Japan's Energy White Paper 2017

Japan's Energy Landscape and Key Policy Measures

PART 1 Fukushima Reconstruction Progress

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PART 3 Energy System Reform and Bolstering Industry Competitiveness

Ministry of Economy, Trade and Industry

PART 1

Fukushima Reconstruction Progress

Reconstruction in Fukushima is steadily progressing. In 2011, the Great East Japan Earthquake and ensuing accident at TEPCO's Fukushima Daiichi Nuclear Power Station marked a turning point for Japan's overall energy policy. Despite some hurdles and delays, decommissioning and contaminated water management at the station are advancing in accordance with the Mid-and-Long-Term Roadmap toward the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station.

1 Contaminated Water Management

In September 2013, the Japanese government established basic policy measures to prevent further contamination from water used for cooling the nuclear reactor and groundwater flowing into the reactor building. These preventive and multi-layered countermeasures are based on three basic principles: 1) isolate groundwater from the contamination source; 2) prevent contaminated water leakage; and 3) remove contaminated water.

Isolation

Measures such as pumping groundwater from wells and frozen soil walls—underground walls of ice that block the flow of groundwater—have helped reduce the volume of water flowing into station buildings from around 400 m^3/day to around 120 m^3/day as of March 2017.

Impermeable walls of frozen soil (land side)

Groundwater flows into the buildings are prevented by using ice walls created by freezing soil in the ground around the buildings.

Conceptual drawing of the frozen soil wall

Freezing ducts

Preventing Leakage

Impermeable walls along the coast have significantly limited the flow of radioactive materials into the sea. METI has confirmed significant improvements in port water quality since installation.

Impermeable steel wall (sea side)

A 780-meter-long wall of 30-meter-tall steel pipes was constructed on the sea side of Units 1 through 4, which has been gradually improving the water quality in the surrounding sea area.

Installation of additional water tanks

Water tanks for storing treated water are being systematically installed to ensure adequate storage capacity.

Removal

Multi-nuclide removal equipment (ALPS) continuously purifies contaminated water generated daily. Treatment of all contaminated water in the station trenches was completed in December 2015, marking a significant reduction in risk.

2 Toward Decommissioning

In early 2017, remote-controlled cameras and robots captured direct readings inside the primary containment vessels of Unit 1 and Unit 2. The devices recorded large amounts of data, including images and radiation dosage levels, marking a major step toward decommissioning. The Japanese government continues to support the development of the technology necessary for decommissioning while bringing together innovative solutions from inside and outside Japan.

Progress at each unit

Unit 1

Dismantling of the building cover completed (November 2016)

Dismantling of the building cover

Number of fuel assemblies: 392

Unit 2

Began installation of a platform to access the top floor of the building (September 2016)

Installation of a working platform

Number of fuel assemblies: 615

Unit 3

Began installation of fuel removal equipment (November 2016)

Performance test following assembly of fuel removal equipment

Number of fuel assemblies: 566

Unit 4

Removal of all fuel completed (December 2014)

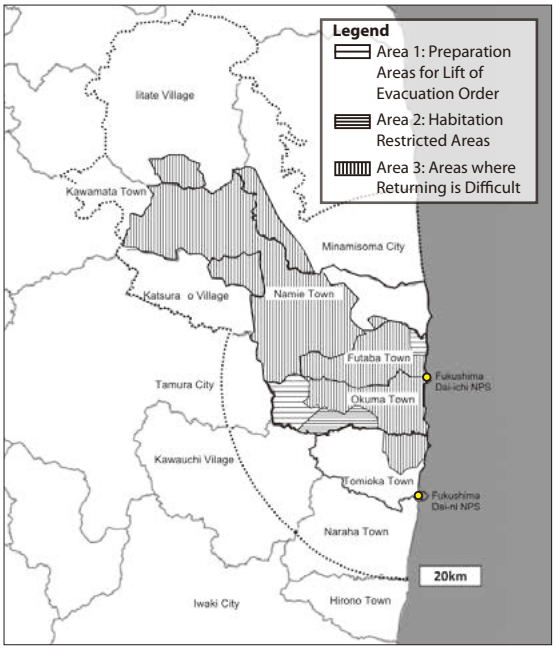
Removing fuel from the SFP

3 Care for Earthquake Disaster Victims

As of spring 2017, all area restrictions and evacuation orders* were removed except for the towns of Okuma and Futaba.

