J-POWER’s Challenge for Decarbonization
J-POWER, based on its corporate philosophy, has developed power generation facilities which suit the social requirement in each era, utilizing cutting edge technologies which mitigate environmental load.

Corporate philosophy

Our mission
We will meet people’s needs for energy without fail, and play our part for the sustainable development of Japan and the rest of the world.

Our Credo (an extract)
We pursue harmony with the environment, and thrive in the trust of communities where we live and work.

History of J-POWER’s Power Generation Asset Development

- Improvement of post-war electricity shortage
- Diversification of generation facilities after oil crisis
- Improvement of electricity shortage in developing countries
- Reduction of environmental load

Global capacity
As of Mar. 31, 2018

- Coal-fired: 9.5 GW
- Hydro: 9.1 GW
- Wind: 0.5 GW
- Gas-fired, etc.: 5.5 GW

Total capacity: 24.6 GW

*Capacity shows owned capacity
## Challenge for Decarbonization

- Challenging further carbon reduction / decarbonization along national policy based on Paris agreement

### Paris agreement

<table>
<thead>
<tr>
<th>Countries set GHG reduction targets, reviewed every 5 years</th>
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<tbody>
<tr>
<td>2030</td>
</tr>
<tr>
<td>GHG reduction by 26%</td>
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<table>
<thead>
<tr>
<th>National policy</th>
<th>Energy mix</th>
<th>Challenge for energy conversion / decarbonization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewables approx. 22-24%</td>
<td>LNG approx. 27%</td>
<td>Renewables</td>
</tr>
<tr>
<td>Nuclear approx. 22-20%</td>
<td>Coal approx. 26%</td>
<td>Hydrogen, CCS</td>
</tr>
<tr>
<td>Oil approx. 3%</td>
<td>Thermal to be highly efficient</td>
<td>Nuclear etc.</td>
</tr>
</tbody>
</table>

### National policy initiatives

- **2030**
  - Contribute to achieve intensity target as a member of ELCS* (see page 6)

- **2050s**
  - Decarbonization of generation by fossil fuel

#### J-POWER’s initiatives

- **Expansion of renewable energy**
  - FY2025 Target: New development with 1GW scale

- **Carbon reduction and decarbonization in coal use**
  - Development of high-efficiency coal-fired thermal (USC, IGCC)
  - Mixed combustion of biomass fuel
  - Develop technologies aiming for zero emissions in the 2050s (CCS, hydrogen)

- **Ohma Nuclear Power Plant project**

- **Expansion of renewable energy business overseas**

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*The Electric Power Council for a Low Carbon Society*
Expansion of renewable energy

✓ With establishing Department of Renewable Energy, contribute to realizing a low-carbon society through renewable energy, as a leader in the business of fully domestically produced and CO2 free energy

➢ Take steps to develop renewable energy capacity such as small- to medium- scale hydroelectric, wind, and geothermal power plants

➢ Take steps in technology development aiming for expanding renewable energy

➢ Take steps toward long-term stable operation of hydroelectric power plants that will contribute greatly to the stable supply of electricity and reduction of CO₂ emissions

Expand renewable energy capacity

Hydroelectric
- Increase in capacity through upgrades of major equipment (repowering) at existing plants
- New development of small- to medium- scale hydroelectric plants

Wind
- New development of onshore wind power and steady replacement of existing facilities
- Proceed with offshore wind business in addition to Hibikinada

Geothermal
- New development, replacement of existing facilities

FY2025 Target (Renewable energy)
New development with 1GW scale
[Hydroelectric 0.3TWh/year increase*, wind and others 2.5TWh/year increase*]

FY2017 (As of March 31, 2018)
Total 17.9GW

Carbon reduction and decarbonization for coal use
Biomass mixed combustion, Oxygen-blown IGCC, CCS, etc.

