

Futtsu Thermal Power Station

**TEPCO**

TEPCO Fuel & Power

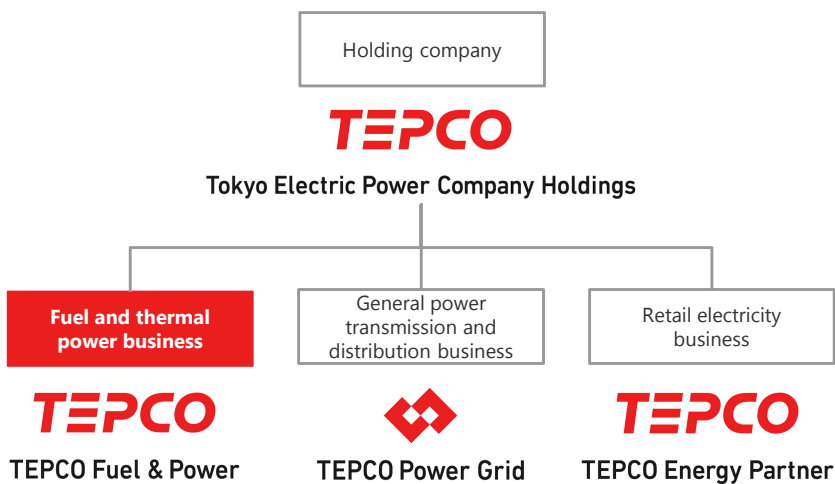




Sodegaura Thermal Power Station

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.



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LNG ship - (Pacific Arcadia)

# Vision **Integrated Energy Value Chain Company**

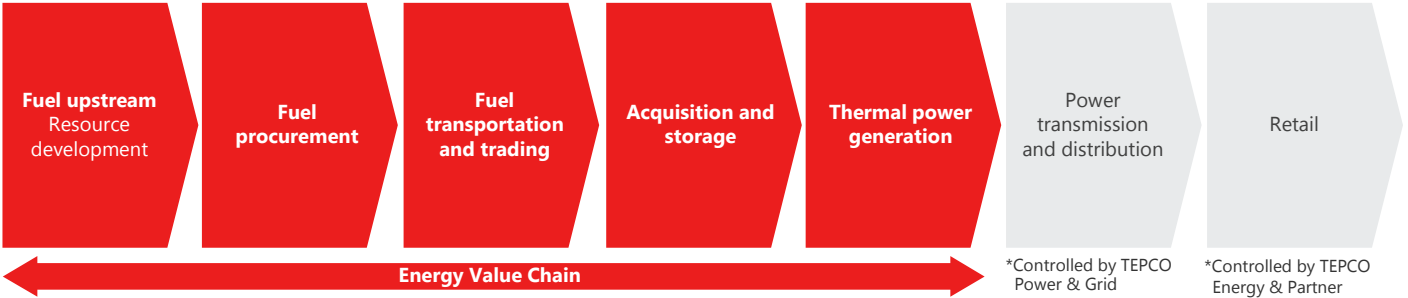
TEPCO Fuel & Power's vision is to become an 'Integrated Energy Value Chain Company.'

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







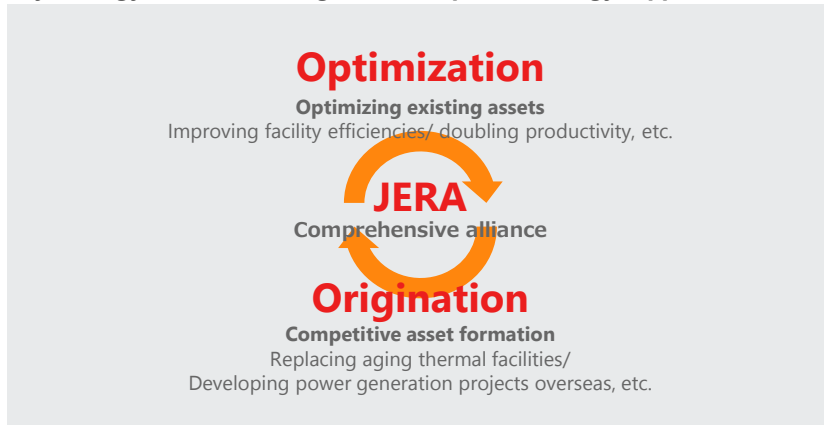
Kawasaki Thermal Power Station

# 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



JERA Releasing JERA Business Plan (Feb 10)