* Habitation Restricted Areas and Preparation Areas for Lift of Evacuation Order

Areas to which evacuation orders have been issued (Apr 1, 2017)



Municipalities where evacuation orders were lifted

Municipalities	Date of the lifting of the evacuation order
Tamura City	April 1, 2014
Kawauchi Village	
· Area 1: Preparation Areas for Lift of Evacuation Order	October 1, 2014
· Area 2: Habitation Restricted Areas	June 14, 2016
Naraha Town	September 5, 2015
Katsurao Village	June 12, 2016
Minamisoma City	July 12, 2016
Iitate Village	March 31, 2017*
Kawamata Town	March 31, 2017**
Namie Town	March 31, 2017***
Tomioka Town	April 1, 2017***

Decided by the Nuclear Emergency Response Headquarters on June 17, 2016 (*), on October 28, 2016 (**) and on March 10, 2017 (***)

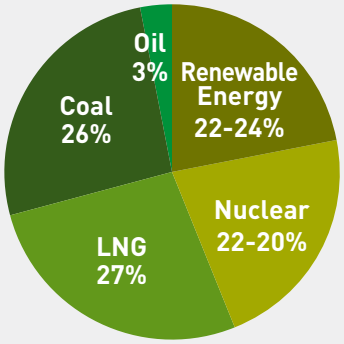
PART 2

New Developments in Energy Policy

METI has outlined Japan's policy positions in a newly compiled report called the Long-term Energy Supply and Demand Outlook for FY2030 (the "Energy Mix"). Its target 2030 energy mix is pictured in Graph 1.

To achieve stable supplies of energy, economic efficiency, environmental feasibility and safety, Japan has adopted the following three strategies: 1) strengthen energy security; 2) implement energy conservation and renewable energy policies that consider environmental concerns alongside growth; and 3) balance public interest issues, such as stable supplies of energy and reduced costs, with market liberalization and growing competition.

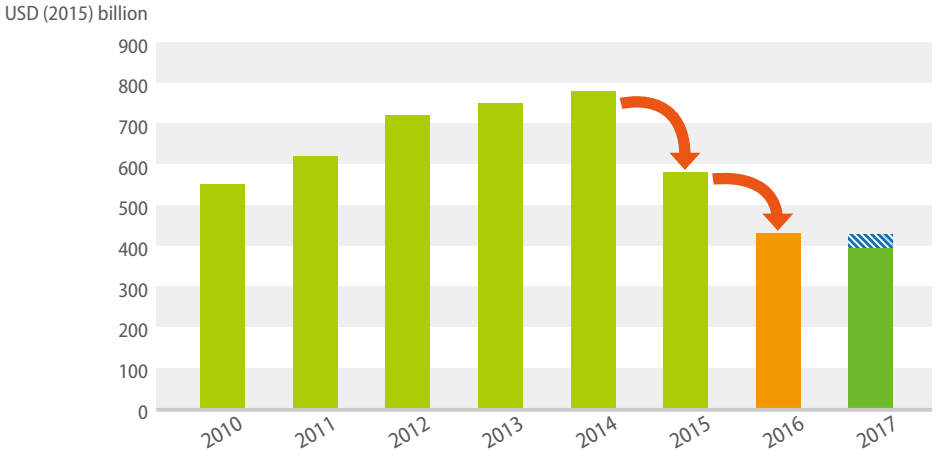
<Graph 1>



1 Strengthening Energy Security

Due to a slump in oil prices since 2014, the fundamental strength of oil and natural gas development companies has declined and led to a sharp fall in investments in upstream development. Bolstering support for upstream development is a key priority to strengthen the energy security of Japan.

Decline in Global Upstream Development Investments



Source: IEA "World Energy Investment 2016"

Bolstering Support for Upstream Development Companies

The Japan Oil, Gas and Metals National Corporation (JOGMEC) Act was revised in 2016 to significantly expand and enhance JOGMEC's role of providing risk capital incentives to help upstream development companies invest in new projects.

