

J-POWER Group  
Medium-term Management Plan  
- Facing the Challenge of Further Growth -

July 31, 2015

# To Our Stakeholders

The Japanese energy industry is emerging from a prolonged period of uncertainty in energy policy following the Great East Japan Earthquake, and entering an era of new challenges. The government has been discussing and considering rebuilding the energy mix in Japan as a result of the Fukushima Nuclear Power Plant Accident, and the “Long-term Energy Supply-demand Outlook” looking toward 2030 was formulated this July, setting power generation mix targets for renewable energy, nuclear power and coal-fired thermal power, in addition to establishing new CO<sub>2</sub> reduction targets for international society. Furthermore, the Amended Electricity Business Act providing for the unbundling of power generation and transmission was passed in June as the final element of liberalization of the electricity business following on from the full-scale liberalization of retail business and abolishment of wholesale regulations that will come into force next fiscal year.

In response to these conditions, J-POWER Group has established a Medium-term Management Plan to address the challenge of achieving further growth over the next decade by leveraging the increase in capital carried out in March.

The basic direction of our efforts involves (1) the creation of a platform for further growth in the domestic market as it undergoes liberalization and in order to survive competition in power generation by being cost competitive, (2) to grow our overseas power generation business to contribute to sustainable development based on the energy circumstances in each region worldwide, and (3) to conduct business in Japan and abroad as a leading company in coal-fired thermal power generation by accelerating the development of technology aimed at reducing carbon emissions of coal-fired thermal power to adapt to measures addressing climate change.

Efforts aimed at further growth by accumulating power generation business will require a growth cycle of at least 10 years considering the period required for investment in construction after planning and environmental assessment. That is why efforts aimed at 2025 are J-POWER Group's “Medium-term Management Plan.”

We will continue to do our best to carry out our mission stated in J-POWER Group's corporate philosophy as “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.”

We are as always grateful for your continued support.

President



# Table of Contents

1. Medium-term Management Plan
  - 1-1. Business Environment and Key Concepts of the Medium-term Management Plan
  - 1-2. Medium-term Management Plan
    - (1) Direction of “Challenges of Further Growth”
    - (2) Growth of Power Generation Assets
    - (3) Growth and Soundness Targets
2. Key Initiatives Aimed at Realization of the Medium-term Management Plan
  - 2-1. Key Concepts of the Medium-term Management Plan and 6 Key Initiatives
  - 2-2. 6 Key Initiatives
    - (1) Promotion of Development of High-Efficiency Coal-fired Thermal Power Plants and Technology Aimed at the Next Generation
    - (2) Being Competitive in the Market Created by Liberalization and Improvement of Reliability of Facilities
    - (3) Expansion of Renewable Energy
    - (4) Promotion of the Ohma Nuclear Power Project Based on the Premise of Safety
    - (5) Promotion of Overseas Power Generation Business
    - (6) Improvement of Efficiency of Assets by Screening Businesses
3. Returns to Shareholders

# 1. Medium-term Management Plan

# 1-1. Business Environment and Key Concepts of the Medium-term Management Plan

## ■ The business environment surrounding J-POWER Group

- ➡ Intensifying market competition due to the electricity system reform
- ➡ Uncertainty surrounding nuclear power policy
- ➡ Climate change
- ➡ Robust growth in electric power demand centered upon developing countries

## ■ J-POWER Group's strengths in finding opportunities in environmental changes

- ➡ Competitive power plants producing large volumes of electric power
- ➡ Abundant development pipeline
- ➡ Excellent environmental technology enabling future business development
- ➡ Track record in overseas business development

## ■ Responses to risks to overcome

- ➡ Initiatives to further reduce carbon emissions

## ■ Key concepts of the Medium-term Management Plan based on the above understanding of business environment and J-POWER Group's strengths

- ➡ Realize growth in Japan by “Surviving the Competition in a **Liberalized Market**”
- ➡ Enhancing “**Overseas Business Expansion**”
- ➡ Further “**Low-carbon Technologies**” enabling greater business growth globally

- In the domestic market undergoing liberalization:
  - ➡ Create a platform for further growth (Steady promotion of abundant development pipeline)
  - ➡ Win the market competition with being cost competitive
- To contribute to sustainable development in each region worldwide:
  - ➡ Focus more on acquiring new projects
- To enable development of business in Japan and abroad through initiatives to promote low-carbon coal-fired thermal power
  - ➡ Promote initiatives aimed at the commercialization and dissemination of oxygen-blown IGCC\*<sup>1</sup>
  - ➡ Conduct R&D initiatives for CCS technology\*<sup>2</sup>, etc. and contribute to the realization of further reductions of carbon emissions