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

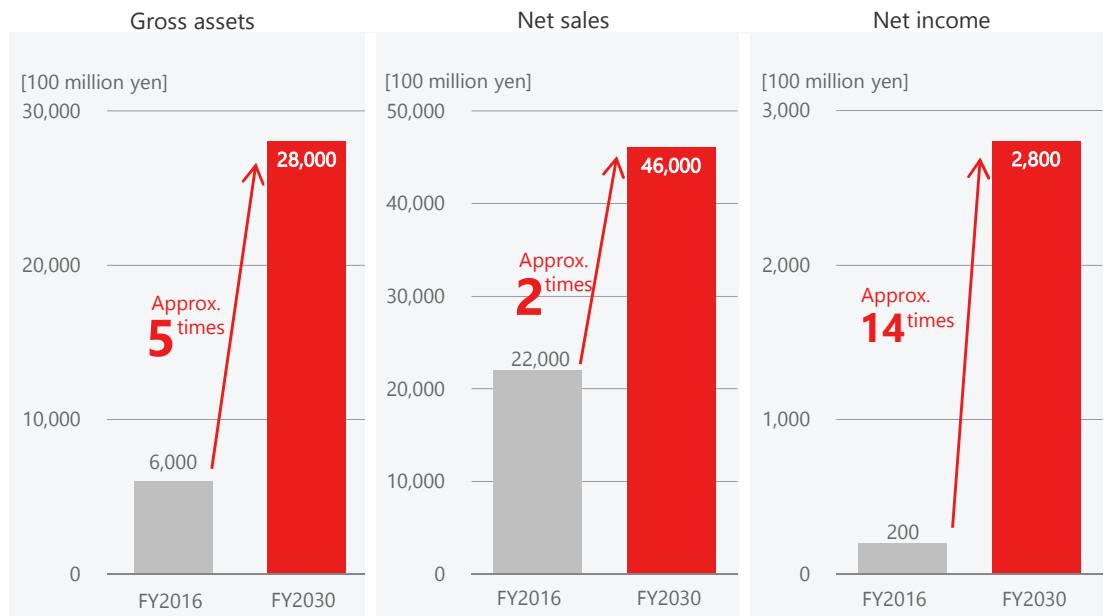
## Strategy

### 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

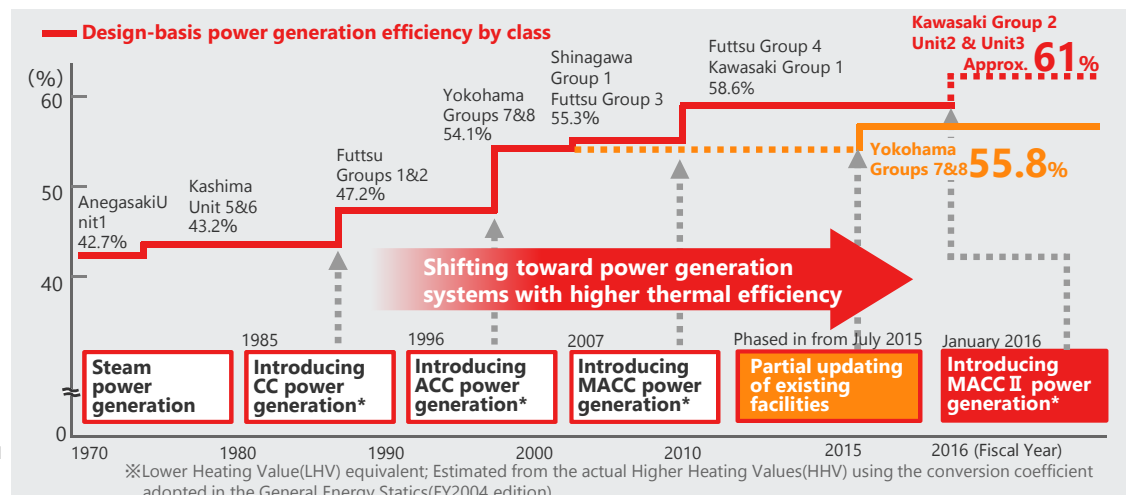
'Optimizing existing assets (Optimization)' signifies optimizing all the business flows associated with existing assets such as workforce, materials, funds and information to the extreme extent to maximize profits. TEPCO Fuel & Power's thermal power stations will work on optimizing their power generation 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. (Some of the 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

