1. Thailand Energy Situation
2. Alternative Energy Development Plan (AEDP 2015)
4. National Energy Reform
Final Energy Consumption

### By Economic Sector 2017
- Transportation: 40.1%
- Industry: 35.2%
- Commercial: 8.1%
- Residential: 13.3%
- Agriculture: 3.3%

### By Fuel Type 2017
- Traditional RE: 6.5%
- Petroleum Products: 50.1%
- Electricity: 20.4%
- Coal & its Products: 6.7%
- Natural Gas: 7.1%
- Renewable Energy: 9.1%

### Final Energy Consumption
- 2013: 75,214
- 2014: 75,804
- 2015: 77,881
- 2016: 79,929
- 2017: 80,752

### Commercial Energy
- 2013: 61,236
- 2014: 61,075
- 2015: 63,844
- 2016: 67,296
- 2017: 68,144

### Petroleum Products
- 2013: 35,948
- 2014: 36,570
- 2015: 37,981
- 2016: 39,714
- 2017: 40,451

### Electricity
- 2013: 14,002
- 2014: 14,371
- 2015: 15,455
- 2016: 16,233
- 2017: 16,505

### Coal & its Products
- 2013: 5,947
- 2014: 4,629
- 2015: 4,403
- 2016: 5,313
- 2017: 5,423

### Natural Gas
- 2013: 5,339
- 2014: 5,505
- 2015: 6,005
- 2016: 6,036
- 2017: 5,765

### Renewable Energy
- 2013: 5,902
- 2014: 5,775
- 2015: 6,579
- 2016: 7,182
- 2017: 7,322

### Traditional RE
- 2013: 8,076
- 2014: 8,954
- 2015: 7,458
- 2016: 5,451
- 2017: 5,286
Share of Fuel for Electricity Generation 2017

- Renewable Energy/ other Energy: 20.6%
- Coal/ Lignite: 18%
- Natural Gas: 61.20%
- Fuel Oil/ Diesel: 0.2%

CO₂ Emission per Unit of Power Generation (kWh)

Source: EPPO
• Reduce Energy Intensity (EI) by 30% in 2036 in comparison with 2010
• Accelerate EE execution via 3 strategies: 1) Compulsory
  2) Voluntary
  3) Complementary

• Fuel Diversification: reduce reliance on natural gas and increase the share of renewable energy, clean coal technology and power purchasing from neighboring countries
• Research: Smart Grid, EV etc.

• Increase the share of renewable energy to 30% by 2036
• Target by energy type: 1) Power generation: ~ 20% of electricity substitution
  2) Heat: ~ 37% of heat substitution
  3) Biofuel: ~ 25% of fuel substitution

• Reduce natural gas demand in accordance with PDP, EEP & AEDP
• Extend domestic natural gas supply & LNG Management
• Infrastructure for LNG import: gas pipelines, LNG receiving terminals etc.

• Support EE measures (EEP) in the transportation sector
• Promote the use of renewable Energy (AEDP): Biofuels
• Rebalance fuel mix by setting appropriate fuel price structures that reflect actual costs
Alternative Energy Development Plan (AEDP) 2015-2036

**Foundation:** Commitment to the development of a low-carbon society

**Facilitator:** Private-led investment

**Strategy:** Alternative Energy Development Plan 2015-2036

**Facilitator:** Government funded RD&D

**Goal:** Target 30% renewables in Total Energy Consumption by 2036

### Bio-Energy
- Biomass: 5,570 MW, 22,100 ktoe
- Biogas: 1,280 MW, 1,283 ktoe
- MSW + Industrial Waste: 550 MW, 495 ktoe

**Total:** 6,720 MW Power | 23,878 Ktoe Heat

### Bio-Fuel
- Ethanol: 11.3 ML/Day
- Biodiesel: 14 ML/Day
- Pyrolysis Oil: 0.53 ML/Day
- CBG: 4,800 t/Day
- Alt. Fuels*: 10 ktoe

### Solar
- 6,000 MW
- 1,200 Ktoe

**Total:** 9,002 MW Power | 1,200 Ktoe Heat

### Wind
- 3,002 MW

### Hydro
- Large Hydro: 2,906.40 MW
- Small Hydro: 376 MW

**Total:** 3,282.40 MW

### New-Energy
- Geothermal, Used Tire Oil, etc.: 10 ktoe

* Alternative fuels = Bio-oil, Hydrogen
Ministry of Energy came up with Energy 4.0 which is to use energy efficiently and to generate electricity by taking into account cost and service.

At present, a development is made combining the use of clean energy and environmental protection that will lead to energy conservation, clean environment and citizen’s happiness.
Alternative Energy Promotion Measures

- Exemption of imported duty of equipment or machines
- Exemption of income-corporate taxes resulting from selling RE or saving energy for periods up to 8 years

Investment grants

BOI

Data Support

Feed-in Tariff (FIT)

ESCO fund

- One stop service center
- Data on renewable development progress
- Resource data maps, such as solar, wind, biomass, biogas, and MSW

- Provides lower risk capital to renewable-focused businesses
- Equity investment (ESCO venture capital)
- Equipment leasing
- Credit guarantee facility

- Biomass: 4.24-5.34 THB/kWh
- Biogas: 3.76-5.34 THB/kWh
- MSW: 5.08-6.34 THB/kWh
- Wind: 6.06 THB/kWh
- Hydro: 4.90 THB/kWh
- Solar: 5.66-6.85 THB/kWh
- SPP Hybrid Firm: 3.56 THB/kWh
- VSSP Hybrid Firm: 3.76-5.34 THB/kWh
Final Energy Consumption