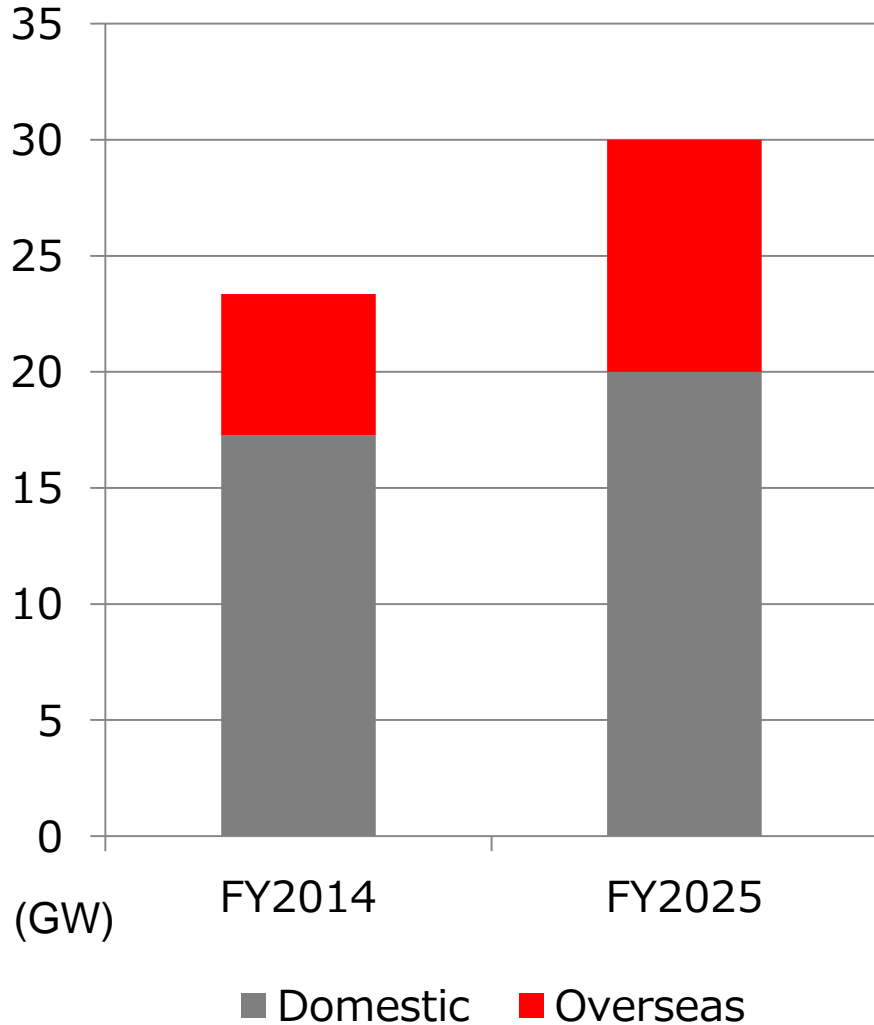
\*1: A combined cycle power generation system using a gas turbine and a steam turbine with gas produced from coal as fuel. Utilizing oxygen when gasifying coal (oxygen-blown) has an advantage such that there is possibility of more efficient CO<sub>2</sub> capture compared with air-blown IGCC.

\*2: Technology for reducing CO<sub>2</sub> emissions by “capturing” and “storing” the CO<sub>2</sub> produced in power generation without releasing it into the atmosphere

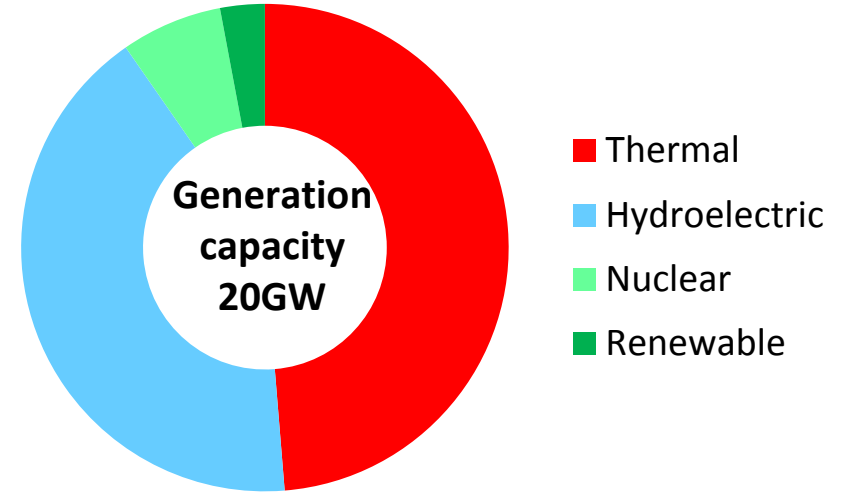
# 1-2. Medium-term Management Plan - (2) Growth of Power Generation Assets



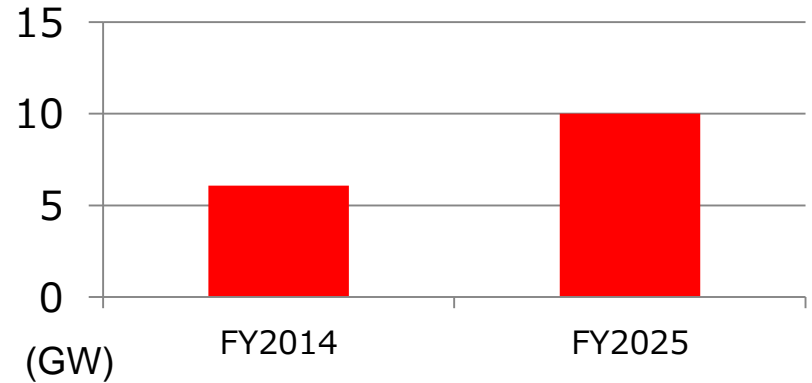
■ Power generation capacity: 30GW



■ Composition of domestic power generation assets (FY2025)



■ Overseas owned capacity: 10GW



- Growth indicator: J-POWER EBITDA\*
  - Increase around 1.5 times the level of FY2014 in FY2025  
(FY2014 results: 181.8 billion yen)
- Soundness indicator: Interest-bearing debts/ J-POWER EBITDA\*
  - Improve from level at end of FY2014 at end of FY2025  
(End FY2014 results: 9.5x)

\* J-POWER EBITDA

= Operating income + Depreciation and amortization + Equity in earnings of affiliates

### 3-year forecast

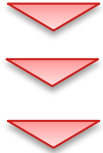
- Growth indicator: J-POWER EBITDA
  - ⇒ 3-year average of 185 billion yen/ year from FY2015 to FY2017
- Soundness indicator: Interest-bearing debts/ J-POWER EBITDA
  - ⇒ Maintain same level as results at end of FY2014 at end of FY2017



