



Futtsu Thermal Power Station

TEPCO

TEPCO Fuel & Power



Sodegaura Thermal Power Station

TEPCO Fuel & Power is a member of the Tokyo Electric Power Company (TEPCO) Group, handling the fuel and thermal power business.

The company procures LNG (Liquefied Natural Gas), coal and oil from around the world for use at 15 thermal power stations for generating electricity. It taps into the technologies and experiences that have supported electricity demand in the Kanto region over many years and is actively involved in the construction and operation of power stations abroad.

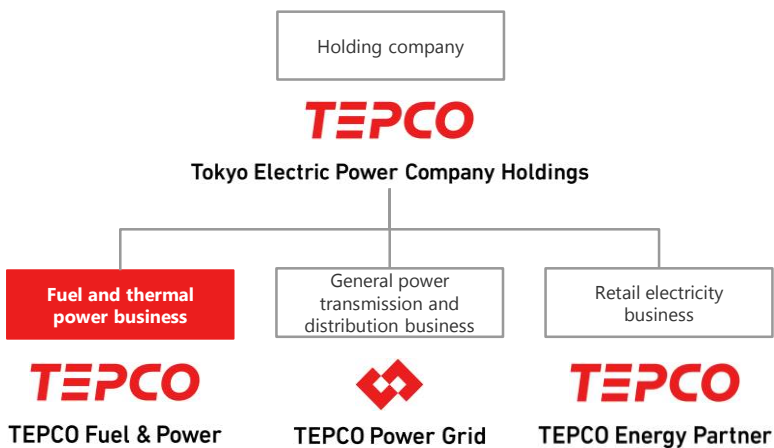


Table of Contents

Vision ...2

Strategy ...3

Comprehensive alliance (JERA) ...4

- Expanding the business scale and optimizing the value chain
- JERA's growth strategy
- Management targets

Optimization ...6

- Improving the efficiency of power generation facilities
- Operating power generation units with economical efficiencies
- Doubling productivity through better plant administration

Origination ...9

- Replacing aging thermal power plants
- Developing IPP business abroad

Culture ...11

Company information ...12

- Company overview
- Thermal power generation and thermal power stations
- Overview of LNG terminals and long-term LNG contracts
- Fuel costs for thermal power generation and fuel volume consumed
- Main abroad investment projects



LNG ship (Pacific Arcadia)

Vision Integrated Energy Value Chain Company

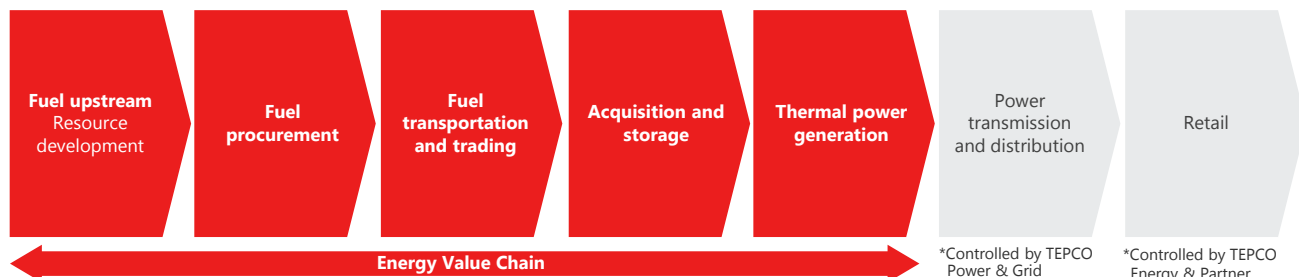
TEPCO Fuel & Power's vision is to become an 'Integrated Energy Value Chain Company.'

It is committed to strengthening and optimizing the entire value chain of its business domains from the fuel upstream business (resource development) to thermal power generation, so as to transform into an integrated energy company entity with world level business operations and profitability.

The company will emerge victorious in the turbulent global energy market and provide stable energy supply at internationally-competitive prices, while enhancing the TEPCO Group's overall corporate value in a bid to make continued contributions to the revitalization of Fukushima.



TEPCO Fuel & Power's business domains



※Some of these businesses have been integrated into JERA.



Kawasaki Thermal Power Station

Strategy

TEPCO Fuel & Power's key business strategy is built around a comprehensive alliance with Chubu Electric Power Company. Under the partnership, a new company called JERA has been established to gradually integrate the two companies' fuel and thermal energy operations.

