Unlocking Energy Efficiency Potential: Thailand’s Policies Perspective

Department of Alternative Energy Development and Efficiency (DEDE)

Mr. Pongphat Munkkunk
Director

Bureau of Human Resource Development

October 26th, 2017

SIEW 2017 – Marina Bay Sands, Singapore
1. Thailand’s Energy Efficiency Situation

2. Energy Efficiency Plan (EEP 2015)

3. Energy Efficiency Policies and Measures
Thailand’s Energy Efficiency Situation
Final Energy Consumption By Type

- **Fossil Fuel**: 78.09%
- **Renewable Energy**: 13.83%
- **Traditional Renewable Energy**: 5.97%
- **Hydroelectric (Import)**: 2.11%
- **Electricity**: 2.27% (Solar, Wind, Biomass, Waste, Biogas)
- **Thermal Energy**: 8.98% (Solar, Biomass, Waste, Biogas)
- **Large hydroelectric**: 0.35%
- **Small Hydroelectric**: 0.03%
- **Biogas (Thermal)**: 2.20%

Final Energy Consumption By Sector (%)

- **Transportation**: 37%
- **Industrial**: 36%
- **Residential**: 15%
- **Commercial**: 7%
- **Agricultural**: 5%
Thailand Integrated Energy Blueprint (2015)

Main Concept EEP2015

- Reduce energy intensity (EI) by 30% within 2036 (Base year 2010)

- Equivalent to reduction of EI from 8.54 ktoe per billion Baht (2010) to 5.98 ktoe per billion Baht (2036) [currently at 8.22]

- Approximately 56,000 ktoe in energy saving in 2036

- Combination of compulsory, voluntary and complementary measures
**Energy Conservation Fund (ENCON Fund)**

- Established by Energy Conservation Promotion Act B.E.2535
- To provide funding for energy conservation promotion to help realize EEP2015
- Funded by levy from petroleum products at 0.25 Baht (1 Cent) per liter
- Earning of around 25M USD per month, with current balance (as of October 2017) of 1,250M USD

---

**Oil price structure for ULG. Vat and Market margin not included. Structure may vary depending on type as shown in table**

<table>
<thead>
<tr>
<th>UNIT: BAHT/LITRE</th>
<th>EX-REFIN.</th>
<th>TAX</th>
<th>M. TAX</th>
<th>OIL FUND</th>
<th>CONSV. FUND</th>
<th>WHOLESALE PRICE(WS)</th>
<th>VAT</th>
<th>WS&amp;VAT</th>
<th>MARKETING MARGIN</th>
<th>VAT</th>
<th>RETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULG</td>
<td>15.6875</td>
<td>6.5000</td>
<td>0.6500</td>
<td>6.3100</td>
<td>0.2500</td>
<td>29.3975</td>
<td>2.0578</td>
<td>31.4553</td>
<td>2.5277</td>
<td>0.1769</td>
<td>34.16</td>
</tr>
<tr>
<td>GASOHOL95 E10</td>
<td>16.7176</td>
<td>5.8500</td>
<td>0.5850</td>
<td>0.3500</td>
<td>0.2500</td>
<td>23.7526</td>
<td>1.6627</td>
<td>25.4153</td>
<td>1.5277</td>
<td>0.1069</td>
<td>27.05</td>
</tr>
<tr>
<td>GASOHOL91</td>
<td>16.4871</td>
<td>5.8500</td>
<td>0.5850</td>
<td>0.3500</td>
<td>0.2500</td>
<td>23.5221</td>
<td>1.6465</td>
<td>25.1686</td>
<td>1.5060</td>
<td>0.1054</td>
<td>26.78</td>
</tr>
<tr>
<td>GASOHOL95 E20</td>
<td>17.7485</td>
<td>5.2000</td>
<td>0.5200</td>
<td>-3.0000</td>
<td>0.2500</td>
<td>20.7185</td>
<td>1.4503</td>
<td>22.1688</td>
<td>2.2161</td>
<td>0.1551</td>
<td>24.54</td>
</tr>
<tr>
<td>GASOHOL95 E85</td>
<td>22.6869</td>
<td>0.9750</td>
<td>0.0975</td>
<td>-9.3500</td>
<td>0.2500</td>
<td>14.6594</td>
<td>1.0262</td>
<td>15.6855</td>
<td>4.0696</td>
<td>0.2849</td>
<td>20.04</td>
</tr>
<tr>
<td>H-DIESEL</td>
<td>15.9238</td>
<td>5.8500</td>
<td>0.5850</td>
<td>0.0100</td>
<td>0.2500</td>
<td>22.6188</td>
<td>1.5833</td>
<td>24.2021</td>
<td>1.4840</td>
<td>0.1039</td>
<td>25.79</td>
</tr>
<tr>
<td>LPG</td>
<td>20.7216</td>
<td>2.1700</td>
<td>0.2170</td>
<td>-6.5965</td>
<td>0.0000</td>
<td>16.5121</td>
<td>1.1558</td>
<td>17.6679</td>
<td>3.2566</td>
<td>0.2280</td>
<td>21.15</td>
</tr>
</tbody>
</table>

