Bioenergy Applications in the Philippines

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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
- Hydro Power
- 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
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
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

Potential Gasoline Displacement
- 400 million liters per year for E10
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.
Biofuels Implementation Plan

2004: Use of B1 in Government Vehicles (M.C. 55)

2007: Biofuels Law: Mandatory use of biofuels to start at 1% biodiesel (B1)

2009: Biofuels Law: 2% biodiesel 5% bioethanol

2011: Biofuels Law: >2% biodiesel 10% bioethanol (full implementation Feb. 6, 2012)

RA 9367 Effectivity
Targeted Biofuels Blend, 2013-2030*

*National Biofuels Program 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)
**Current Mandate:** B2, E10  
**Targets:** B10 and E20 by 2020, B20 and E85 by 2025

<table>
<thead>
<tr>
<th>Renewable Energy</th>
<th>Capacity (in Million Liters)</th>
<th>No. of Projects Monitored as of 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>As of 2014</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction*</td>
<td>Operational</td>
<td>Production</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>-</td>
<td>584.9</td>
</tr>
<tr>
<td>Bioethanol</td>
<td>38.0</td>
<td>222.1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>38.0</td>
<td>807.0</td>
</tr>
<tr>
<td><strong>As of 2015</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction*</td>
<td>Operational</td>
<td>Production</td>
</tr>
</tbody>
</table>

* With Certificate of Registration of Notice to Proceed Construction

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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
  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
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

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
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**

- **2011**
  - FIT, RPS and other policy initiatives have been promulgated
  - 276.7 MW biopower capacity are added to the grid

- **2015**
  - Mandatory B5 to all Diesel by 2015

- **2020**
  - PNS for B20 & E85 by 2020

- **2025**
  - PNS for B10 and E20 by 2015

- **2030**
  - DC on B20 and E85 by 2025

**Assessment of Biomass Utilization; Identification of new projects**

- **1**
  - DC on E10 in 2011

- **2**
  - PNS for B5 by 2014
  - DC on B5 by 2015

- **3**
  - DC on B10 and E20 by 2020

- **4**
  - DC on B20 and E85 by 2025

- **5**

**Continuing resources development, R, D & D and technology support activities**

**FIT and RPS**
Where are we now?

2010 and 2014 Total Installed Capacity Mix (MW)

**2010**

- **Hydro**: 21%
- **Wind**: 0.21%
- **Solar**: 0.006%
- **Biomass**: 0.19%
- **Geothermal**: 12%
- **Natural Gas**: 18%
- **Coal**: 29%
- **Oil-based**: 20%

Total Installed Capacity = 15,881 MW

RE Capacity Share = 5,304.25 MW

% RE Share = 33.4%

**2014**

- **Wind**: 283, 1.58%
- **Solar**: 23, 0.13%
- **Biomass**: 131, 0.73%
- **Geothermal**: 1,918, 10.69%
- **Natural Gas**: 3,462, 19.95%
- **Oil Based**: 3,476, 19.37%
- **Coal**: 5,708, 31.81%

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)

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>AWARDED PROJECTS</th>
<th>POTENTIAL CAPACITY MW</th>
<th>INSTALLED CAPACITY MW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grid-Use</td>
<td>Own-Use</td>
<td>Grid-Use</td>
</tr>
<tr>
<td>Hydro Power</td>
<td>352</td>
<td>1</td>
<td>7,053.15</td>
</tr>
<tr>
<td>Ocean Energy</td>
<td>7</td>
<td>-</td>
<td>26.00</td>
</tr>
<tr>
<td>Geothermal</td>
<td>41</td>
<td>-</td>
<td>610.00</td>
</tr>
<tr>
<td>Wind</td>
<td>56</td>
<td>1</td>
<td>1,180.80</td>
</tr>
<tr>
<td>Solar</td>
<td>129</td>
<td>16</td>
<td>3,820.24</td>
</tr>
<tr>
<td>Biomass</td>
<td>40</td>
<td>22</td>
<td>229.07</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>624</td>
<td>43</td>
<td>12,853.57</td>
</tr>
<tr>
<td>TOTAL</td>
<td>667</td>
<td></td>
<td>12,863.28</td>
</tr>
</tbody>
</table>
# RE Capacity Addition Historical Development

## RE Installations from 2009-2015 under RA 9513

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>2009-2015</th>
<th>Own-Use</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Projects</td>
<td>Installed Capacity (MW)</td>
<td>No. of Projects</td>
</tr>
<tr>
<td>Biomass</td>
<td>19</td>
<td>295.07</td>
<td>18</td>
</tr>
<tr>
<td>Geothermal</td>
<td>3</td>
<td>60.00</td>
<td>-</td>
</tr>
<tr>
<td>Solar</td>
<td>7</td>
<td>144.40</td>
<td>-</td>
</tr>
<tr>
<td>Hydropower</td>
<td>11</td>
<td>47.37</td>
<td>-</td>
</tr>
<tr>
<td>Ocean Energy</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wind</td>
<td>6</td>
<td>393.90</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>46</strong></td>
<td><strong>940.74</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>EXISTING</th>
<th>ADDITIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016-2020</td>
</tr>
<tr>
<td>BREOC</td>
<td>295.07</td>
<td>506.47</td>
</tr>
<tr>
<td>OWN USE</td>
<td>141.86</td>
<td>3.92</td>
</tr>
<tr>
<td>TOTAL</td>
<td>436.93</td>
<td>510.39</td>
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</tbody>
</table>
Bioenergy Power Plants/Projects

12 MW Rice-Husk Power Plant (Phase 1) - SJCIPC

12 MW Rice-Husk Power Plant Project - GIFT

8.8 MW Biogas Power Plant Project – Aseagas Corporation
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

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

* 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)

<table>
<thead>
<tr>
<th>RESOURCE</th>
<th>FOR NOMINATION / CONVERSION</th>
<th>WITH CERTIFICATE OF CONFIRMATION OF COMMERCIALITY</th>
<th>WITH CERTIFICATE OF ENDORSEMENT TO ERC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO. OF PROJECTS</td>
<td>CAPACITY (MW)</td>
<td>NO. OF PROJECTS</td>
</tr>
<tr>
<td>HYDRO</td>
<td></td>
<td></td>
<td>86</td>
</tr>
<tr>
<td>WIND</td>
<td>7</td>
<td>1,023.55</td>
<td>11</td>
</tr>
<tr>
<td>SOLAR</td>
<td>15</td>
<td>565.18</td>
<td>47</td>
</tr>
<tr>
<td>BIOMASS</td>
<td>18</td>
<td>140.32</td>
<td>12</td>
</tr>
<tr>
<td>TOTAL</td>
<td>22</td>
<td>1,588.73</td>
<td>162</td>
</tr>
</tbody>
</table>
**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 !!!