

# Power and Renewable Energy Segment

## Review of Operations

Idemitsu group conducts power generation and electricity retailing. In the power generation business, we operate a variety of renewable energy sources, including solar, wind, biomass, and geothermal, as well as large, high-efficiency LNG thermal power plants, which have a low environmental impact, and petroleum-based thermal power plants, which fully utilize the byproduct gas generated from the decomposition of heavy oil in oil refining as fuel. Going forward, we will promote the development of a variety of renewable energy sources in Japan and overseas to contribute to a low-carbon society and to ensure the stable and safe operation of existing power sources. In the electricity retail business, we are expanding nationwide, except in Okinawa, and will propose a retail electricity menu that meets customer needs.

## Business Environment Outlook

In Japan, it is expected that the introduction of geothermal power generation will be promoted as a result of a review of the feed-in tariff (FIT) for renewable energy, moves to convert renewable energy into a major power source in accordance with the 5th Basic Energy Plan, and the effects of policies such as power system reform and progress in decarbonization and technological innovation. At the same time, competition in solar panel manufacturing is expected to intensify as Chinese manufacturers enter the market.

Overseas, the expansion of business related to renewable energy is expected in light of the expected increase in electricity demand due to the promotion of renewable energy and the reduction of the cost of power generation from renewable energy sources as well as economic development in emerging countries.

## Medium-term Management Plan Business Policy

Based on our medium-term visions of "Development and promotion of power sources and related businesses using diverse energy sources that contribute to CO<sub>2</sub> reduction," "Overseas development utilizing knowledge and problem-solving skills cultivated in Japan" and "Maintenance and expansion of the base domestic electric power business and development of new solutions and commercial products," we will address the following 3 points as our basic policies.

### Maintenance and expansion of core businesses

We are involved in the operation of approximately 1GW of power plants in Japan, overseas and affiliated companies.

Japan operates about 700MW, including solar, geothermal, biomass, and wind power, totaling about 200MW.

These power stations aim to provide a stable supply of electricity to customers throughout Japan, and are working to ensure safe and stable operations. We will also invest in LNG thermal power plant projects not only in Japan but also overseas to acquire know-how and secure stable earnings in overseas power generation businesses.

At the same time, in the area of electricity sales, we will expand sales of high-voltage and low-voltage products. We will also continue to develop products and services to meet diverse customer

needs, such as by further enhancing our low-carbon CO<sub>2</sub> menu to meet the increasing needs of customers.

We will continue to leverage its strengths in the electric power business, which combines power generation and retail, with the aim of expanding its customer base by leveraging the sales channels it has cultivated throughout Japan.

## Promoting the development of renewable energy sources in Japan and overseas

As of the end of November 2019, we were operating a photovoltaic power plant in Vietnam, and a renewable energy power plant with a total development capacity of 200MW with diverse resources in Japan, including solar, wind, biomass, and geothermal power. Based on the management know-how accumulated to date, we will actively develop photovoltaic power plants and other facilities with a target of building up to 4GW by 2030. As a target area, we plan to develop mega solar power plants in North America and Southeast Asia, which have favorable conditions for sunlight and policy guidance.

### Specific Initiatives in FY2019

- Construction of 49.5MW mega solar plant completed in Vietnam
- Start of 100MW photovoltaic power generation project in Colorado, USA
- Start of 50.5MW photovoltaic power generation project in California, USA
- Decision made to commercialize biomass power generation at the Tokuyama Complex

## Demonstrating and developing solution businesses

- Obtaining opportunities arising from the expansion of renewable energy and institutional reforms
- Coexistence with local communities by promoting local production and local consumption models using renewable energy
- Providing solutions such as microgrids to meet the growing electrification needs of Southeast Asia
- Development of high-value-added fields utilizing the elemental technologies of CIS solar cells
- Development of next-generation solar cells based on CIS elemental technologies

## Risks and Opportunities

### Risk

- Decline in business profitability due to policy and institutional changes in Japan and overseas
- Further intensifying competition in the retail electricity business in Japan
- Complexity of grid connection (power transmission line) process in Japan
- Mass disposal of solar modules after completion of FIT period
- Decline in production competitiveness due to intensified sales competition for solar modules
- Regulation of geothermal power generation development in potential areas by the Natural Parks Act as well as the forestry and forest-related law

### Opportunity

- Increasing social needs for renewable energy worldwide by responding to climate change issues and guiding policies
- Increase in electricity demand in emerging Asian countries
- Expansion of business opportunities in line with domestic power system reforms
- Growing social needs for decentralized energy such as strengthening domestic energy supply, local production for local consumption, and private consumption
- Lower costs of renewable energy generation due to technological innovation and the rise of new business models

### TOPICS 1

#### Initiatives for photovoltaic power generation

Our photovoltaic power generation business is centered on the construction and operation of solar power plants on idle land in our group and the research, development, manufacturing, and sales of CIS solar modules by Solar Frontier K.K., a group company. In Japan, we not only operate 16 solar power plants on its own, but also develop solar plants in cooperation with other companies.

At Solar Frontier K.K., we aim to grow our business by shifting from panel sales to system integrators selling power systems. As part of our efforts for the next generation, we are working on the development of ultra-lightweight panels, which we believe will enable us to expand the range of installation sites and create new markets with high added value. We are also working with construction material manufacturers in Japan and overseas to develop next-generation building integrated photovoltaics.

In addition, as a measure to deal with the mass disposal of panels at the end of the FIT period, we are engaged in joint research with NEDO (New Energy and Industrial Technology Development Organization) to develop recycling technology for CIS solar cells. This recycling technology is characterized by the separation and collection of each material. It has been confirmed that more than

90% of rare metals such as indium and selenium contained in the battery can be collected. We will apply this treatment technology to the recycling of crystalline silicon solar panels. In the future, we plan to construct a pilot line at the Kunitomi Plant, where we will study the feasibility of solar panel recycling technology.



Ultra-light panel prototype



Image of a building integrated photovoltaics

### TOPICS 2

#### Initiatives for geothermal power generation

Since the 1970s, we have focused on geothermal energy as a renewable energy alternative to oil and have been working on its development. In 1996, Idemitsu Oita Geothermal Co., Ltd., one of our group companies, started supplying steam for power generation to the Takigami Power Station (Oita Prefecture) of Kyushu Electric Power Co., Inc. In addition to striving for stable operation, in March 2017, Idemitsu started commercial operation of the Takigami Binary Power Plant, one of Japan's largest geothermal binary power plants. In 2018, the power plant received the highest rank of "Minister of Economy, Trade and Industry Award" at the 2017 New Energy Awards sponsored by the New Energy Foundation. Since 2011, we have conducted joint exploration for geothermal energy development in the Oyasu District of Akita Prefecture, and in 2017 and 2018, we conducted flow tests to evaluate the capacity of the

wells drilled. In addition to working to ensure the safe operation of existing power plants, we will promote activities with a view to developing new geothermal projects in Japan and expanding them overseas.



Flow test