For JERA to compete as an internationally-competitive global energy company, we will implement a strategy combining 'optimizing existing assets (Optimization)' and 'competitive asset formation (Origination).'

Key strategy for transforming into a competitive energy supplier

Optimization

Optimizing existing assets

Improving facility efficiencies/ doubling productivity, etc.



Comprehensive alliance

Origination

Competitive asset formation

Replacing aging thermal facilities/
Developing power generation projects overseas, etc.



Conclusion of basic agreement on integration of existing thermal power generation businesses



Khanom Power Station, Thailand



LNG ship (Pacific Notus)

Strategy

Comprehensive alliance (JERA)

Amidst intensifying global competition for energy resources, it is essential for Japan's energy businesses to create an internationally competitive global energy company to provide stable energy supply at internationally competitive rates.

JERA stands for 'Japan's Energy for a new eRA.'

JERA is an energy company created from a comprehensive alliance with Chubu Electric Power Company covering the entire value chain from fuel upstream and procurement to power generation. The strengths of the two companies are brought together to build a new energy business model for managing the entire value chain.

Expanding business operations and optimizing the value chain

JERA will expand business operations for each of its business divisions. Expanding the volume of fuel procurement will enable the diversification (decentralization) of suppliers and participation in upstream business under better conditions. Increasing the number of power generation facilities within and outside Japan will lead to greater options in fuel acquisition and consumption destinations.

Management of the integrated and optimized value chain can also build a system for 'using the most economical fuel at the most efficient power stations.'

TEPCO Fuel & Power will strengthen and optimize the entire value chain through JERA to achieve higher economic efficiency, supply stability and flexibility, thereby completing the mission of supplying energy at international competitive rates.

TEPCO
TEPCO Fuel & Power

→ **Jera** ←
Energy for a New Era

CHUBU
Electric Power

JERA's basic principles

- Creating a global energy company
- Building a new energy business model
- Strengthening the entire supply chain



Bayu-Undan Gas Field, Australia

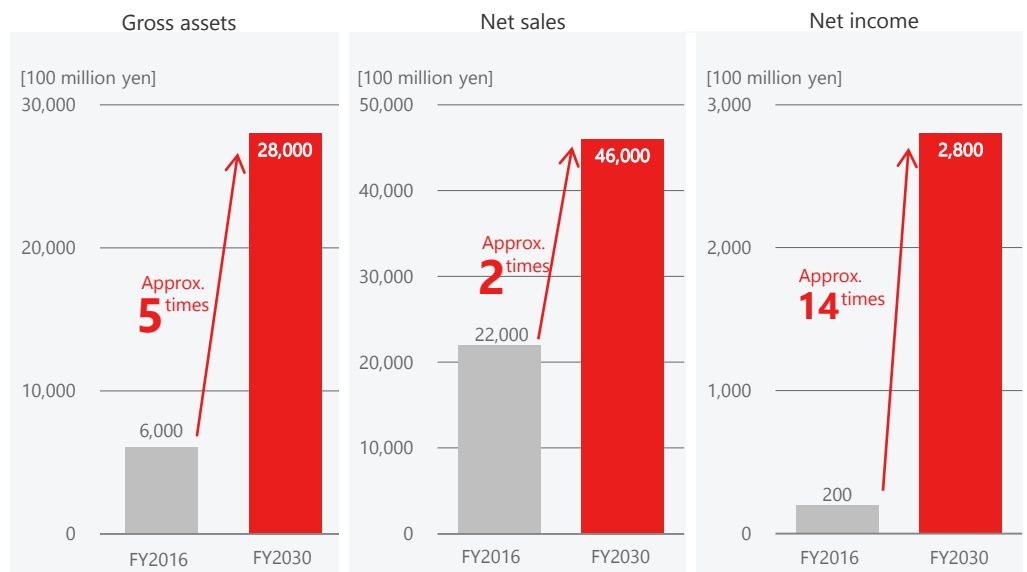
Strategy

JERA's growth strategy

JERA aims to grow its three business domains, i.e. domestic power generation, overseas power generation and fuel businesses, to increase the gross assets by approx. 5 times, net sales by approx. 2 times and net income by approx. 14 times by FY2030.