Realizing a Highly Liquid LNG Market

Japan is the world's largest importer of LNG. LNG buying and selling agreements formed by Japanese companies are primarily long-term contracts. However, pricing is linked to crude oil prices and attached destination clauses restrict resale, hindering flexible trading to respond to supply and demand. In May 2016, Japan announced an LNG market strategy to realize a transparent and highly flexible international LNG market. In April 2017, an LNG spot market was opened on the Tokyo Commodity Exchange to improve the reliability of indices and increase transparency.

2 Balancing Environmental Concerns with Growth

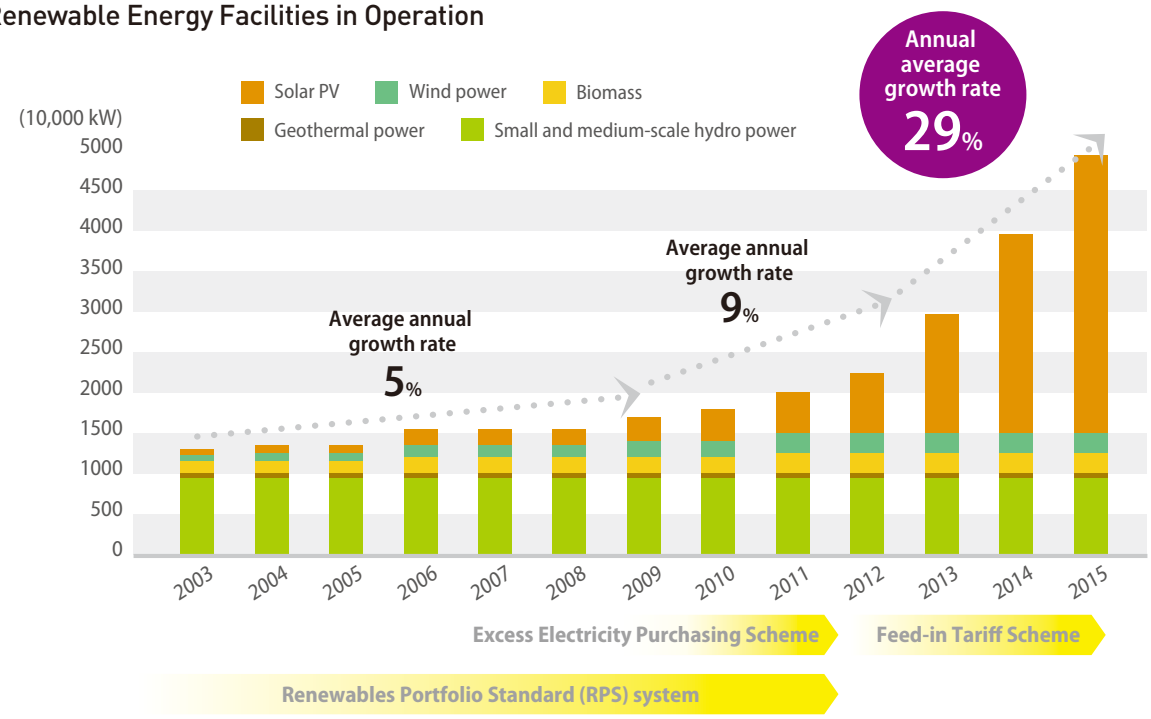
To realize its Energy Mix Plan, Japan is developing policies that not only achieve comprehensive energy conservation and maximize the introduction of renewable energy, but also reduce the public burden while exploring the future possibilities of hydrogen energy.

Reducing Public Burden

Since July 2012, the capacity of renewable energy facilities in operation has grown at an average annual rate of 29%. Currently, solar energy accounts for the largest share of renewable energy, while wind power, biomass and geothermal energy still have room for growth. The driving force for promoting renewable energy has been the Feed-in Tariff (FIT) Scheme for Renewable Energy, which has spurred a 2.5-fold increase in capacity of facilities in operation since it began four and a half years ago.

However, a growing public burden has limited further gains. The FIT Law was revised in May 2016 in order to (1) eliminate uncommissioned projects and mandate proper project implementation, (2) suppress prices through a tendering system for large-scale solar energy projects, and (3) establish medium- and long-term price targets. (Enacted in April 2017)

Renewable Energy Facilities in Operation



Source: Agency of Natural Resources and Energy

Hydrogen Energy for the Future

Japan aims to realize a hydrogen-based society through the following three phases.