*As of October 17th, 2017*
Goal to reduce Energy Intensity by 30% in 2036, down to 5.97 ktoe/billion Baht

EEDP 2011 - 2030
= 25% Reduction

EEP 2015 – 2036
= 30% Reduction

Ei_{\text{base} 2010} = 8.54\ ktoe/billion\ baht
Ei_{\text{Actual} 2015} = 8.22\ ktoe/billion\ baht
Ei_{\text{Goal} 2036} = 5.97\ ktoe/billion\ baht

Current progress - 3.8%

Assumption:
> GDP Growth 3.8%
> Population Growth 0.03%
EEP 2015 Strategies & Measures

3 Strategies – 10 Measures

Compulsory

• EE 1: Energy Management system in designated factory/building
• EE 2: Building Energy Code
• EE 3: Energy Standard and Labeling (HEPS/MEPS)
• EE 4: Energy Efficiency Resources Standard (EERS)

Voluntary

• EE 5: Financial Incentive
• EE 6: Promotion of LED (Light Emitting Diode)
• EE 7: Promotion of EE in Transport Sector
• EE 8: Research and Development in Energy Efficient Technologies

Complementary

• EE 9: Human Resources Development
• EE 10: Promotion of Public Awareness on Energy Conservation
## EEP 2015 Measures Summary

**Unit: ktoe**

<table>
<thead>
<tr>
<th>Measures/Sector</th>
<th>Industrial</th>
<th>Building</th>
<th>Residential</th>
<th>Transportation</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE1 : Energy Management system in designated factory/building</td>
<td>4,388</td>
<td>768</td>
<td></td>
<td></td>
<td>5,156</td>
<td>10.0</td>
</tr>
<tr>
<td>EE2 : Building Energy Code</td>
<td></td>
<td></td>
<td></td>
<td>1,166</td>
<td>1,166</td>
<td>2.3</td>
</tr>
<tr>
<td>EE3 : Energy Standard and Labeling (HEPS/MEPS)</td>
<td>749</td>
<td>1,648</td>
<td>1,753</td>
<td></td>
<td>4,149</td>
<td>8.0</td>
</tr>
<tr>
<td>EE4 : Energy Efficiency Resources Standard (EERS)</td>
<td>202</td>
<td>184</td>
<td>114</td>
<td></td>
<td>500</td>
<td>1.0</td>
</tr>
<tr>
<td>EE5 : Financial Incentive</td>
<td>8,895</td>
<td>629</td>
<td></td>
<td></td>
<td>9,524</td>
<td>18.4</td>
</tr>
<tr>
<td>EE6 : Promoting LED</td>
<td>281</td>
<td>424</td>
<td>286</td>
<td></td>
<td>991</td>
<td>1.9</td>
</tr>
<tr>
<td>EE7 : Promotion of EE in Transport Sector</td>
<td></td>
<td></td>
<td></td>
<td>30,213</td>
<td>30,213</td>
<td>58.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14,515</td>
<td>4,819</td>
<td>2,153</td>
<td>30,213</td>
<td>51,700</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Industry Sector still be key player for target achievement
Energy Efficiency Policies and Measures

