An Overview of Bioenergy Policy and Market in Korea

2018. 09. 06.

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Presentation Agenda

I. Introduction

II. Current Status on Bio-power

III. Prospects on Bio-power

IV. Summary
I. Introduction
CO₂ Reduction Plan in Korea

(MOE, 2015)

<table>
<thead>
<tr>
<th>Year</th>
<th>BAU</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>9.0</td>
<td>8.5</td>
</tr>
<tr>
<td>2012</td>
<td>8.0</td>
<td>7.0</td>
</tr>
<tr>
<td>2020</td>
<td>6.0</td>
<td>5.4</td>
</tr>
<tr>
<td>2030</td>
<td>5.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

37% Reduction

x 10⁸ ton C
Targets for Renewable Energy

In 2016: 4.8%
- Wind: 2.5%
- Others: 4.4%
- Bio: 19.5%
- Hydro: 4.3%
- Waste: 61.6%

In 2035: 11%
- Others: 1.3%
- Solar thermal: 7.9%
- Geothermal: 8.5%
- Waste: 29.2%
- Bio: 18.0%
- Hydro: 2.9%
- Wind: 18.2%
- PV: 14.1%

Renewable energy: $1.42 \times 10^7$ TOE $\rightarrow 3.62 \times 10^7$ TOE $\times 2.55$

Bioenergy: $2.76 \times 10^6$ TOE $\rightarrow 5.65 \times 10^6$ TOE $\times 2.04$
II. Currents Status on Biopower
## Supporting Policies on Bioenergy

<table>
<thead>
<tr>
<th>Bioenergy</th>
<th>Supporting Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bio-power</strong></td>
<td>Feed-in-Tariff ----(\rightarrow) <strong>RPS</strong> (from 2012)</td>
</tr>
<tr>
<td><strong>Biofuels</strong></td>
<td>Tax exemption ----(\rightarrow) <strong>RFS</strong> (from 07. 2015)</td>
</tr>
<tr>
<td><strong>Bio-heat</strong></td>
<td><strong>Renewable Heat Obligation (RHO)</strong> (???)</td>
</tr>
</tbody>
</table>
Status and Targets of Bioenergy Supply by Type
(KNREC, 2014)
Bioenergy Market in Korea
(KNREC, 2017)

2016: $1.0 \times 10^9

- **Biodiesel**: 71.7%
- **Biopower Fuel**: 14.7%
- **Wood Pellet**: 4.1%
- **Wood Chip**: 2.6%
- **Bio-SRF**: 5.0%
- **Bio-Solid Fuel**: 2.6%
- **Sludge Solid Fuel**: 2.6%
- **Biogas**: 0.3%
# RPS Target

*(KNREC, 2018)*

**Program participants:** Power producers having capacity > 500MW (21 power companies)

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2016</th>
<th>2018</th>
<th>2020</th>
<th>2022</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS Target, %</td>
<td>2.0</td>
<td>2.5</td>
<td>3.5</td>
<td>5.0</td>
<td>7.0</td>
<td>9.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Liability, (No. of certificates) x 10^3 RECs</td>
<td>6,420</td>
<td>9,210</td>
<td>15,081</td>
<td>21,999</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bio-power</td>
<td>60 (0.9%)</td>
<td>724 (7.9%)</td>
<td>2,081 (13.8%)</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**In 2018, REC prices**
- **Contract**: $66/REC
- **Spot trading**: $90/REC
Renewable Generation by Technology
(KNREC, 2018)

Power generation (GWh)

- IGCC
- Fuel cell
- Ocean
- Hydro
- Wind
- PV
- Bio
- Waste

Renewable Generation by Technology (KNREC, 2018)

3% 15.3%
Bio-Power by Fuel type
(KNREC, 2017)

X 10^3 MWh

Bio-Power fuel
Bio-SRF
Wood pellet
Others

Biogas

Year
Advantages of Bio-power

- Easy adaption to existing power plants
- Low investment cost
- Low entry barriers
- High REC credit until 2018 May

<table>
<thead>
<tr>
<th>Renewable energy type</th>
<th>REC Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio</td>
<td></td>
</tr>
<tr>
<td>Co-firing</td>
<td>1.0</td>
</tr>
<tr>
<td>Dedicated</td>
<td>1.5</td>
</tr>
<tr>
<td>PV</td>
<td>0.7-1.5</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
</tr>
<tr>
<td>On-shore</td>
<td>1.0</td>
</tr>
<tr>
<td>Off shore</td>
<td>1.5-2.0</td>
</tr>
</tbody>
</table>
Wood Pellet Consumptions in Korea (KBEA, 2018)