Phase 1: Expand use of FCVs, hydrogen stations and Ene-Farms (underway)
Phase 2: Introduce hydrogen power generation, establish a large-scale hydrogen supply system (~2030)
Phase 3: Establish a CO_2-free hydrogen supply system (~2040)

3 Market Liberalization and Increased Competition

To form an energy market that encourages competition across many different sectors, METI is introducing reform with three key aims: (1) secure stable energy supplies; (2) cut electricity prices; and (3) expand business opportunities for operators and the range of choices for consumers.

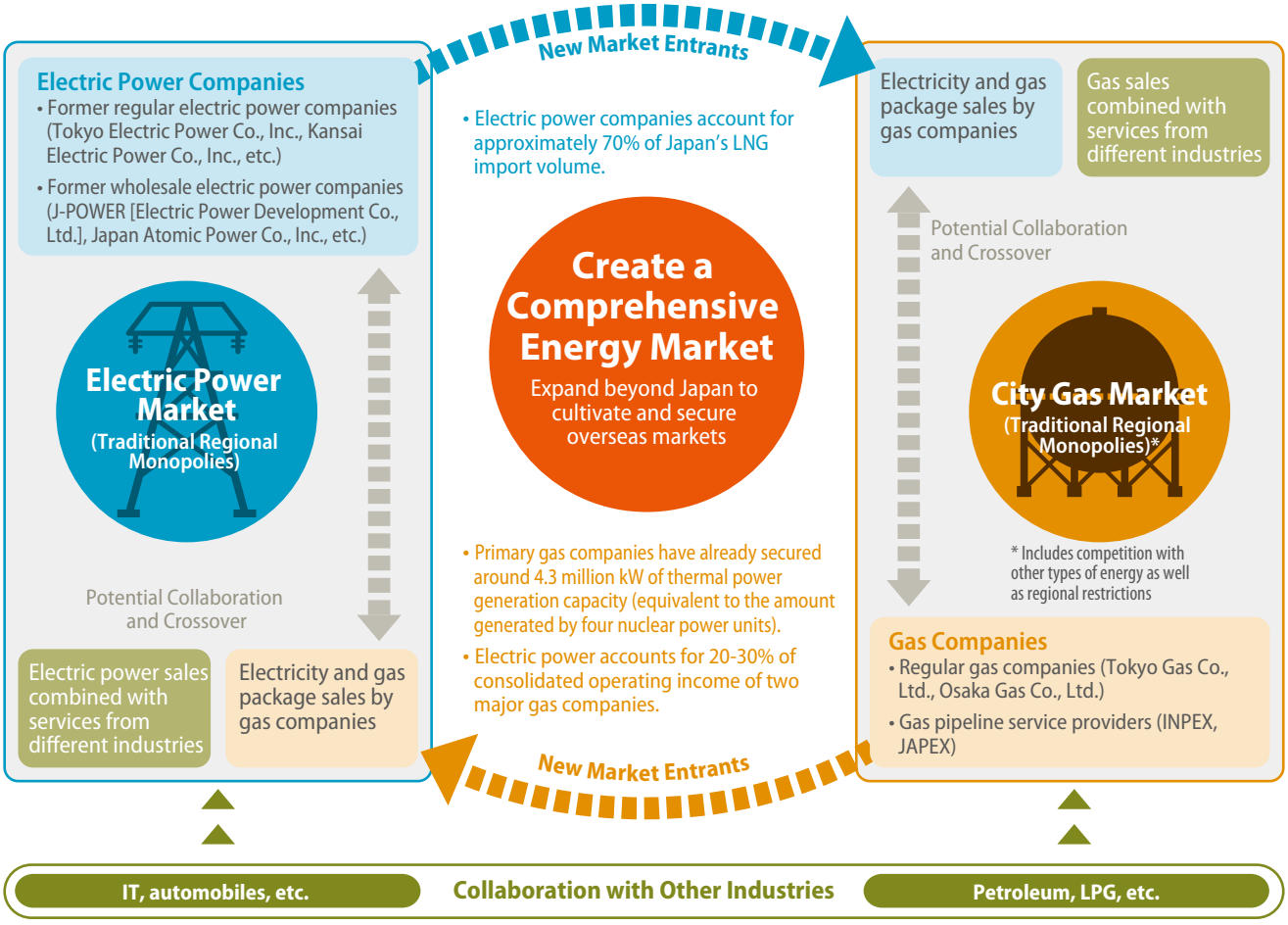
Electricity

Established in 2015, the Electricity Market Surveillance Commission has examined a regulatory framework that covers retailers, methods for controlling unfair trading in wholesale markets and the future of wheeling charge schemes for transporting energy.