In the domestic power generation business, JERA will replace existing power stations and build new plants to develop highly efficient and competitive power sources. In the overseas power generation business, the company will make use of its business deployment insight in the far-reaching value chain with particular emphasis in Asia, Middle East and North / Central Americas, where it already conducts business operations. In the fuel business, JERA will actively take on short-term and spot projects with flexibility, rather than focusing on long-term contracts with a high level of economic viability and stability in a bold effort to restructure fuel procurement portfolio. Furthermore, it will strive to expand its fuel trading business and fuel upstream business as well.

Management targets





Construction of Kawasaki Thermal Power Station Group 2 Unit 2

Strategy

Optimization

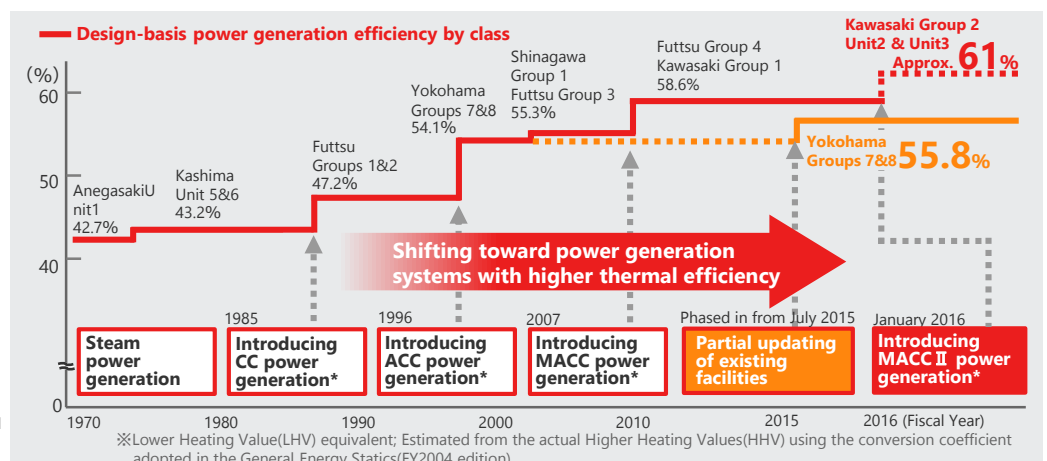
'Optimizing existing assets (Optimization)' signifies optimizing all the business flows associated with existing assets such as workforce, materials, funds and information to the extreme extent to maximize profits. TEPCO Fuel & Power's thermal power stations will work on optimizing their power generation facilities, their operations and other regular work processes to reduce the fuel cost, which represents approx. 80% of sales expenditures.

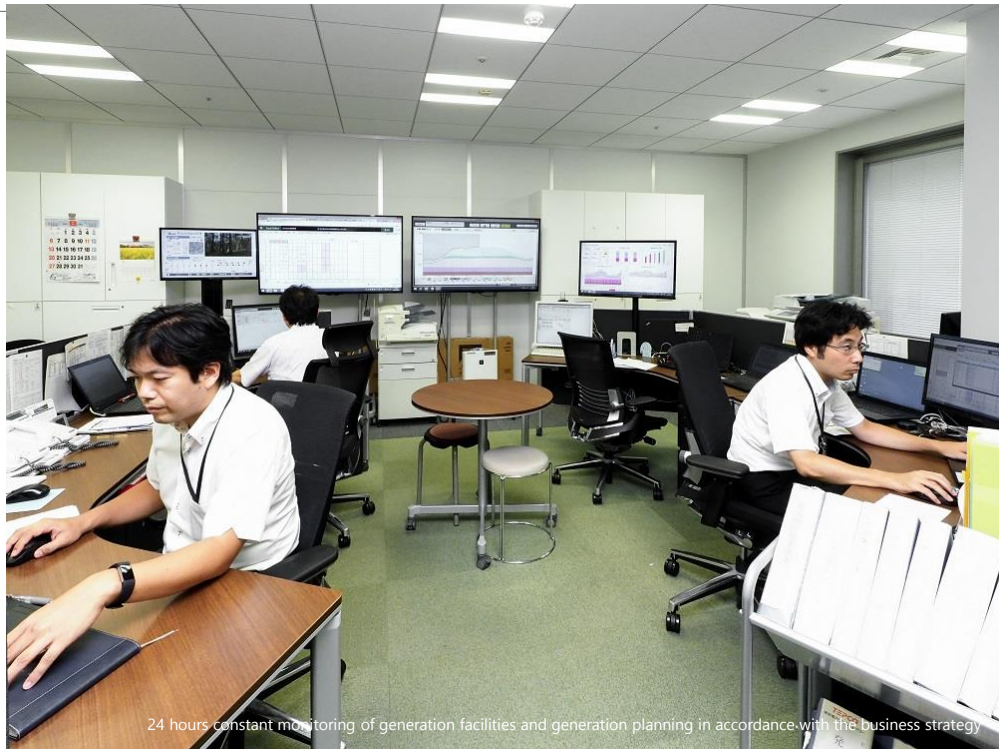
Improving the efficiency of power generation facilities