- **Domestic, ton/yr**
  - 2013: 65,606
  - 2014: 90,462
  - 2015: 82,137
  - 2016: 52,572
  - 2017: 67,446

- **Imported, ton/yr**
  - 2013: 484,668
  - 2014: 1,849,641
  - 2015: 1,470,684
  - 2016: 1,716,641
  - 2017: 2,431,166

[Bar chart showing wood pellet consumption trends from 2013 to 2017.]
Major Countries for Pellet Export to Korea
(KBEA, 2018)

<table>
<thead>
<tr>
<th>Country</th>
<th>Pellet Export (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnam</td>
<td>296,647</td>
</tr>
<tr>
<td>Malaysia</td>
<td>192,609</td>
</tr>
<tr>
<td>Thailand</td>
<td>50,737</td>
</tr>
<tr>
<td>Indonesia</td>
<td>34,275</td>
</tr>
<tr>
<td>Canada</td>
<td>14,791</td>
</tr>
<tr>
<td>USA</td>
<td>2,564</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1,221</td>
</tr>
<tr>
<td>Russia</td>
<td>1,149</td>
</tr>
<tr>
<td>Philippines</td>
<td>1,124</td>
</tr>
<tr>
<td>Japan</td>
<td>1,123</td>
</tr>
<tr>
<td>Poland</td>
<td>50</td>
</tr>
<tr>
<td>Singapore</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>346,378</strong></td>
</tr>
</tbody>
</table>

*2018.07*
Challenging Issues on Bio-Power

• High dependence on imported pellets
  (55% of bio-power is from imported pellets)

• Concern about air pollution by PM emissions
## Notice for REC changes, Biopower
### (MOTIE public hearing, May 18th 2018)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Technology</th>
<th>New REC, Equivalence value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFG</td>
<td>-</td>
<td>0.5</td>
</tr>
<tr>
<td>Wood chip/ Wood pellet</td>
<td>Co-firing</td>
<td>1.0 ---→ 0</td>
</tr>
<tr>
<td></td>
<td>Co-firing &gt; Dedicated</td>
<td>1.0 → 0.5</td>
</tr>
<tr>
<td></td>
<td>Dedicated</td>
<td>1.5 ---→ 1.0</td>
</tr>
<tr>
<td>Bio-SRF</td>
<td>Co-firing</td>
<td>1.0 ---→ 0</td>
</tr>
<tr>
<td></td>
<td>Co-firing &gt; Dedicated</td>
<td>1.0 → 0.25</td>
</tr>
<tr>
<td></td>
<td>Dedicated</td>
<td>1.5 ---→ 0.5</td>
</tr>
<tr>
<td>Unutilized Forest residues</td>
<td>Co-firing</td>
<td>1.0 ---→ 1.5</td>
</tr>
<tr>
<td></td>
<td>Co-firing &gt; Dedicated</td>
<td>1.0 ---→ 2.0</td>
</tr>
<tr>
<td></td>
<td>Dedicated</td>
<td>1.5 ---→ 2.0</td>
</tr>
<tr>
<td>Bio-power fuel, Sludge fuel</td>
<td>-</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Unutilized Forest Biomass in Korea

Cutting volume: $9.40 \times 10^6 \text{ m}^3$

Utilized: $5.15 \times 10^6 \text{ m}^3$

Unutilized: $4.15 \times 10^6 \text{ m}^3$

Logistics for collection of unutilized forest residues is the key issue!
III. Prospects on Biopower
RE 3020 plan
(MOTIE, 2017)
Action plan of RE 3020
(MOTIE, 2017)

PV, Wind will be key renewable energies for RE3020

2017

- PV: 5.7GW (38%)
- Wind: 12GW (8%)
- Hydro: 1.8GW (12%)
- Bio: 2.3GW (16%)
- Waste: 3.8GW (25%)
- Others: 0.2GW (1%)

2030

- PV: 36.5GW (57%)
- Wind: 17.7GW (28%)
- Hydro: 3.3GW (5%)
- Bio: 3.3GW (5%)
- Others: 1.4GW (6%)

PV: $5.7GW \times 6 = 36.5GW$
Wind: $12GW \times 15 = 17.7GW$
Bio: $2.3GW \times 1.4 = 3.3GW$
IV. Summary

1. Ambitious CO$_2$ reduction plan is the main driver for implementation of renewable energies including bioenergy

2. RPS is the main supporting policy for biopower

3. Wood pellet has been the most attractive option for power companies to reach the RPS target

4. Bio-wastes and forest residues are the main sources for bioenergy. Shortage of the feedstocks for bioenergy becomes the main issue

5. Korean government now more focus on PV and wind

6. Currently sustainability of bioenergy is not officially considered
Thank You for Kind Attention!