Gas

From 2020, a series of phased reforms will kick off the unbundling of regional pipeline networks and the full liberalization of entry into the retail market. As of May 2017, 190,000 applications have been received for switching contracted suppliers as liberalization steadily progresses.

In addition to promoting efficiency, energy liberalization must benefit households and address issues of public interest. Key ongoing concerns include securing stable energy supplies, which links directly to energy security, as well as ensuring environment protection and universal service.



Electric Power

2015 Organization for Cross-regional Coordination of Transmission Operators (OCCTO) established
2016 Full liberalization of retail electricity markets
2020 Legal separation of the power transmission/distribution sector

City Gas

2017 Full liberalization of retail gas rates markets
2020 Legal separation of the commercial pipeline sector (3 major companies)

PART 3

Energy System Reform and Bolstering Industry Competitiveness

Japan's energy companies can help realize safe and stable supplies of energy, improve economic efficiency and achieve environmental feasibility on a global scale.

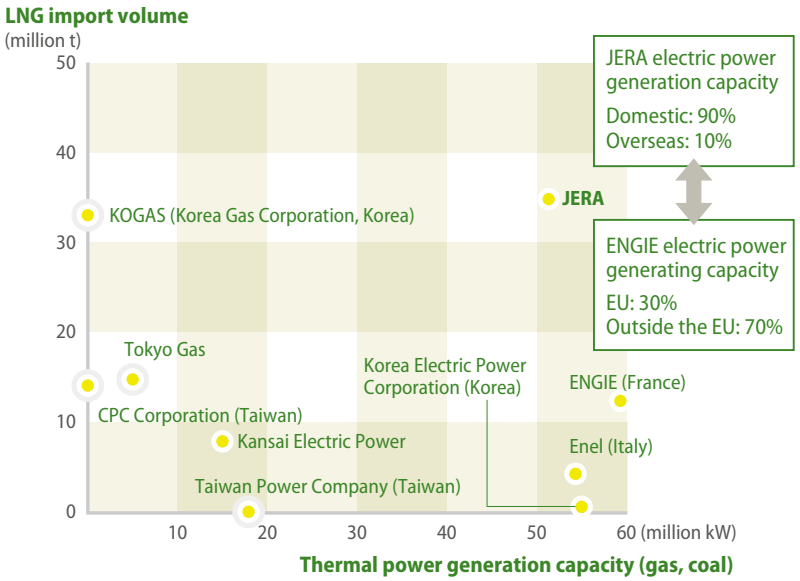
1 Industry Trends: Domestic Electric Power and Gas

Liberalization of the electric power retail sector has attracted new market entrants from different industries and spurred competition. Crossover between the electricity and gas markets is now possible, which will encourage the development of companies able to offer a comprehensive range of energy services.

Company Profile
JERA

JERA was established in 2015 with joint investments from TEPCO Fuel & Power and Chubu Electric Power. JERA aims to integrate and reorganize each function of its thermal power generation business by FY2019 to become the world's largest energy company for both LNG procurement and thermal power generation. Combining both gas- and coal-fired plants, JERA's electric power generation capacity will grow to equal that of France's ENGIE, a major player in gas-fired power generation in Europe. (2020 estimate)

FY2020 Forecast



Source: Prepared by Agency of Natural Resources and Energy with materials provided by JERA.

2 Industry Trends: Domestic and Overseas Petroleum

Domestic oil refiners and primary distributors are actively restructuring their businesses by consolidating refineries and rationalizing distribution. Other initiatives include strengthening the international competitiveness of domestic refineries through collaboration in petrochemicals, as well as developing business in overseas markets and other energy industries.

Ministry of Economy, Trade and Industry