## 2. Key Initiatives Aimed at Realization of the Medium-term Management Plan

## 2-1. Key Concepts of the Medium-term Management Plan and 6 Key Initiatives

### Key Concepts of the Medium-term Management Plan



Liberalization

Overseas Business Expansion

Low-carbon Technologies



(1) Promotion of **development of high-efficiency coal-fired thermal power plants and technology** aimed at the next generation

(2) **Being competitive in the market** created by liberalization and **improvement of reliability of facilities**

(3) **Expansion of renewable energy**

(4) **Promotion of the Ohma Nuclear Power Project** based on the premise of safety

(5) **Promotion of overseas power generation business**

(6) **Improvement of efficiency of assets** by screening businesses

## 2-2. 6 Key Initiatives (1) Promotion of Development of High-Efficiency Coal-fired Thermal Power Plants and Technology Aimed at the Next Generation

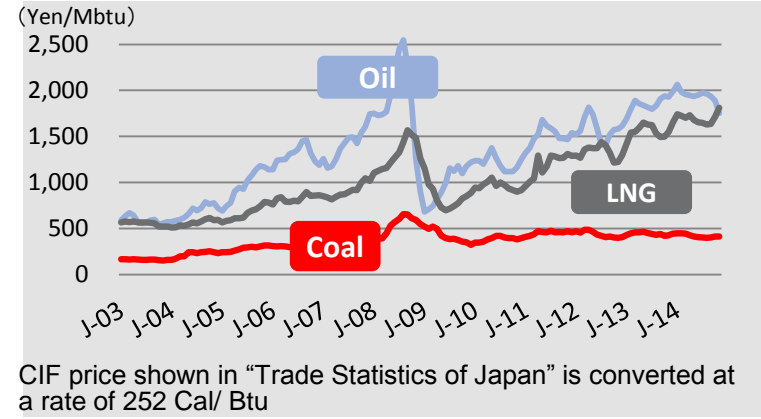


- Development of high-efficiency coal-fired thermal power plants in Japan
  - ➡ Coal is widely distributed throughout the world, and is a stable energy source with lower geopolitical risk than oil or gas
  - ➡ It is the lowest-cost energy imported into Japan, and we aim to achieve growth while contributing to growth of the Japanese economy through the use of coal as an important part of a balanced energy mix

### Major coal-fired thermal power projects under construction or planning

| Project                            | Equity interest | Capacity               | Start of operation (scheduled)     |
|------------------------------------|-----------------|------------------------|------------------------------------|
| Takehara New Unit No.1 replacement | -               | 600MW                  | 2020                               |
| Takasago replacement               | -               | 2 units of 600MW       | Unit No.1: 2021<br>Unit No.2: 2027 |
| Kashima Power                      | 50%             | 650MW class            | 2020                               |
| Yamaguchi Ube Power                | 45%             | 2 units of 600MW class | In the early 2020's                |

### Import price of fossil fuel in Japan



- Development of technology aimed at higher efficiency and lower carbon emissions
  - ➡ Promote development of more efficient oxygen-blown IGCC technology to enable continued use of coal
  - ➡ Conduct R&D initiatives for CCS technology, etc. and contribute to the realization of further reductions of carbon emissions

### Comparison of net efficiency (based on LHV) of coal-fired thermal power generation

| Type                 | Net efficiency in general | Reference: J-POWER's major power plants   |
|----------------------|---------------------------|---|
| Sub-critical         | (40%) (45%)               | Takehara No.1, Takasago   |
| Super-critical       |                           | Takehara No.3, Matsushima, Matsuura No.1, Ishikawa  |
| Ultra Super Critical |                           | Isogo, Tachibanawan, Matsuura No.2, Takehara New No.1 (constructing), Takasago replacement (planning) |
| Oxygen-blown IGCC    |                           | (Demonstration test is scheduled to start in 2017)  |

It is possible to reduce CO<sub>2</sub> emissions by replacing old coal-fired thermal power plants with high-efficiency power plants

## 2-2. 6 Key Initiatives (2) Being Competitive in the Market Created by Liberalization and Improvement of Reliability of Facilities (1)



### ■ Being competitive in the market created by liberalization

- ➔ Liberalization of domestic electricity business market is progressing in which regulations are relaxed and competition is introduced
  - ✿ Amid intensifying competition in the power generation business, J-POWER will achieve further growth by being cost competitive
  - ✿ At the same time, we will play the role expected of us to activate the wholesale electricity market essential for a competitive market\*
- ➔ Conduct appropriate risk management and pursue increased returns in response to increased volatility in earnings associated with increased market competition

(We will utilize our business experience abroad such as in the United States, which has an advanced liberalized market, to conduct business in the domestic market as it undergoes liberalization)

\* Role expected of us to activate the wholesale electricity market

An extract from the Report of the Electricity System Reform Expert Subcommittee (February 2013) (pp.24-25)

#### 5. Diversification of electric power buyers of the power capacity of Wholesale Power Generators (WPGs)

In the past, almost the entire amount of power of WPGs has been supplied to EPCOs under long-term bilateral contracts, while the entry of WPGs into the market will lead to the expansion of the wholesale market, and is needed to activate the wholesale market.  
.....(snip).....

The activation of the wholesale market is indispensable to the promotion of new entry and competition in the retail market, and as this represents the other side of the same coin, i.e. “choices for consumers” themselves, this must be promoted with maximum effort possible before pursuing the full liberalization of the retail market. Additionally, the results need to be regularly monitored, and observed from an objective standpoint to check whether a truly competitive market is emerging or not.