The higher a power generation facility's thermal efficiency is, the lower the amount of fuel it requires, thereby cutting the fuel cost. TEPCO Fuel & Power has been a pioneer in actively embracing cutting-edge high-efficiency facilities, and taken advantage of the accumulated knowledge and technologies to boost the efficiency of existing facilities even further.

In January 2016, the Kawasaki Thermal Power Station began operating the 1600°C-class Combined Cycle II (MACC II) system, which offers the world's highest level of thermal efficiency. Some improvements to its construction process has successfully reduced the construction duration by 6 months.

At the Yokohama Thermal Power Station and Futsu Thermal Power Station, existing gas turbines have been upgraded to the latest high-performance models to boost the plants' efficiency and output, thereby reducing the fuel cost. (All units at the Yokohama Thermal Power Station have completed the installation work and resumed operation.)





24 hours constant monitoring of generation facilities and generation planning in accordance with the business strategy

Strategy

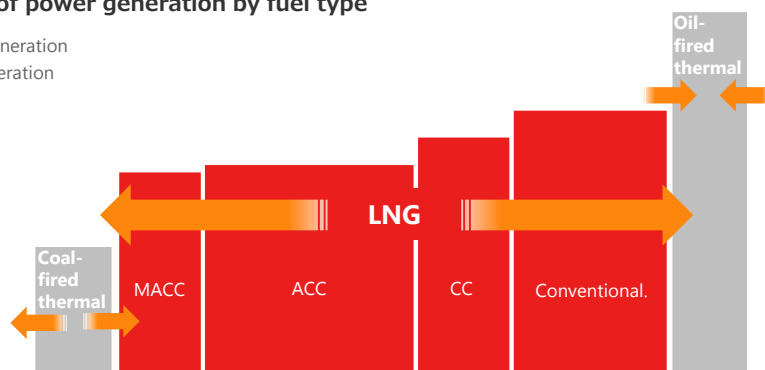
Operating power generation units in pursuit for financial viability

Thermal power stations need to generate electricity in line with demand that fluctuates constantly according to season, day of the week and time of the day. TEPCO Fuel & Power owns over 90 power generation units, which is in an overwhelmingly greater scale than that of other electric utilities. Each unit uses a different fuel or has a different thermal efficiency and a different duration of time required for inspection shutdown. They are controlled round the clock for most economical operation in pursuit for greater financial viability, achieved through running units that operate on coal or LNG, which have a lower unit price in fuel cost.

Unit cost and amount of power generation by fuel type

Length = Unit cost of power generation

Width = Amount of power generation



Central operation room of Futtsu Thermal Power Station



Central operation room of Kawasaki Thermal Power Station



Facility inspection using a tablet-type device, Sodegaura Thermal Power Station

Strategy

Doubling productivity through better plant administration

TEPCO Fuel & Power has been streamlining and optimizing day-to-day work operations to double productivity. External experts have been invited to thoroughly improve inefficient areas of work in operation maintenance and general administration. Information and communications technologies have also been utilized to streamline work processes.

• In search for kaizen

At coal-fired or combined cycle LNG thermal plants, efforts to shorten the periodic inspection have begun. By breaking down and refining tasks, and handling multiple tasks simultaneously, steady improvement in productivity has been observed.

Case study Faster connection of pipe flanges

A high level of precision is required when connecting as many as 730 pipe flanges during a gas turbine inspection. By breaking down the task into several segments and analyzing them with 1 second precision, it was found that in some segments, junior workers took much longer to handle them than experienced colleagues did. Mockup training is being provided to narrow the gap.



• Utilizing information communications technology

Mobile devices, cloud services, wearable devices, etc. are actively adopted for plants' operation maintenance duties in an effort to transform the conventional workflow. Potential use of big data, accumulated through plant operations and inspections, is also being explored.