Compulsory Measures
Energy Efficiency Plan: Rules and Regulations


Decree on designated building Effective from 12/12/1995

Decree on designated factory Effective from 17/07/1997

Ministerial Regulations

Energy Management in designated buildings and factories Effective from 20/11/2009

Persons Responsible for Energy (PRE) Effective from 31/07/2009

Energy Management Auditors Effective from 11/05/2012

Building Energy Code Effective from 20/06/2009

High Energy Efficiency Standard for Equipments and Machinery Effective from 08/04/2009

1992
• Focus on Engineering Solutions
• Low attention on Value of People

2007
• Introduce EMS
• Systematic approach of energy conservation
### Regulation - Designated Building and Factory

Electricity Meter  
- $> 1,000$ kW  
- $> 1,175$ kVA  
- $> 20$ million MJ/year

<table>
<thead>
<tr>
<th>Type</th>
<th>Designated Factory/Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Meter</td>
<td>$&lt; 3,000$ kW</td>
</tr>
<tr>
<td>Transformer size</td>
<td>$&lt; 3,530$ KVA</td>
</tr>
<tr>
<td>Energy Used</td>
<td>$&lt; 60$ million MJ/ year</td>
</tr>
<tr>
<td>Number of Energy Manager</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>At least one is senior</td>
</tr>
</tbody>
</table>

- 1. Do energy management system (EMS)  
- 2. Appoint Person Responsible for Energy (PRE)

Currently 8,000 designated factories and buildings
To prescribe types and sizes of buildings and also standards, rules and procedures for designing of energy conservation building.

New or retrofitted buildings being constructed which have total area of all stories equal to 2,000 m² or more must be designed under the energy conservation requirements.

Currently mandatory only for government buildings. Voluntary for others.
**MEPS: Minimum Energy Performance Standards**

- Both voluntary and mandatory program
- Collaboration between DEDE and TISI
- Standards are set up by DEDE, but they are regulated by TISI.

**HEPS: High Energy Performance Standard**

- Voluntary program
- Collaboration between DEDE and EGAT
- Standards are set up by DEDE, and labeling programs are responsible by DEDE and EGAT

TISI: Thailand Industrial Standard Institute, EGAT: Electricity Generating Authority of Thailand
Energy Efficiency Policies and Measures

Voluntary Measures
Criteria:

• Available for factories/buildings/project developers for both EE and RE (RE ~ 37%)
• DEDE loans the funding via financial institutions to familiarize the bank with EE/RE investment
• Maximum loan of no more than 50M baht with interest rate of no more than 4%
• Payback period of 7 years
• New period: 2016-2019 = 4.5 Billion Baht, interest rate of 3.5%, payback period of 5 years

Finance Consideration

- Apply for loan
- Make a contract – funding from DEDE
- Invest and repay the loan + investment at 3.5% interest rate
- Repay the principal +0.5% interest to DEDE
- Return the money

<table>
<thead>
<tr>
<th>Phase</th>
<th># of projects</th>
<th>Total investment (Mbaht)</th>
<th>Investment via ENCON Fund (Mbaht)</th>
<th>Investment via bank (Mbaht)</th>
<th>Energy saved (ktoe)</th>
<th>Energy saved (Mbaht)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>78</td>
<td>3,427</td>
<td>1,902</td>
<td>1,525</td>
<td>98</td>
<td>1,805</td>
</tr>
<tr>
<td>2</td>
<td>83</td>
<td>3,330</td>
<td>1,735</td>
<td>1,595</td>
<td>99</td>
<td>1,713</td>
</tr>
<tr>
<td>3</td>
<td>98</td>
<td>5,878</td>
<td>2,702</td>
<td>3,176</td>
<td>93</td>
<td>2,329</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>1,282</td>
<td>377</td>
<td>905</td>
<td>13</td>
<td>421</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>2,042</td>
<td>489</td>
<td>1,554</td>
<td>17</td>
<td>539</td>
</tr>
<tr>
<td>Total</td>
<td>295</td>
<td>15,959</td>
<td>7,205</td>
<td>8,755</td>
<td>320</td>
<td>6,806</td>
</tr>
</tbody>
</table>
Turnkey solution for energy-related measures