CO2-free capacity (future)
Ohma Nuclear Power Plant

* Comparison with FY2017
Challenge for carbon reduction and decarbonization in coal use

✓ Contribute to realizing a balanced energy mix through use of coal, a stable energy source that is widely available around the world, while contributing to achieving a low-carbon society through challenges for decarbonization of fossil energy power sources

◆ Develop technologies aiming for zero emissions in the 2050s
  ➢ Commercialization of oxygen-blown IGCC*1
  ➢ R&D of CCS*2 (Osaki CoolGen), hydrogen (Brown coal hydrogen demonstration project)

◆ Promote development of high-efficiency coal-fired thermal power

◆ Take steps toward biomass mixed combustion, focusing on wood-based biomass fuel
  ➢ Continue combustion at existing coal-fired power plants
  ➢ Aim for a maximum of 10% mixed combustion in Takehara Thermal Power Plant New Unit No.1 (start of operations planned for 2020)
Ohma Nuclear Power Plant Project

- Through the use of MOX fuel, play a central role in the nuclear fuel cycle and contribute to energy security
- Contribute to realizing a low-carbon society as a CO2-free energy source

<table>
<thead>
<tr>
<th>Overview of the Ohma Nuclear Power Project</th>
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<tbody>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
</tr>
<tr>
<td><strong>Type of nuclear reactor</strong></td>
</tr>
<tr>
<td><strong>Fuel</strong></td>
</tr>
<tr>
<td><strong>Start of construction</strong></td>
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<tr>
<td><strong>Start of operation</strong></td>
</tr>
<tr>
<td><strong>Status</strong></td>
</tr>
</tbody>
</table>
(Reference) Initiatives for CO2 Reduction in Japan

**GHG reduction target**
- Reducing GHG by 26% in 2030 from 2013 level

**Energy mix (Generation type in FY2030)**
- Estimating share for each generation type in FY2030 in line with GHG reduction target
- Total thermal efficiency is estimated to be at the same level as high-efficiency generation (coal: USC, LNG: combined cycle)
- Renewables are mainstreamed

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Approx. Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>26%</td>
</tr>
<tr>
<td>LNG</td>
<td>27%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>22-20%</td>
</tr>
<tr>
<td>Renewables</td>
<td>22-24%</td>
</tr>
<tr>
<td>Oil</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Policy measures**

**Voluntary initiative**
- Commitment to a low carbon society on electricity business (J-POWER is joining)
  - Electricity business companies as a whole* aim for the carbon intensity in line with the energy mix (0.37kg-CO2/kWh at user’s end in FY2030)
  - *Covering over 99% of total electricity sales in Japan when this commitment was drew up in 2015

**Generators**
- Newly built thermal power must employ highest efficiency technology that is already in commercial operation
- Each generator must aim for achieving high efficiency premised in the energy mix

**Grid operators**

**Retailors**
- Each retailer must aim for over 44% in terms of non-fossil power ratio in FY2030, the same level estimated in the energy mix

**Energy conservation act**
- Energy supply structure enhancement act
(Reference) Status of Developing Renewable Energy

### Wind

- **Triton Knoll**: 215MW
- **Setana Osato**: 45MW
- **Kuzumaki No.2**: 45MW
- **Nikaho No.2**: 41MW
- **Minami Ehime No.2**: Max. 41MW
- **Kaminokuni No.2**: Max. 120MW
- **Hibikinada Offshore**: Max. 88MW
- **Seiyo Yusuhara**: Max. 180MW
- **Kita-Kagoshima**: Max. 180MW
- **Wajima**: Max. 90MW
- **Youra-hanto**: Max. 65MW
- **Max. 764MW**

### Hydro

- **Shinkatsurazawa/ Kumaoi**: 21.9MW
  - Start of operation: FY2022 (planned)

- **Ashoro Repowering**: 40.0 → 42.3MW
  - Completion of repowering: FY2022 (planned)

### Geothermal

<table>
<thead>
<tr>
<th>Project</th>
<th>Capacity</th>
<th>Equity ratio</th>
<th>Owned capacity</th>
<th>Start of operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wasabizawa</td>
<td>42MW</td>
<td>50%</td>
<td>21MW</td>
<td>FY2019 (planned)</td>
</tr>
<tr>
<td>Onikobe Replacement</td>
<td>14.9MW</td>
<td>100%</td>
<td>14.9MW</td>
<td>FY2023 (planned)</td>
</tr>
<tr>
<td>Appi</td>
<td>14.9MW</td>
<td>15%</td>
<td>2.2MW</td>
<td>2024 (planned)</td>
</tr>
</tbody>
</table>

*EIA: Environmental impact assessment*