Case study Introduction of tablet devices

The use of tablet devices has started in on-site inspection work. Data, previously recorded by hand, is entered into tablet devices to boost efficiency. The input data is displayed in graph, etc. making it possible to identify signs of failure on the spot. This is one of many benefits from the use of tablet devices.





Hitachinaka Power Station

Strategy

Origination

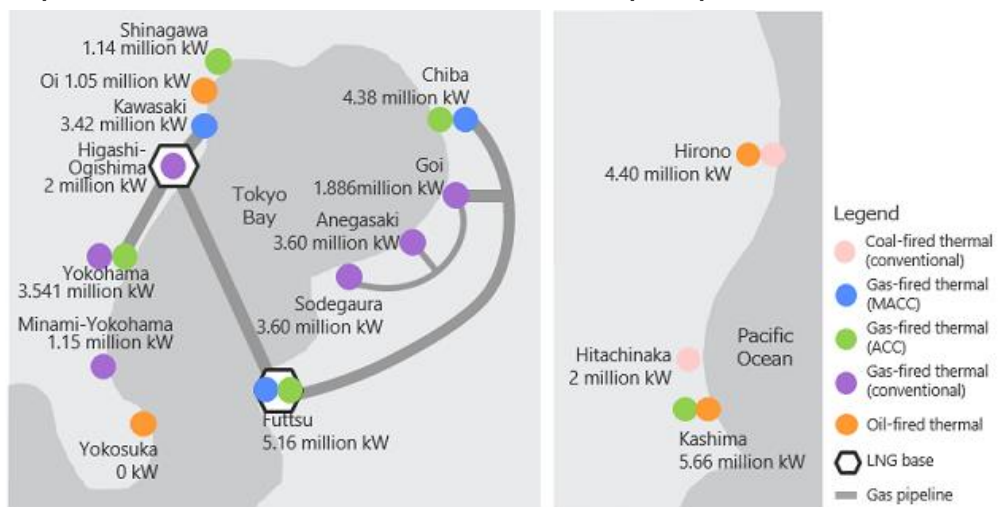
Along with optimization of existing assets (Optimization), TEPCO Fuel & Power is aiming to create competitive assets (Origination). In order to create new competitive assets, efforts will be made to replace aging thermal plants and develop IPP business abroad.

Replacing aging thermal power plants

Aging thermal plants, the combined output power over the years of which is 10 million kW, are to be replaced. The strengths of TEPCO Fuel & Power include past track record of actively adopting latest power generation facilities with high efficiency, insight into overseas projects and technological sharing with Chubu Electric Power Company. It has a competitive edge in terms of technology required for introducing latest equipment, risk assessment expertise and inspection / maintenance technology as well as the reduction of fuel cost and CO2 emissions. Tapping into its insight into overseas projects, the company will participate international bidding to seek a wide variety of suggestions and ideas from plant manufacturers around the world, expecting to globally reduce the costs of plant construction.

Replacement candidate sites

(replacement candidates to be chosen from TEPCO's thermal power plants)





