Renewable Energy in Thailand

Mr. Sumrit Haema
Executive Director
Bureau of Energy Research

Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, Thailand

Stakeholder Workshop on Renewable Energy and Experience Sharing
15 August 2012
The Sukosol Hotel, Bangkok
Contents

- Energy situation in Thailand
- Thailand’s Alternative Energy Development Plan (2012-2021)
- Current developments of alternative energy
Thailand’s Energy Sources in 2011

- **Electricity**: 95% Domestic, 5% Import
- **Coal**: 33% Domestic, 67% Import
- **Natural Gas**: 74% Domestic, 26% Import
- **Petroleum**: 100% Import
- **Crude Oil**: 15% Domestic, 85% Import

**Imported Value (Billion Baht)**
- Coal: 40
- Natural Gas: 136
- Petroleum: 10
- Crude Oil: 927

**Total Imported Value = 1,125 Billion Baht / 37.5 Billion USD**
Thailand’s Energy Uses by source

Total Energy Use 2.56 million barrels (oil equivalent) per day = 56 billion USD

Source: Department of Energy Business, Ministry of Energy
Total Energy Use 2.56 million barrels (oil equivalent) per day = 56 billion USD

Thailand’s Energy Uses by Sector

- Res. & Com.: 35.95%
- Transport: 35.69%
- Agriculture: 5.23%
- Industry: 23.13%

Source: Department of Energy Business, Ministry of Energy
Thailand’s Alternative Energy Potential

Natural
- Solar
- Hydro
- Wind

Crop
- Sugar cane (Molasses)
- Cassava
- Palm

Waste
- Agricultural wastes
- Industrial wastes
- Municipal solid waste (MSW)
Alternative Energy Development

Upgraded the master plan called “10-Year Alternative Energy Development Plan”

AEDP 2012-2021

Wind  Solar  Hydro  Bioenergy  Biofuels  Tidal wave  Geothermal
Alternative energy development plan (AEDP) 2012 - 2021

**Goal** - Committed to the development of low-carbon society

**Target** - 25% of AE in total energy consumption by 2021

Promote AE community uses
Encouraging Private Investment
Improve Support infrastructure
Promote R&D as a tool for RE industry
Publicly Promote better understanding
Supporting Law and regulations

<table>
<thead>
<tr>
<th>Solar</th>
<th>Wind</th>
<th>Hydro Power Plant</th>
<th>New Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000 MW</td>
<td>1,200 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*100 ktoe</td>
<td>600 MW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,200 MW</td>
<td>*100 ktoe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total AE consumption by 2021 = 24,270 ktoe**

**Bio-energy**
- Biomass: 3,630 MW *8,200 ktoe
- Bio-gas: 600 MW *1,000 ktoe
- MSW: 160 MW *35 ktoe
- Total: 4,390 MW *9,235 ktoe

**Biofuels**
- Ethanol: 9 ML/day
- Bio-diesel: 5.97 ML/day
- New fuels: 25 ML/day
- New fuels: 40 ML/day

* For Heat Process
## Current Situations and targets

<table>
<thead>
<tr>
<th>Type</th>
<th>unit</th>
<th>Current capacity</th>
<th>Target in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Wind</td>
<td>MW</td>
<td>7.28</td>
<td>1,200</td>
</tr>
<tr>
<td>2. Solar</td>
<td>MW</td>
<td>141.97</td>
<td>2,000</td>
</tr>
<tr>
<td>3. Hydro</td>
<td>MW</td>
<td>95.70</td>
<td>1,608</td>
</tr>
<tr>
<td>4. Biomass</td>
<td>MW</td>
<td>1,790</td>
<td>3,630</td>
</tr>
<tr>
<td>5. Biogas</td>
<td>MW</td>
<td>169.54</td>
<td>600</td>
</tr>
<tr>
<td>6. MSW</td>
<td>MW</td>
<td>27.48</td>
<td>160</td>
</tr>
<tr>
<td>7. Tidal &amp; Geothermal</td>
<td>MW</td>
<td>0.30</td>
<td>3</td>
</tr>
</tbody>
</table>
## Current Situations and Targets

<table>
<thead>
<tr>
<th>Type</th>
<th>unit</th>
<th>Current Capacity</th>
<th>Target in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Solar</td>
<td>Ktoe</td>
<td>3.25</td>
<td>9,335 Ktoe</td>
</tr>
<tr>
<td>9. Biomass</td>
<td>Ktoe</td>
<td>4,493</td>
<td>100</td>
</tr>
<tr>
<td>10. Biogas</td>
<td>Ktoe</td>
<td>421</td>
<td>8,200</td>
</tr>
<tr>
<td>11. MSW</td>
<td>Ktoe</td>
<td>1.71</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Biofuel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Ethanol</td>
<td>ML/Day</td>
<td>1.23</td>
<td>39.97 ML/day</td>
</tr>
<tr>
<td>13. Biodiesel</td>
<td>ML/Day</td>
<td>2.77</td>
<td>(12,191 ktoe)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25.0</td>
</tr>
</tbody>
</table>
1. Wind Energy