### ■ Strengthening of initiatives for stable operation

- ➡ Ensuring stable operation is the greatest priority of risk management
- ➡ We will unceasingly pursue optimization of maintenance and operation of facilities aimed at ensuring stable operation
- ➡ This will result in the improvement of productivity and thereby the improvement of the value of facilities

### ■ Nationwide improvement and maintaining soundness of transmission facilities

- ➡ The efficient competitive market that is the objective of electricity system reform is supported by a nationwide transmission network functioning soundly
- ➡ In order to support active market competition in addition to contributing to stable supply of electric power, we will make further efforts for nationwide improvement of transmission facilities such as interconnecting lines and for ensuring that they function robustly

#### J-POWER's major interconnecting lines and frequency converter stations

| Facility                           | Outline  |
|------------------------------------|--|
| Kitahon HVDC Link                  | Transmission facility connecting grids of Hokkaido and mainland                  |
| Honshi Interconnecting Line        | Transmission facility connecting grids of mainland and Shikoku                   |
| Anan-kihoku HVDC Link*             |  |
| Kanmon Interconnecting Line        | Transmission facility connecting grids of mainland and Kyushu                    |
| Sakuma Frequency Converter Station | Frequency converter station connecting east Japan (50 Hz) and west Japan (60 Hz) |

\*Owned jointly with Kansai EPCO and Shikoku EPCO

## 2-2. 6 Key Initiatives (3) Expansion of Renewable Energy

■ We will utilize our technological capabilities and continue to be a leader in the business of fully domestically produced and CO<sub>2</sub> free energy

➡ We will take steps to newly develop and acquire projects for wind power, and also improve capacity utilization rates through more advanced and efficient maintenance

### Major wind farm projects under construction or planning

| Project                        | Equity interest | Capacity | Start of operation (scheduled) |
|--------------------------------|-----------------|----------|--------------------------------|
| Ohma                           | 100%            | 19.5MW   | 2016                           |
| Yurihonjo Bayside              | 100%            | 16.1MW   | 2017                           |
| (Tentative name) Setana-Ohsato | 90%             | 50MW     | 2018                           |

➡ From the establishment of J-POWER, we have been producing a large amount of electricity by hydroelectric power, which is fully domestically produced and CO<sub>2</sub> free energy, and will promote the development of geothermal power in addition to hydroelectric power to serve as a baseload power source

### Major geothermal and hydroelectric power projects under construction or planning

| Project                         | Equity interest | Capacity | Start of operation (scheduled) |
|---------------------------------|-----------------|----------|--------------------------------|
| Wasabizawa Geothermal           | 50%             | 42MW     | 2019                           |
| Konokitani (hydroelectric)      | -               | 199kW    | 2016                           |
| Shinkatsurazawa (hydroelectric) | -               | 16.8MW   | 2020                           |

➡ We will continue to take steps to expand the biomass mixed combustion in coal-fired thermal power plants

### Track record of the biomass mixed combustion in coal-fired thermal power plants

| Power plant | Biomass fuel  |
|-------------|---|
| Matsuura    | Sewage sludge low-temperature carbon fuel* <sup>1</sup> ,<br>Sewage sludge oil-desiccated fuel* <sup>2</sup> , Wood-base fuel* <sup>3</sup> |
| Takasago    | Sewage sludge low-temperature carbon fuel   |
| Takehara    | Sewage sludge low-temperature carbon fuel   |

\*1 Fuel made of sewage sludge carbonized at a low temperature  
 \*2 Fuel made of sewage sludge heated with cooking oil to remove water content  
 \*3 Fuel made of wood-base chips and pellets utilizing scrap construction timber and forest offcut

## 2-2. 6 Key Initiatives (4) Promotion of the Ohma Nuclear Power Project Based on the Premise of Safety



- ➡ We will secure a baseload power source for supporting stable energy supply in Japan, which has few of its own natural resources, and also respond to the need for measures against global warming
- ➡ We will play a central role in Japan's nuclear fuel cycle policy by utilizing plutonium, supporting the back end of the nuclear power business
- ➡ In addition to sincerely and appropriately responding to compliance reviews by the Nuclear Regulation Authority (NRA), we will take voluntary steps to steadily implement safety measures that are the prerequisite for operation

### Overview of the Ohma Nuclear Power Project

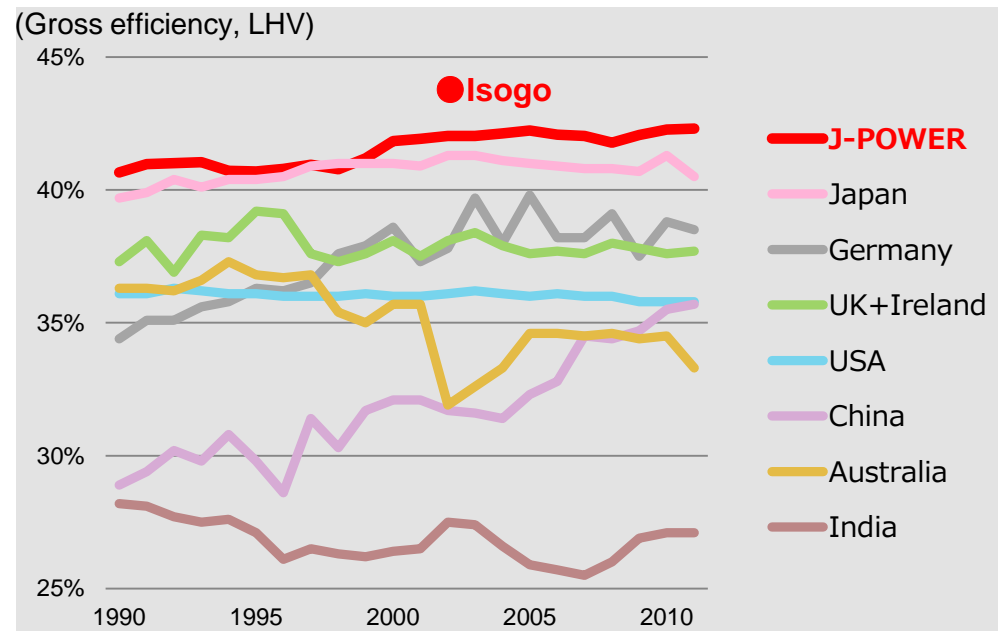
|                         |   |
|-------------------------|---|
| Location                | Ohma-machi, Shimokita-gun, Aomori Prefecture  |
| Capacity                | 1,383MW   |
| Type of nuclear reactor | Advanced Boiling Water Reactor (ABWR)   |
| Fuel                    | Enriched uranium and uranium-plutonium mixed oxide (MOX)  |
| Start of construction   | May, 2008   |
| Start of operation      | To be determined  |
| Status                  | In December 2014, J-POWER submitted to NRA an application for permission for alteration of reactor installment license and an application for construction plan approval in order to undertake review of compliance with the new safety standards |