Fong Der Power Station, Taiwan

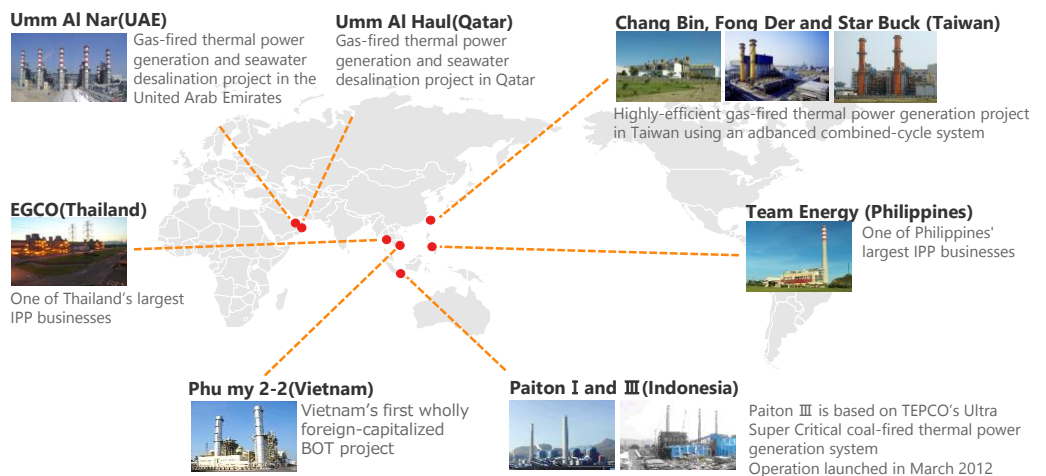
Strategy

Developing IPP businesses abroad

TEPCO Fuel & Power had been taking part in 10 overseas IPP business projects (thermal power plants) in 7 countries. It has been working on boosting the capacity factor of the existing thermal plants and building new ones overseas, drawing knowledge from many years of plant construction, operation and maintenance experiences. These businesses have been integrated into JERA on July 2016.

Overview of overseas IPP businesses

As of January 2016





Culture Diversification

TEPCO Fuel & Power, with approx. 2,500 employees, has a flat organizational structure in which self-regulated and swift decision-making is done by diverse human capital from diverse perspectives.

In its efforts to pursue the business strategies, the company will strive to develop human capital capable of surviving global competition and achieving the transformation of the company while overseeing the entire value chain. Each of the thermal power plants has been creating a work environment where employees seek to double productivity with creativity while maintaining and improving technologies and skills that have been developed over many years.

Many of TEPCO Fuel & Power employees and its affiliate workers will work together to perform their duties in the entire value chain from fuel upstream to thermal power generation.





Kawasaki Thermal Power Station Group 2 Unit 2

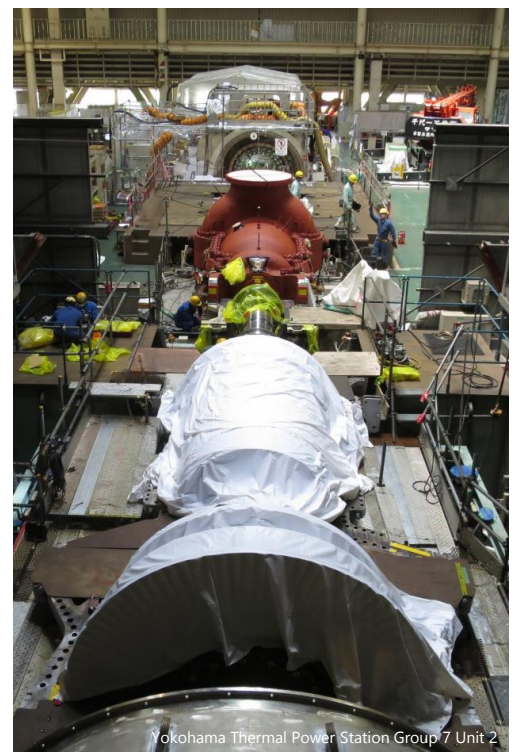
Company Information

Company overview

As of 2.1.2018

Company name	TEPCO Fuel & Power, Incorporated
Business description	Fuel and thermal power generation
Head office location	1-5-3 Uchisaiwai-cho, Chiyoda-ku, Tokyo
Representative	Seiji Moriya, President
Establishment	April 1, 2015*
Paid-in capital	30 billion yen
Parent company	Tokyo Electric Power Company Holdings (100%)
Number of employees	Approx. 2,500
Power plants	15 sites (92 units, approx. 43 million kW)

* Established as a Preparation Office: April 1, 2015
Change in business name to TEPCO Fuel & Power, Incorporated: April 1, 2016