Target in 2021: 134.36 ktoe (1,200 MW) for electricity

Current Capacity: 0.81 ktoe (7.28 MW) for electricity

- Major Activities Towards the Success

  - Promote community to collaborate in broaden production and use of wind energy
    - Wind turbine in co-generation with other power generating systems in remote community and non-electrified island
    - Wind turbine for agricultural application such as water pumping
  
  - Push up amendment of laws and regulations which do not benefit in wind energy development such as code of practice regarding the request on land utilization of wind energy project development

  - Improve infrastructure system
    - establish the extension plan for transmission system
    - emerge industry for electricity storage devices and integrate with wind power generation system

  - Establish users and producers network of wind energy

  - Promote R&D on wind energy
    - Develop wind turbine type appropriated with Thailand wind speed
Target in 2021: 224 ktoe (2,000 MW) for electricity, 100 ktoe for heat

Current Capacity: 8.81 ktoe (78.69 MW) for electricity, 3.25 ktoe for heat

Major Activities Towards the Success

- Promote implementation of small scale solar energy system projects in household and community level, including Solar PV Rooftop for 1000 MW in 10 yrs.

- Promote integrated upstream industry of solar panel production, for ex: silicon wafers plant

- Assign the Electricity Authorities of Thailand to consider extending the transmission and distribution lines to support the development of wind energy

- Conduct efficiency standards of solar collector system

- Push up the amendment of Laws and Industrial Act, 1992 (B.E.2535)

- Adjust the Adder to be Feed-in tariff (FIT) system
3. Hydro Power

Target in 2021: 420.1 ktoe (1,608 MW) for electricity

Current Capacity: 25 ktoe (95.70 MW) for electricity

- support the construction of hydropower plant project at community level, let local administration organization or local people to collaborate as project owner and capable for their future self-management maintenance

- DEDE will work with EGAT on developing small hydropower system for downstream irrigation dam and mini hydro power system at power generation capacity of 200-6,000 kW

- assign EGAT to develop new pumped storage system project in 2 areas, i.e. Lam Takong pumped storage (unit 3-4) at 500 MW and Chulabhorn dam pumped storage project at capacity of 784 MW to support RE development in the Northeast region

- disseminate and conduct public relations on information and advantages of hydropower projects

- conduct research and develop the Micro Hydro Turbine of run-of river (water flow) type

- study and develop hydro turbine of low-head type

- conduct feasibility study on developing pico hydropower system

❖ Major Activities Towards the Success
Target in 2021: 1,625.75 ktoe (3,630 MW) for electricity, 8,200 ktoe for heat

Current Capacity: 801.68 ktoe (1,790 MW) for electricity, 4,493 ktoe for heat

**Major Activities Towards the Success**

- Promote plantation of fast growing trees that can be used as *feedstocks* for power/heat generation
- Develop production and standard of biomass pellets as for the future biomass fuel
- Develop gasifier and gas engine technology as well as biomass-to-liquid (BTL) technology
- Promote the use of high pressure boiler to improve efficiency of power generation from biomass
- Promote establishment of “Distributed Green Generation (DGG)” as power production from biomass in community level
- Coordinate with the Electricity Authority of Thailand to consider extending the transmission and distribution lines to support the development of biomass power plant project
5. Biogas

Target in 2021: 268.72 ktoe (600 MW) for electricity, 1,000 ktoe (heat)

Current Capacity: 71.29 ktoe (159.17 MW) for electricity, 421 ktoe (heat)

❖ Major Activities Towards the Success

• promote and support biogas production at household level

• study and develop biogas production from other alternative resources and develop technologies for biogas production

• promote and support development of biogas network for connecting to system with excess capacity for sharing in community through mechanism of community self management

• promote production and utilization of compressed bio-methane gas (CBG) from biomass/energy crop for transportation sector

• promote production and utilization of biogas from biomass/energy crops for power generation

• study and develop laws and regulations for biogas safety standard

• conduct public relations via media to disseminate knowledge and news and to create good image of investment in producing and utilizing biogas safely (biogas safety campaign)
• promote and support waste-to-energy production from MSW in small communities, for instances: schools, temples, communities, local organizations

• study the Refuse-Derived Fuel (RDF) management and promote production and utilization of RDF in local administrative organization

• build up the collaboration in targeted area for establishment of waste-to-energy system

• conduct campaign to educate children and juveniles in the detailed waste management for energy and environment at local level