## 2-2. 6 Key Initiatives (5) Promotion of Overseas Power Generation Business

- Following on from the U-Thai site (Thailand) and Central Java site (Indonesia) currently under development, we will acquire new development projects mainly in Asia where there is burgeoning energy demand.
- In the United States, which has an advanced liberalized market and is expected to present abundant business opportunities, we will aim to expand our business while incorporating diverse forms of sales based on our current business platform

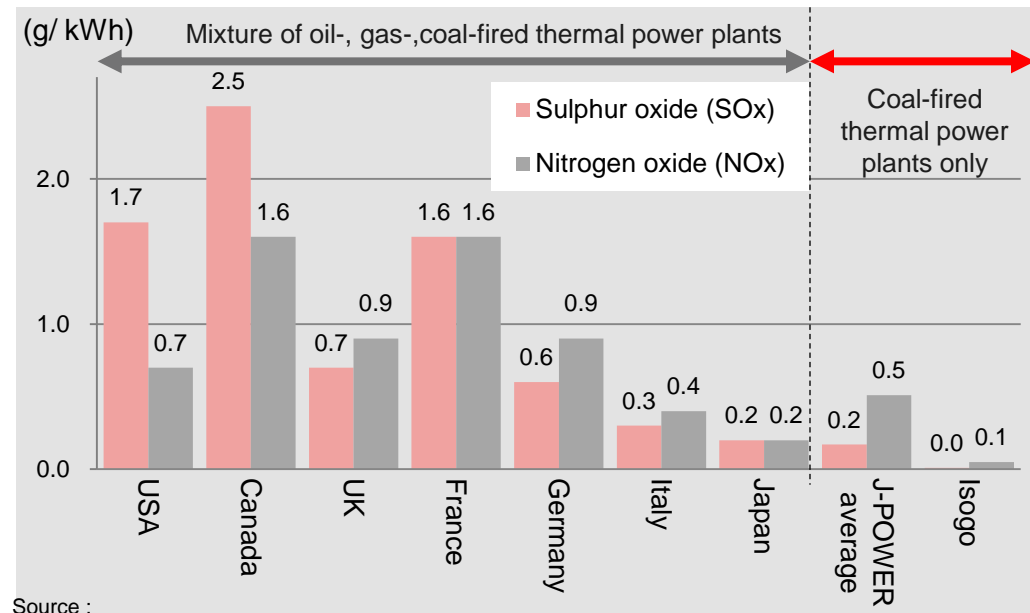
J-POWER Group's coal-fired thermal power technology, which maintains the world's leading thermal efficiency and is as clean as gas-fired thermal power, will enable us to develop high-efficiency coal-fired power plants mainly in Asia where electricity demand is increasing most strongly

Average thermal efficiency of world's coal-fired thermal power plants



Source: "Ecofys International Comparison of Fossil Power Efficiency and CO2 Intensity 2014", Results for J-POWER and Isogo

SOx and NOx emissions per unit of thermal power generation



Source : Overseas : Amount of emission / OECD.StatExtract Complete database available via OECD's iLibrary  
 Electricity generated / IEA ENERGY BALANCES OF COUNTRIES 2012 EDITION  
 Japan : The Federation of Electric Power Companies of Japan (10 EPCOs and J-POWER)  
 FY2014 result for J-POWER and Isogo



- The business domains where we realize growth remains unchanged (= global power generation business)
- Meanwhile, the business environment is changing with the new Basic Energy Plan, Japan's response to climate change issues, and the advancement of liberalization



- ➡ Also, from the perspective of becoming more endurable to risk, it is essential that we unceasingly increase the efficiency of our assets
- ➡ In addition to key initiatives (1) through (5), we will proceed to screen businesses by constantly reassessing their value and promoting initiatives to further increase our earnings capacity

### Examples of initiatives to increase asset efficiency over the past 5 years

- Making Mihama Seaside Power a wholly-owned subsidiary, and selling Ichihara Power (replacement of assets)
- Sale of interest in coal mine in Australia and acquisition of interest in new mine (replacement of assets)
- Establishment of J-Wind Service and concentration of operation and maintenance of wind farms (Increase of asset value through improvement of operating efficiency)

# 3. Returns to Shareholders

### 3. Returns to Shareholders

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- ➡ Although our overseas business has reached a stage in which we expect profit to grow, we remain in a period of asset formation aimed at further growth
- ➡ At the same time, J-POWER Group is in a transitional period in which its business environment undergoes significant change moving forward to FY2020 caused by factors such as progress of liberalization
- ➡ Therefore, during this period, we will continue to provide stable dividends as in the past, while also working to form competitive business assets and also maintain and improve our financial soundness
- ➡ After FY2020, we will strive to enhance the returns to shareholders as a result of our growth, and also flexibly consider how returns to shareholders should be decided, based on factors such as changes in our earnings structure