Low-risk (ESCO guarantees energy saved under Energy Performance Contract (EPC))

Standardized Measurement and Verification

Collaboration between DEDE and FTI since 2007

Result

(2552 – 2558)

- 560 EPC-based projects
- 24,796 Mbaht in investment
- 5,222 Mbaht saving per year
- 60 registered ESCO created
- ESCO Association established in 2013

Develop Code of Practice to standardized ESCO

Develop M&V standard to ensure appropriate measurement and verification for ESCO business

Capacity Building and establish networking between stakeholders (ESCO Fair, Business Matching, Training)

ESCO Pilot projects for government buildings sector
Measure Overview:
Set up to joint capital promote investment in energy conservation and renewable energy development projects

Co-Investing & Investment Promotion Scheme
- ESCO Venture Capital
- Equity Investment (max 50 mb.)
- Equipment Leasing (max 10 mb.)
- Green House Gas
- Technical Assistant
- Credit Guarantee Facility

Investment Overview:
All 3 Phases

<table>
<thead>
<tr>
<th></th>
<th>FM1</th>
<th>FM2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of project</td>
<td>81</td>
<td>45</td>
<td>126</td>
</tr>
<tr>
<td>Total Investment (MB)</td>
<td>3908.46</td>
<td>1040.23</td>
<td>4938.69</td>
</tr>
<tr>
<td>Inv. from ESCO Fund (MB)</td>
<td>524.25</td>
<td>370.92</td>
<td>895.17</td>
</tr>
<tr>
<td>Saving (ktoe)</td>
<td>21.99</td>
<td>18.73</td>
<td>40.72</td>
</tr>
<tr>
<td>Energy Saving (MB)</td>
<td>662.59</td>
<td>362.76</td>
<td>1025.35</td>
</tr>
</tbody>
</table>

2015 ongoing (April 2015 – April 2017)
500 million Baht
Allocated from Gov’s ENCON FUND
### Direct Subsidy

**Project feature:**
- **Subsidy 20-30% of capital investment** for high efficient equipment/ machineries
  - Max. 3 million baht
  - Min. 0.05 million baht
- To buy EE products
- Payback period < 7 years

<table>
<thead>
<tr>
<th></th>
<th>2010-2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target</strong></td>
<td>Industry, Building, Agriculture</td>
<td>Industry, Building, Agriculture</td>
<td>SMEs</td>
<td></td>
</tr>
<tr>
<td>No. of project</td>
<td>232</td>
<td>247</td>
<td>115</td>
<td>594</td>
</tr>
<tr>
<td>No. of Measure</td>
<td>316</td>
<td>362</td>
<td>190</td>
<td>1,462</td>
</tr>
<tr>
<td>Supported (MB)</td>
<td>127.5</td>
<td>166.5</td>
<td>25.7</td>
<td>319.7</td>
</tr>
<tr>
<td>Saving (ktoe)</td>
<td>10.6</td>
<td>14.2</td>
<td>2.1</td>
<td>26.90</td>
</tr>
<tr>
<td>Total Investment (MB)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>2,106.7</td>
</tr>
<tr>
<td>Saving (MB/Yr)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>847.1</td>
</tr>
</tbody>
</table>
Energy Efficiency Policies and Measures

Complementary Measures
Capacity Buildings

1. Train PREs
2. Promote highly efficient technologies and materials
3. Promote Best Practice for energy conservation

Bureau of Human Resource Development

For actual Hand-on Experience
Technologies Demonstration

Energy Display Center
54 technologies showcased
- 37 Industrial sector technologies
- 10 Commercial building technologies
- 7 Residential sector technologies
- 20,000 visitors per year

Advance Technology Demonstration Project Phase 3
Focus on new and highly efficient technologies with small coverage publicly.

A total of 3 technologies in 5 establishment
- Subsidize 40% of the cost
- Max subsidy = 6 million Baht
- Energy saving of at least 15% for manufacturing process or 20% for utility system

Adsorption Chiller
Once-through Boiler
EE10: Awareness Promotion

“Thailand Energy Awards”
- Awareness Raising
- Participation
- Public Relation
- Increase Visibility

“ASEAN Energy Awards”
Thank You