026-2030
BREOC	295.07	506.47	500.00	500.00
OWN USE	141.86	3.92	5.00	5.00
TOTAL	436.93	510.39	505.00	505.00



Bioenergy Power Plants/Projects



Bioenergy Power Plants/Projects



2MW Biogas-Fired Power Plant Project – Asian Carbon Neutral Power Corporation



30MW Bagasse-Fired Cogeneration Power Plant – Universal Robina Corporation

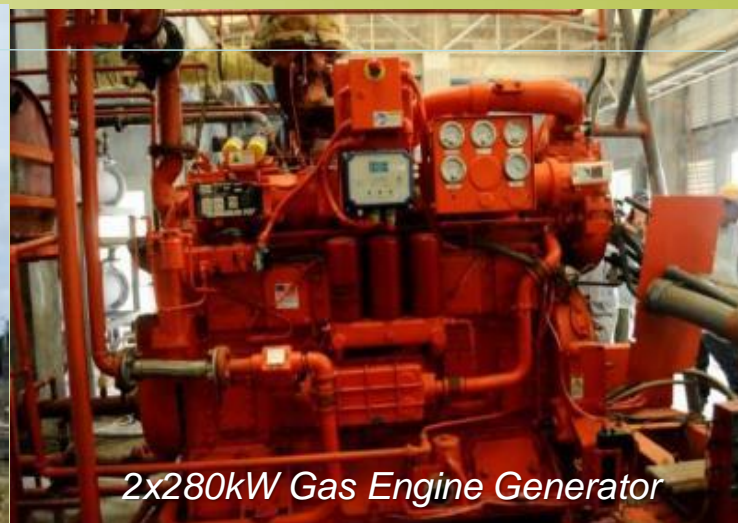


Registered Biogas Projects



1MW Waukeshau Gas Engine Generator

1MW Cavite Pig City (own-use)



2x280kW Gas Engine Generator

560kW Marcela Farms (own-use)



Existing and Updates on RE Policy Mechanisms

Feed-in-Tariff (FIT)

- Priority connection to the grid
- Priority purchase and transmission of and payment for by grid system operators
- Fixed tariff for 20 years
- To be applied for generation utilized in compliance with RPS
- DOE issued List of guidelines for the Selection Process of Renewable Energy Projects Under Feed-In Tariff System and the Award of Certificate for Feed-In Tariff Eligibility



Existing and Updates on RE Policy Mechanisms

Feed-in-Tariff (FIT) Rates

RE Technology	Approved Rates (PHP/kWh)	Installation Target (MW)
Run-of-River Hydro	5.90	250
Biomass	6.63	250
Wind	8.53*	(with initial target of 200) 400**
Solar	8.69 *	(with initial target of 50) 500**

* *Feed in Tariff (FIT) rates for solar was revised in April 2015 (resolution no. 6, series of 2015) from Php 9.68 to 8.69/kWh covering additional target of 450 MW and the second FIT rate for wind energy was issued by the ERC at Php 7.40/kWh covering additional target of 200MW under ERC Resolution No. 14, series of 2015.*

** *Amended targets for wind energy and solar power up to March 15, 2016.*



Feed-In Tariff Monitoring Board (as of June 2016)

RESOURCE	FOR NOMINATION / CONVERSION		WITH CERTIFICATE OF CONFIRMATION OF COMMERCIALITY		WITH CERTIFICATE OF ENDORSEMENT TO ERC	
	NO. OF PROJECTS	CAPACITY (MW)	NO. OF PROJECTS	CAPACITY (MW)	NO. OF PROJECTS	CAPACITY (MW)
HYDRO		-	86	732.12	4	26.60
WIND	7	1,023.55	11	715.30	6	393.90
SOLAR	15	565.18	47	1,227.73	20	525.95
BIOMASS			18	140.32	12	105.05
TOTAL	22	1,588.73	162	2,815.47	42	1,051.5



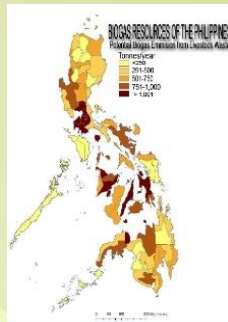
Bioenergy Programs

- **USAID Biomass Resource Inventory Results**
 - 4,446.54 Mwe Potential Power Generation Capacity net of Competing Uses
 - 17.26 Million tCO₂ Potential GHG Emission Reduction
- **Biofuel Feedstock Demonstration Projects**
 - Nipa Sap
 - Sweet Sorghum
 - Cassava
 - Macroalgae
- **Actual On-road Tests for B5 using New Vehicle Models**
 - Toyota Hilux
 - Toyota Innova
- **Household Electrification Project using Biomass Gasification Technology in an Off-grid Area (coconut wastes)**



Biogas Initiatives

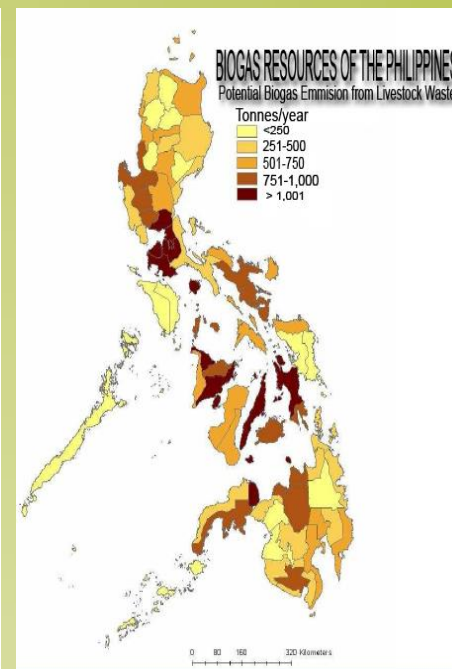
- Biogas Technology Assessment in the Philippines
- Establishment of Biogas Demonstration Project with Hands-on Training in General Santos City



Biogas Technology Assessment in the Philippines

EXPECTED OUTPUTS

- Comprehensive database on biogas technology
- GIS-based maps



Establishment of Biogas Demonstration Project with Hands-on Training in General Santos City

EXPECTED OUTPUTS

- Demonstration Unit of Biogas Digester for Power Generation
- Biogas Technology Design, Construction and Operations Training



Challenges

- Feedstock supply, sustainability and cost
- Validation of emerging biomass/biofuels feedstock and its related utilization technologies
- 2G/3G biofuel technology costs



The Way Forward

- **Full implementation of the Renewable Energy Act**
 - *Finalization / Approval of Guidelines on other RE Policy Mechanisms (Renewable Portfolio Standard (RPS), Green Energy Option, etc.)*
 - *Establish Energy Investment Coordinating Center and Linkages with other Government Regulatory Agencies*
 - *Resource Inventory and Establishment of RE Database*
 - *Capacity Building / Information, Education and Communication Campaigns*



MABUHAY

THANK YOU ! ! !