## J-POWER Group's Efforts to Develop Technology Aimed at Reducing Carbon Emissions

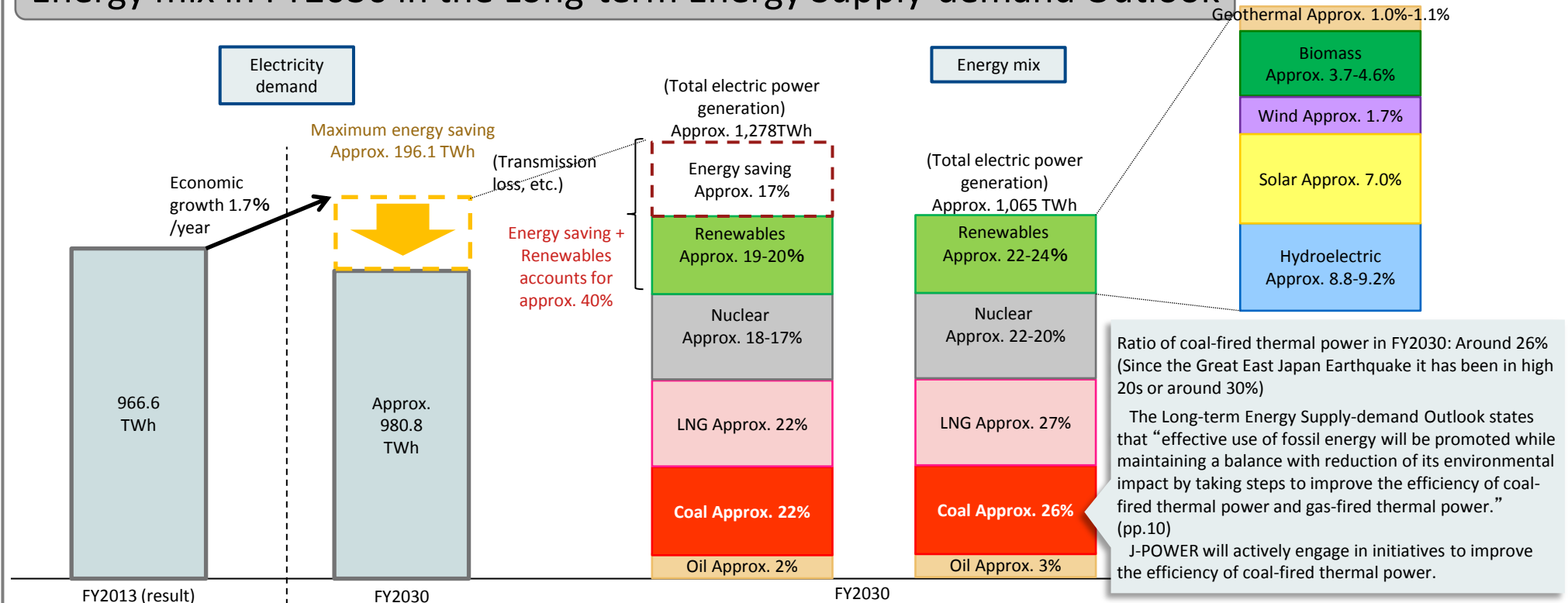
1. Future Positioning of Coal-fired Thermal Power Generation
2. Efforts to Improve Efficiency of Coal-fired Thermal Power Generation
3. Toward Higher Efficiency and Lower Carbon Emissions
4. Efforts in Existing Coal-fired Thermal Power Plants (Biomass Mixed Combustion)

# Appendix (1) Future Positioning of Coal-fired Thermal Power Generation

## Positioning of coal in the Basic Energy Plan

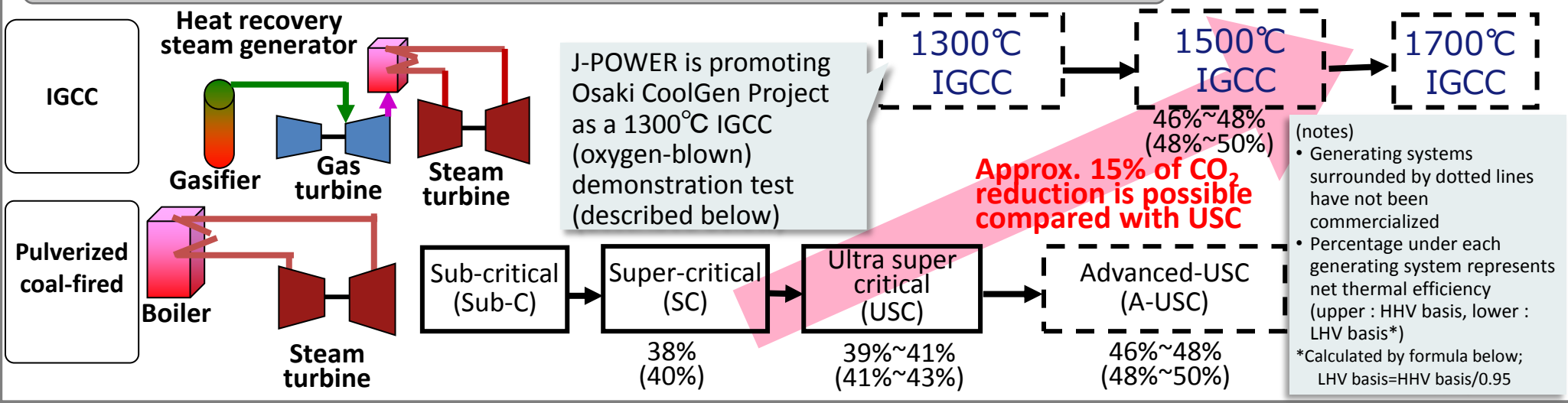
- Although it produces a larger amount of greenhouse gas emissions, coal has the lowest geopolitical risk and the lowest cost per thermal unit among fossil fuels, making it an important baseload power source fuel that is economical and has a stable supply
- It is an energy source that continues to be utilized while reducing the environmental impact by effectively employing high-efficiency coal-fired thermal power generation and other measures