• speed up the amendment of Joint Venture Act B.E. 2535 to enable private sector co-invest with local admin. organization in producing energy from MSW by all types, especially RDF type, then to co-generate heat and power in industrial plants, including promote production of oil derived from plastic waste.
1. Geothermal Energy

- Target in 2021: 1 MW for electricity
- Current Capacity: 300 kW for electricity

**Major Activities Towards the Success**

- Develop the potential map of national geothermal sources and technologies
- Assess the feasibility in development of geothermal sources by appropriate technologies
- Evaluate the cost effectiveness and impacts on community, environment and public health from energy production
- Adopt technologies which utilize geothermal energy at moderate temperature
- Follow up any technologies suitable for potentials and geography

2. Tidal and Current Energy

- Target in 2021: 2 MW for electricity

**Major Activities Towards the Success**

- Speed up the study on capably identify the sources and technology types that can be applied for tidal and current energy production in Thailand. It is expected primarily that potential areas are located under the Sarasin bridge in Phuket and surrounding areas of Koh Sa Mui-Pa Ngna and Koh Tan
- Capably assess the development potential and readiness preparation to develop the pilot project
Major Activities Towards the Success

- increase the national average production of cassava and sugarcane
- conduct research and develop ethanol production from other alternative crops
- prepare to terminate use of 91 benzene, ending by October 2012
- increase numbers of the gas station for E20 and E85
- make the price differences of E20 at minimum of 2 baht lower than E10 (91) to encourage the use of E20
- support the budget on research, testing and building up incentive to raise ethanol demand
- continuously campaign the public relations to create understanding on the E10, E20 and E85 gasohol
- promote use of flex fuel vehicle (FFV)
- conduct feasibility study of applying FFV conversion kit for any old cars and motorcycles to capably fuelled by E85
- Amend the laws and regulations to support the ethanol free trade in the future
8. Biodiesel and 2nd Gen. Biofuels for Future Diesel Substitution

1. Biodiesel

- Target in 2021: 1,878.34 ktoe (5.97 ML/day)
- Current Capacity: 723.65 ktoe (2.30 ML/day)

2. 2nd Gen. Biofuels for Future Diesel Substitution

- Target in 2021: 7,865.75 ktoe (25 ML/day)

- Major Activities Towards the Success

  - promote growing palm trees in appropriate areas not competing with any food crops
  - increase production capacity of crude palm oil
  - promote research work on biodiesel production from algae
  - promote research work on the future new fuel for diesel substitution comprising of
    - New energy crop development, i.e. jatropha and micro algae
    - Use of ethanol for blending to substitute diesel oil, i.e. Fatty Acid Ethyl Ester (FAEE), Ethanol blended with Additive (ED95), diesohol
    - Development of oil conversion technology, i.e. Bio Hydrofined Diesel (BHD) and Biomass-to-Liquid (BTL)
AEDP Advantages

Energy Sector

- 9201 MW of electricity
- 9335 ktoe of heat
- 39.97 ML/day of biofuel
- Share of alternative energy in final consumption is 24,271 ktoe

Economic Sector

- Reduce oil imports for 574,000 million Baht
- Promote private sector investment for approx. 442,000 million Baht

Environmental Sector

- Decrease CO₂ emission for 76 million tons/yr within 2021
7 Supporting Mechanisms:
- **RE-Electricity Generating**
  - 5 from MoEN
  - 1 from Board of Investment
  - 1 from TGO

### Support from the Ministry of Energy

<table>
<thead>
<tr>
<th>DEDE &amp; EPPO</th>
<th>DEDE</th>
<th>DEDE</th>
<th>EPPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Measures for RE Promotion

1. **BOI-Investment Incentives**
   - Renewable energy maps
   - Info from demonstration site
   - One-Stop Service Renewable energy potential info

2. **Investment Grant**, i.e. biogas, solar hot water, and MSW (i.e. 100% 2009, 50% 2010, 25% 2011 for MSW)

3. **“Energy Soft Loan”** Revolving funds for RE and energy conservation Projects

4. **ESCO Venture Capital Fund**

5. **“Adder”: Feed-in Premiums Policy**

### Offices giving licenses

- ONEP
- ERC
- Local Admin

### Private Investor

- **To raise a loan**
- **Capital requesting**
  - Registration for intent expression as per the time specified
  - Negotiation for electricity selling & buying
    - Firm
    - Non Firm

### Technical support

### Banks

### CDM

### Local Admin & EIA

###ENE

### ERC

### Consumers

### Other mechanisms

- **Energy Soft Loan** Revolving funds for RE and energy conservation Projects
- **ESCO Venture Capital Fund**
- **“Adder”: Feed-in Premiums Policy**
Thank you