Fossil Fuel 75.30%

Renewable Energy 15.33%

Traditional Renewable Energy 6.89%

Hydroelectric (Import) 2.48%

11,051 ktoe

Renewable Energy

Electricity 2.74% (Solar, Wind, Biomass, Waste, Biogas)

Small Hydroelectric 0.06%

Large hydroelectric 0.68%

Thermal Energy 9.38% (Solar, Biomass, Waste, Biogas)

Biogas (Thermal) 2.47%

49,822 ktoe

Renewable Energy Consumption Jan - July 2018
## Status of Power Purchase Agreement based on Renewable Energy Sources

<table>
<thead>
<tr>
<th>Status</th>
<th>SPP</th>
<th>VSPP</th>
<th>Power Plant under DEDE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Submit, wait for Agreement</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Agree to purchase wait for PPA</td>
<td>18</td>
<td>454.14</td>
<td>319.54</td>
<td>0</td>
</tr>
<tr>
<td>PPA Signed, wait for COD</td>
<td>16</td>
<td>868.953</td>
<td>719.622</td>
<td>83</td>
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<tr>
<td>Commercial Operation Date - COD</td>
<td>60</td>
<td>2,730.05</td>
<td>2,176.22</td>
<td>914</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>94</strong></td>
<td><strong>4,053.15</strong></td>
<td><strong>3,215.38</strong></td>
<td><strong>997</strong></td>
</tr>
</tbody>
</table>

**Source**: ERC website, up to November 2018

**Note:**
- IPP = > 90 MW
- SPP = 10 – 90 MW
- VSPP = < 10 MW
**Overall energy plan revision**

### Categories

<table>
<thead>
<tr>
<th>Categories</th>
<th>AEDP2015</th>
<th>AEDP2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar / resident</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Solar Floating (EGAT)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>IPS</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Electricity

<table>
<thead>
<tr>
<th>Share in RE %</th>
<th>2015</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW</td>
<td>4.27</td>
<td>7.68</td>
</tr>
<tr>
<td>Industrial waste</td>
<td>37</td>
<td>50</td>
</tr>
<tr>
<td>Biomass</td>
<td>4,780</td>
<td>5,570</td>
</tr>
<tr>
<td>Biogas (WW + Crops)</td>
<td>500</td>
<td>—</td>
</tr>
<tr>
<td>Small hydro</td>
<td>188</td>
<td>376</td>
</tr>
<tr>
<td>Wind</td>
<td>1,515</td>
<td>3,002</td>
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<tr>
<td>Solar</td>
<td>3,294</td>
<td>6,000</td>
</tr>
<tr>
<td>Large hydro</td>
<td>2,906.4</td>
<td>2,906.4</td>
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<tr>
<td>Others (Geothermal)</td>
<td>-</td>
<td>—</td>
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</table>

### Heat

<table>
<thead>
<tr>
<th>Share in RE %</th>
<th>2015</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW</td>
<td>19.15</td>
<td>19.19</td>
</tr>
<tr>
<td>Biomass</td>
<td>19.15</td>
<td>19.19</td>
</tr>
<tr>
<td>Biogas</td>
<td>6.65</td>
<td>3.15</td>
</tr>
<tr>
<td>Solar</td>
<td>4.27</td>
<td>7.68</td>
</tr>
</tbody>
</table>

### Fuel

<table>
<thead>
<tr>
<th>Share in RE %</th>
<th>2015</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel (mil l/d)</td>
<td>4.30</td>
<td>14.0</td>
</tr>
<tr>
<td>Ethanol (mil l/d)</td>
<td>4.13</td>
<td>11.3</td>
</tr>
<tr>
<td>Pyrolysis oil (mil l/d)</td>
<td>-</td>
<td>0.53</td>
</tr>
<tr>
<td>CBG (ton/d)</td>
<td>3.0</td>
<td>4,800</td>
</tr>
</tbody>
</table>

* Bio-oil, Hydrogen and others

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**Keep overall targets of 30% Renewable Energy in total energy consumption by 2036 but change in energy sources**

**RE share 15.33 % to FEC (July 2018)**
National Energy Reform

Energy Reform Plan

1. Energy Management
2. Electricity
3. Petroleum & Petrochemical
4. Renewable Energy Promotion
5. Energy Efficiency & Conservation
6. Technology Innovation & Infrastructure

6 Dimensions
17 Keystones
National Energy Reform Plan

Key Points of 5 years Energy Reform (2018 – 2022)
6 Dimensions 17 Keystones

1. Energy Management
   (1) Energy Organization Reformation
   (2) National Energy IT Center
   (3) Good Governance Reformation

2. Electricity
   (1) Energy Management
      (1) PDP revision
      (2) Promote of Electricity Business competition
      (3) Restructure of Electricity Business
   (2) Electricity

3. Petroleum & Petrochemical
   (1) Petroleum & Petrochemical
      (1) Natural Gas Industry Development
      (2) Petrochemical Development Phase 4

4. Renewable Energy Promotion
   (1) Renewable Energy Promotion
      (1) Fast Growing Crops Management Reform
      (2) Waste to Electricity Generation Promotion
      (3) Solar PV rooftop Installation Liberation
      (4) Restructure of Energy Used in Transport Sector

5. Energy Conservation and Efficiency
   (1) Energy Conservation and Efficiency
      (1) Energy Efficiency Promotion in Industry Sector
      (2) Enforcement of Building Energy Code (BEC)
      (3) Energy Service company (ESCO) in Public Sector

6. Technology, Innovation & Infrastructure
   (1) Technology, Innovation & Infrastructure
      (1) Electric Vehicle
      (2) Energy Storage System

(1) Fast Growing Crops Management Reform
(2) Waste to Electricity Generation Promotion
(3) Solar PV rooftop Installation Liberation
(4) Restructure of Energy Used in Transport Sector
Thank you for Your attention