## Energy mix in FY2030 in the Long-term Energy Supply-demand Outlook



# Appendix (2) Efforts to Improve Efficiency of Coal-fired Thermal Power Generation

## Thermal efficiency of pulverized coal-fired thermal power and IGCC



## Osaki CoolGen Project

### Architecture rendering of Osaki CoolGen demonstration test plant



### Outline of the project

- Oxygen-blown IGCC demonstration plant (capacity: 166MW)
- Joint venture with Chugoku EPCO, located in Hiroshima prefecture
- Demonstration test is scheduled to start at the end of FY2016 (please see entire schedule below)

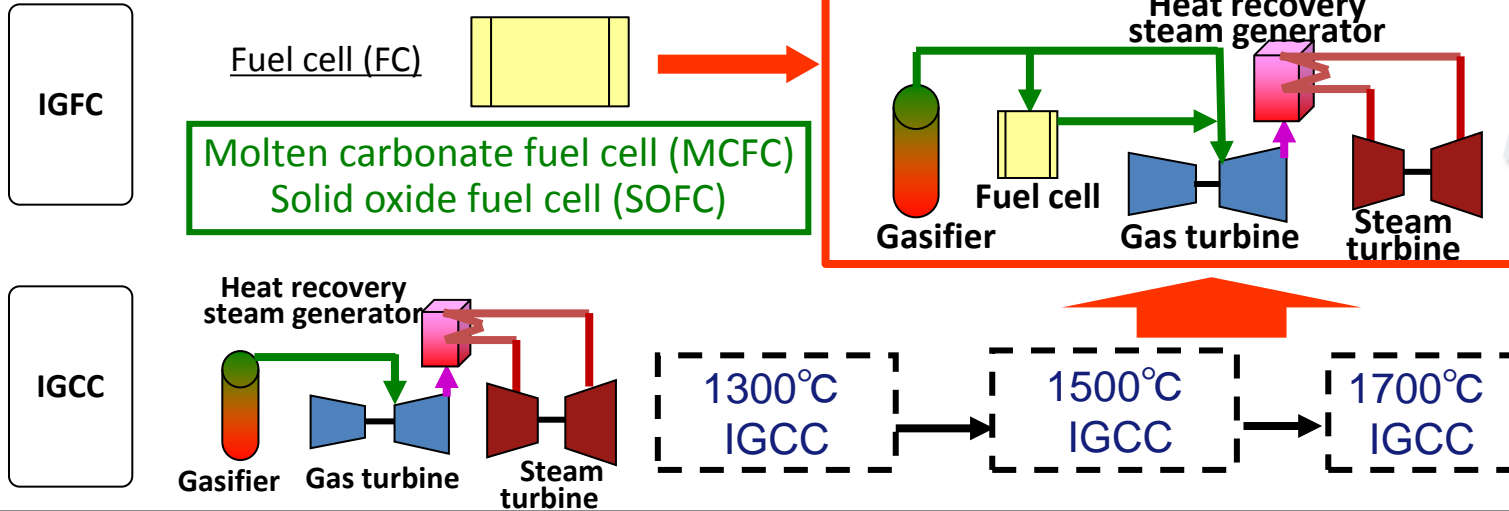
### Entire schedule

|         | 2017                  | 2018                  | 2019 | 2020 | 2021 | Contents of demonstration test     |
|---------|-----------------------|-----------------------|------|------|------|------------------------------------|
| Phase 1 | Test                  |                       |      |      |      | Oxygen-blown IGCC                  |
| Phase 2 | Equipment preparation | Test                  |      |      |      | IGCC with CO <sub>2</sub> capture* |
| Phase 3 |                       | Equipment preparation | Test |      |      | IGFC* with CO <sub>2</sub> capture |

\*Please see next page regarding outlines of CO<sub>2</sub> capture and IGFC

# Appendix (3) Toward Higher Efficiency and Lower Carbon Emissions

## Integrated coal gasification fuel cell combined cycle (IGFC) initiatives



### Features of IGFC and J-POWER's initiative

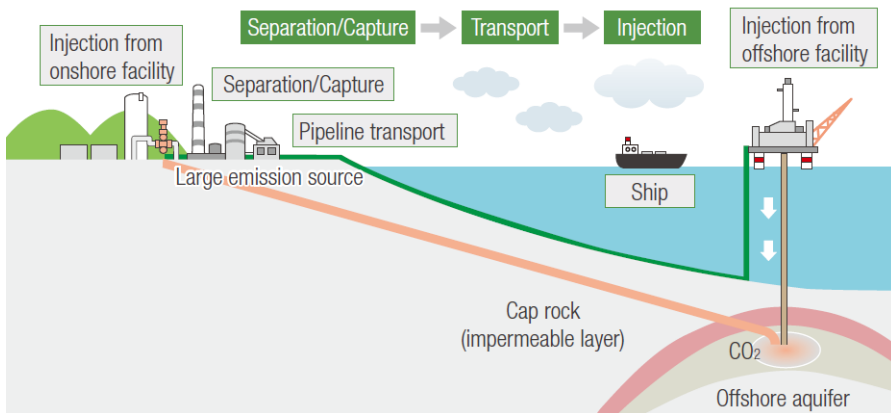
Net thermal efficiency  
⇒ **Over 55%** (HHV)