Yokohama Thermal Power Station Group 7 Unit 2

Thermal power stations

Power station name	Location	Maximum output (kW)	Unit No.	Generation type*1	Fuel used
Chiba Thermal Power Station	Chiba City, Chiba Prefecture	4,380,000	Group 1 (Units 1 to 4)	ACC	LNG
			Group 2 (Units 1 to 4)		
			Group 3 (Units 1・2)	MACC	
			Group 3 (Unit 3)		
Goi Thermal Power Station *2	Ichihara City, Chiba Prefecture	1,886,000	Units 1 to 5	Steam	LNG
			Unit 6	Steam, GT	
Anegasaki Thermal Power Station	Ichihara City, Chiba Prefecture	3,600,000	Units 1 to 6	Steam	Heavy oil, crude oil, NGL, LNG, LPG
Sodegaura Thermal Power Station	Sodegaura City, Chiba Prefecture	3,600,000	Units 1 to 4	Steam	LNG
Futtsu Thermal Power Station	Futtsu City, Chiba Prefecture	5,160,000	Group 1 (Units 1 to 7)	CC	LNG
			Group 2 (Units 1 to 7)		
			Group 3 (Units 1 to 4)	ACC	
			Group 4 (Units 1 to 3)	MACC	
Yokosuka Thermal Power Station	Yokosuka City, Kanagawa Prefecture	0			
Kawasaki Thermal Power Station	Kawasaki City, Kanagawa Prefecture	3,420,000	Group 1 (Units 1 to 3)	MACC	LNG
			Group 2 (Unit 1)		
			Group 2 (Unit 2 to 3)	MACC II	
Yokohama Thermal Power Station *2	Yokohama City, Nakagawa Prefecture	3,541,000	Units 5・6	Steam	Heavy oil, crude oil, NGL, LNG
			Group 7 (Units 1 to 4)	ACC	
			Group 8 (Units 1 to 4)		
Minami-Yokohama Thermal Power Station	Yokohama City, Kanagawa Prefecture	1,150,000	Units 1 to 3	Steam	LNG
Higashi-Ogishima Thermal Power Station	Kawasaki City, Kanagawa Prefecture	2,000,000	Units 1・2	Steam	LNG
Kashima Thermal Power Station *2	Kamisu City, Ibaraki Prefecture	5,660,000	Units 1 to 6	Steam	Heavy oil, crude oil
			Group 7 (Units 1 to 3)	ACC	City gas
Oi Thermal Power Station *2	Shinagawa Ward, Tokyo	1,050,000	Units 1 to 3	Steam	Crude oil
Hirono Thermal Power Station *2	Futaba County, Fukushima Prefecture	4,400,000	Units 1 to 4	Steam	Heavy oil, crude oil
			Units 5・6		Coal
Shinagawa Thermal Power Station	Shinagawa Ward, Tokyo	1,140,000	Group 1 (Units 1 to 3)	ACC	City gas
Hitachinaka Thermal Power Station	Naka County, Ibaraki Prefecture	2,000,000	Units 1・2	Steam	Coal

*1 Generation types

Steam : Steam power generation CC : 1,100°C-class combined cycle generation

ACC : 1,300°C-class combined cycle generation MACC : 1,500°C-class combined cycle generation

MACC II : 1,600°C-class combined cycle generation GT : Gas-turbine generation

*2 The following power stations are in a long-term scheduled shutdown. Goi Units1-6, G/T2, Yokohama Units5-6, Kashima Units1-4, Oi Units1-3, Hirono Unit1

LNG terminals

As of 2.1.2018

Terminal name	Description
Futtsu LNG terminal [Futtsu City, Chiba Prefecture]	2 berths Tank capacity (10 units): 1.11 million kL, equivalent to 516,000 tons of LNG Tank Capacity, under construction (2 units): 0.25 million kL , equivalent to 116.000 tons of LNG
Sodegaura LNG terminal (jointly held with Tokyo Gas) [Sodegaura City, Chiba Prefecture]	3 berths Tank capacity (18 units): 1.06 million kL, equivalent to 493,000 tons of LNG (TEPCO Fuel & Power's portion)
Higashi-Ogishima LNG terminal [Kawasaki City, Kanagawa Prefecture]	1 berth Tank capacity (9 units): 540,000 kL, equivalent to 251,000 tons of LNG
Negishi LNG terminal (jointly held with Tokyo Gas) [Yokohama City, Kanagawa Prefecture]	1 berth Tank capacity (4 units): 140,000 kL, equivalent to 65,000 tons of LNG (TEPCO Fuel & Power's portion)

Group companies

As of 2.1.2018

Consolidated subsidiaries

- Bio Fuel Co., Inc.
- Fuel TEPCO
- TOKYO WATERFRONT RECYCLE POWER CO., LTD.
- KAWASAKI STEAM NET CO., LTD.
- NANSO SERVICE CO., LTD.
- Ohgishima City-Gas Supply Company, Incorporated

Affiliates *Equity Method Affiliated Companies only

- JERA
- Kimitsu Cooperative Thermal Power Company, Inc.
- KASHIMA KYODO ELECTRIC POWER Co., Ltd.
- Soma Kyodo Power Company, Ltd.
- Joban Joint Power Co., Ltd.
- Japan Coal Development Co.,Ltd.



Hirono Thermal Power Station

