Power Grids in Japan

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Energy Bridges between Russia and Japan

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Power grids & electricity market in Japan

Source: Japan’s Electricity Market Deregulation (METI, 2015)
Electric power system in Japan

Loosely coupled power systems and operations—Nation-wide operation by Organization for Cross-regional Coordination of Transmission Operators (OCCTO) since 2015
Interconnection among general power utilities

Frequency converter stations
Shin-Shinano: 0.6GW
Sakuma: 0.3GW
Higashi-Shimizu: 0.3GW (previously 0.1GW)
Total 1.2GW → 2.1 GW (2020), 3 GW

60Hz System 110GW

Kyusyu

500kV

Shikoku

1.4GW

DC±250kV

Chugoku

500kV

16.6GW

5.6GW

Kansai

500kV

Hokuriku

500kV

500kV

Chubu

5.6GW

Tokyo

500kV

500kV

6GW

DC±250kV

Tohoku

0.6GW

Hokkaido

5.6GW

0.3GW

DC±250kV

50Hz System 90GW

Kansai

Tokyo

500kV

Chugoku

Shikoku

Kyusyu

Chubu
Policies of the electricity regulatory reform

◆ Enhancing nationwide system operation in 2015
  ➢ Establishing the Organization for Cross-regional Coordination of Transmission Operators (OCCTO)
  ➢ Framework for development of interconnection

◆ Full retail choice and full liberalization of power generation
  ➢ All customers, including household consumers, will be able to choose an electricity supplier in 2016

◆ Further securing neutrality of the transmission/distribution sector through the legal unbundling: 2020
  ➢ Transmission/distribution company will be separated.
Installed Capacity of 10 Japanese EPCos

<table>
<thead>
<tr>
<th>Year</th>
<th>Others</th>
<th>Nuclear</th>
<th>Oil</th>
<th>LNG</th>
<th>Coal</th>
<th>Pumped Storage</th>
<th>Hydro</th>
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</thead>
<tbody>
<tr>
<td>1952</td>
<td>0.2%</td>
<td>20.2%</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>2009</td>
<td>0.2%</td>
<td>20.2%</td>
<td>-</td>
<td>-</td>
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</table>
Generation mix: 10EPCos, in 100 M kWh
LNG is dominant after Fukushima
New Target of Power Generation Mix, Primary Energy and CO₂ emission in 2030

**Power Generation Mix**
Diversification to four energy kinds

**Primary Energy**
9.8% reduction from 2013 level

**Energy-origin CO₂**
24.9% reduction from 2013 level

<table>
<thead>
<tr>
<th>Energy Kind</th>
<th>2010</th>
<th>2013</th>
<th>2030</th>
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<tbody>
<tr>
<td>Oil</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
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<tr>
<td>Coal</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>LNG</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Renewable</td>
<td>0.2</td>
<td>0.4</td>
<td>0.8</td>
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<tr>
<td>Geothermal</td>
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<tr>
<td>Hydro</td>
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<tr>
<td>Nuclear</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

(Source: Advisory Committee for Natural Resources and Energy)
Economic Dispatch: case of Chubu EPCo

- 石油 (Oil)
- LNG (Natural Gas)
- 石炭・他社 (Coal)
- 一般水力 (Hydropower)
- 扬水動力 (Pump Storage)
- 扬水発電 (Pumped Hydroelectricity)

Supply

Demand

Max Capacity

Reserve Capacity

Nuclear Power Stop

Supply Capacity

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Concluding comments

- For generators: imports from Russia as competitive LNG sources
- For T&D: international interconnections and inter-utility connections will be handled at OCCTO
- For retailers: stable supply and competitive price
- For RES integration: more flexible gas-fired generator preferred