CO<sub>2</sub> emissions  
⇒ **Approx. 30% lower** than normal USC

\*J-POWER continues to develop technology to cope with technological issues such as interconnection with fuel cell aiming at commercialization  
\*Oxygen-blown IGCC has larger possibility to evolve into IGFC compared with air-blown IGCC

## Initiatives aimed at CO<sub>2</sub> capture and storage (CCS) technology

### Outline of CCS technology



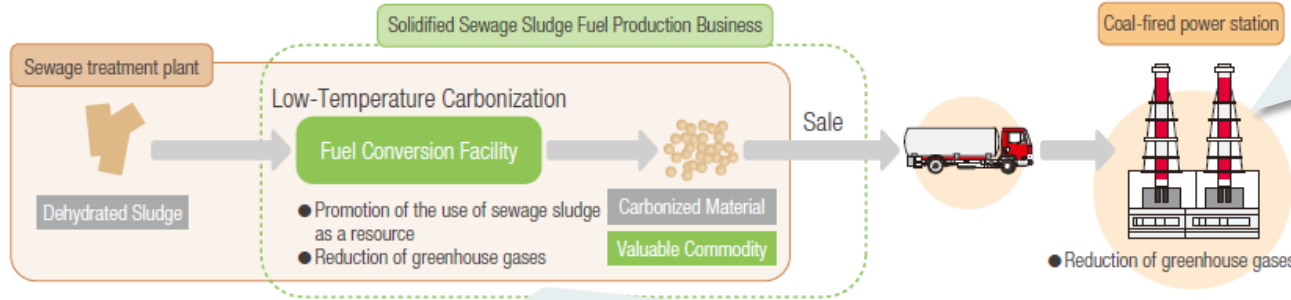
### Overview of CCS and Initiatives by J-POWER

- CCS is a technology for capturing CO<sub>2</sub> produced in combustion of fossil fuels without releasing it into the atmosphere, and storing it deep in the earth after transportation
- Concerning CCS and CCU (CO<sub>2</sub> capture and utilization), the schedule is for fundamental technologies to be put into practice in around 2020, and economical CO<sub>2</sub> capture technologies that enable actual expansion of implementation to be put into practice sequentially from the late 2020's to around 2030, aiming at practical application of CCS and CCU as a whole after FY2030 (See the Roadmap on Development of Next-generation Thermal Power Generation Technology (Interim Report))
- J-POWER Group participated in demonstration tests in Australia (Callide Oxyfuel Project jointly conducted by Japanese and Australian governments and private sector) and also plans to conduct demonstration tests of CO<sub>2</sub> capture in the second phase of the Osaki CoolGen Project
- Oxygen-blown IGCC has the potential to capture CO<sub>2</sub> more efficiently than air-blown IGCC

# Appendix (4) Efforts in Existing Coal-fired Thermal Power Plants (Biomass Mixed Combustion)

## Biomass mixed combustion in existing coal-fired thermal power plants





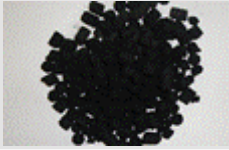
### Biomass fuel: from production to mixed combustion (Example: sewage sludge low-temperature carbon fuel)



- Mixed combustion of biomass, which is CO<sub>2</sub> free energy, in coal-fired thermal power plants is able to reduce coal consumption and CO<sub>2</sub> emissions
- In particular, biomass resources can be utilized more efficiently and cleanly by mixed combustion in J-POWER's coal-fired thermal power plants with high efficiency and environmentally friendly facilities

Instead of simply dealing with mixed combustion, being involved in the biomass fuel production business is expected to ensure quality and stable supply of biomass fuel

## Overview of biomass fuel and status of mixed combustion, etc.

| Biomass resources                         | Wood-base chips  | Wood-base pellets  | Sewage sludge low-temperature carbon fuel  | Sewage sludge oil-desiccated fuel   | Carbonization of ordinary waste for use as fuel                                      |
|---|--|--|--|---|--|
| Appearance of fuel                        |  |              |                                    |   |  |
| Outline of fuel                           | Scrap construction timber is chipped<br>Calorific value: 50 to 70% of coal         | Forest offcut is dried, ground and formed into pellets<br>Calorific value: Approx. 70% of coal | Sewage sludge is carbonated at a low temperature<br>Calorific value: 50 to 70% of coal                                 | Sewage sludge and waste cooking oil are mixed and heated to remove the water content<br>Calorific value: same level as coal | Ordinary waste is carbonized<br>Calorific value: Approx. half of coal                |
| Production site*                          | Nagasaki City, Nagasaki Pref.  | <b>Kobayashi City, Miyazaki Pref.</b>  | <b>1 Hiroshima City, Hiroshima Pref.</b><br><b>2 Kumamoto City, Kumamoto Pref.</b><br><b>3 Osaka City, Osaka Pref.</b> | Fukuoka City, Fukuoka Pref.   | <b>Saikai City, Nagasaki Pref.</b>   |
| Mixed combustion at J-POWER's power plant | Matsuura   | Matsuura   | 1 Takehara<br>2 Matsuura<br>3 Takasago   | Matsuura  | Under consideration  |

\*J-POWER is involved in production of biomass fuel at sites indicated in **boldface**



This document contains statements that constitute forward-looking statements, plans for the future and management targets, etc. relating to the Company and/or J-POWER group. These statements are made based on certain assumptions about future events, and there exist possibilities that such assumptions are objectively incorrect and that actual results may differ from those in the statements as a result of various factors.

Furthermore, information and data other than those concerning the Company and its subsidiaries/affiliates are quoted from public information, and the Company has not verified and will not ensure their accuracy or appropriateness.