JAPAN’S ELECTRICITY MARKET REFORM AND ITS IMPLICATIONS FOR ELECTRIFICATION

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Goals

- Secure stable supply of electricity by facilitating power interchange between regions.
- Hold down increasing tariffs as much as possible.
- Increase consumers’ choice while expanding business opportunities.

Approaches

- Comprehensive measures covering electricity, gas and heat.
- Step-by-step approach with flexibility and a verification process.
- Give due regard to energy mix, especially nuclear and renewables.
Electricity Market Reform Roadmap

【1st Step】
Apr. 2015

Establishment of OCCTO*

*The Organization for Cross-regional Coordination of Transmission Operators

【2nd Step】
Apr. 2016

Establishment of EMSC**

**The Electricity Market Surveillance Commission

【3rd Step】
Apr. 2020

Full Liberalization of Retail Market

Transitional Period of Regulated Retail Tariffs

Abolishment of Regulated Retail Tariffs

Legal Unbundling
The share of new entrants, which remained below 3% until last year, amounts to 11% now.
Switching Rates

As many as 4 million households, 6% of the total, have switched electricity suppliers from the incumbents to new entrants. Another 5% have switched tariffs without changing suppliers.

Switching Cases (as of June 2017)

<table>
<thead>
<tr>
<th>Area</th>
<th>Switching to New Entrants</th>
<th>Switching to New Tariffs (No change of suppliers)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (thousand)</td>
<td>Ratio (%)</td>
</tr>
<tr>
<td>Hokkaido</td>
<td>179</td>
<td>6.5</td>
</tr>
<tr>
<td>Tohoku</td>
<td>136</td>
<td>2.5</td>
</tr>
<tr>
<td>Tokyo</td>
<td>2,005</td>
<td>8.7</td>
</tr>
<tr>
<td>Chubu</td>
<td>311</td>
<td>4.1</td>
</tr>
<tr>
<td>Hokuriku</td>
<td>23</td>
<td>1.8</td>
</tr>
<tr>
<td>Kansai</td>
<td>805</td>
<td>8.0</td>
</tr>
<tr>
<td>Chugoku</td>
<td>47</td>
<td>1.3</td>
</tr>
<tr>
<td>Shikoku</td>
<td>40</td>
<td>2.1</td>
</tr>
<tr>
<td>Kyushu</td>
<td>226</td>
<td>3.6</td>
</tr>
<tr>
<td>Okinawa</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>3,769</td>
<td>6.0</td>
</tr>
</tbody>
</table>
Massive Deployment of Smart Meters

- In accordance with the full retail market liberalization, a massive number of smart meters are scheduled to be deployed.
- The deployment will be accelerated until 2020, when as many as 67 million will be deployed.

**Deployment Plan of Smart Meters**

(Aggregate of 10 Major Utilities’ Plans)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Meters (million)</th>
<th>Annual Additions</th>
<th>Cumulative Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>9.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td>82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Trading Volume on Power Exchange

- Trading volume on the power exchange has been growing rapidly over the past year, amounting to a record high of 5% of total sales now.
Market Reform and Electrification

**Electricity Market Reform**
- Secure stable supply
- Hold down increasing tariffs
- Expand business opportunities

**Social Changes**
- Decarbonization
- Safety aspirations
- AI & IoT

**Electrification**

**Promotion of EVs**

**Demonstration of Power-to-Gas**

**Demonstration of Smart Community**
Promotion of EVs

- Setting a target of 10 million EVs and PHVs in 2030, Japan aspires to introduce EVs with a variety of measures including taxes and subsidies.

<table>
<thead>
<tr>
<th>EV &amp; PHV Promotion Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
</tr>
<tr>
<td>Sales</td>
</tr>
<tr>
<td>EV</td>
</tr>
<tr>
<td>units</td>
</tr>
</tbody>
</table>

- With a view to facilitating introducing EVs, Japan puts a preferential tax treatment into practice. Tax reduction on EVs accounts for 5% of the vehicle price.
- The government has decided to encourage auto manufactures to extend EV driving range by providing subsides according to the maximum range on a full charge.
- The Japanese government has spent more than 55 billion yen (=500 million dollars) for battery chargers. Thanks to this subsidy, there are currently about 28,000 public chargers.
Demonstration of Power-to-gas (P2G)

- Power-to-gas, which converts electricity to hydrogen, is an effective way to make the best use of an abundant surplus renewable energy.
- For the purposes of practicing power to gas, R&D and demonstration projects are underway.

【Abstract of “Power to Gas” 】

- Surplus electricity
  - Renewable energy
  - Stable energy

- Water electrolysis
  - Energy carrier
  - High-pressure hydrogen gas
  - Methane
  - Methanation

- Power grid
  - Injection
  - Pipe-line (ex: Europe)
  - City Gas

- Generation (renewables)
  - Hydrogen production
  - Convert • Storage • Transportation
  - Utilization

- Hydrogen refueling stations
- Fuel cell
- Hydrogen power generation
- Byproduct hydrogen

Power-to-gas, which converts electricity to hydrogen, is an effective way to make the best use of an abundant surplus renewable energy. For the purposes of practicing power to gas, R&D and demonstration projects are underway.