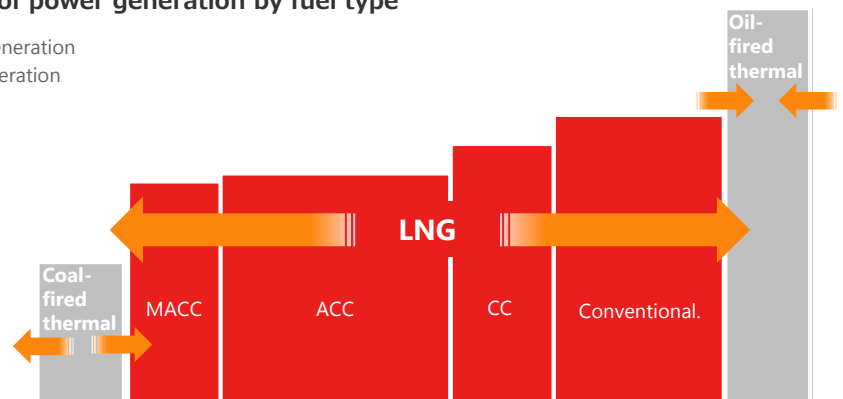
## Strategy

### 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

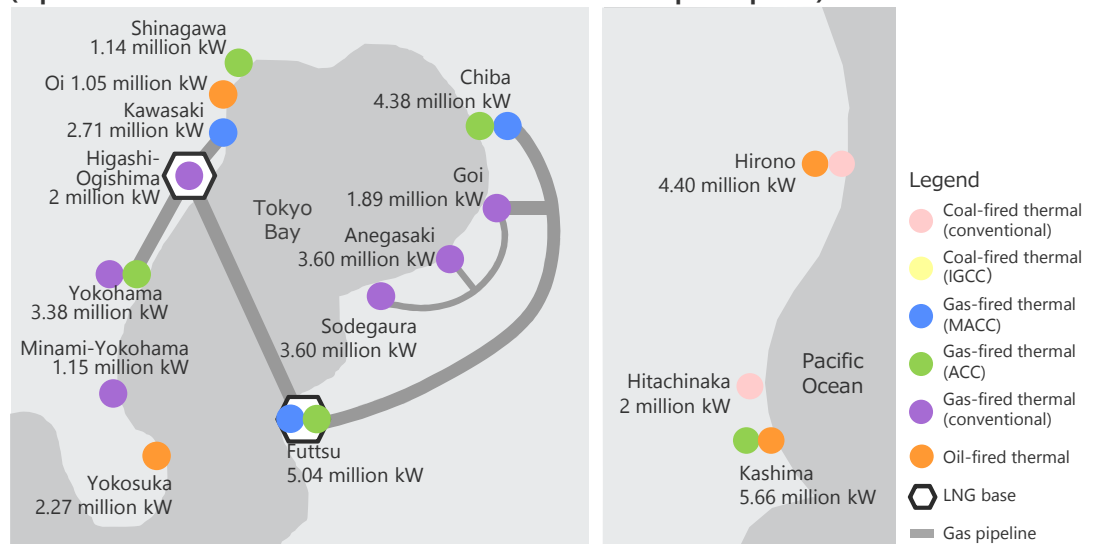
### Origination

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

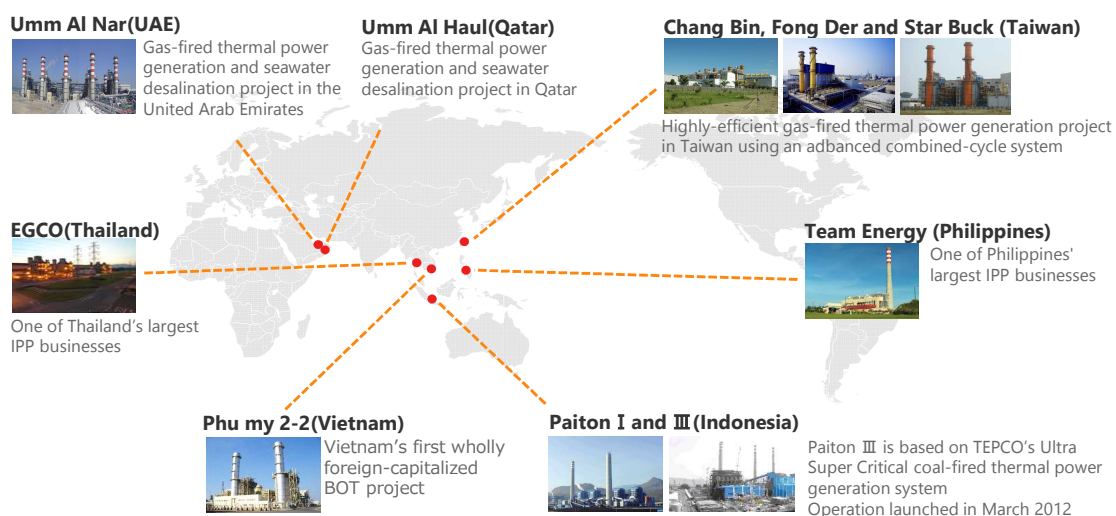
## Strategy

### Developing IPP businesses abroad

TEPCO Fuel & Power has been taking part in 10 overseas IPP business projects (thermal power plants) in 7 countries, with the power generation capacity upward of 3 million kW in total. 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. Taking advantage of the fact that the company's business domains covers the entire value chain, the company will aim to win more IPP development contracts in various regions.

#### 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 resources from diverse perspectives.

In its efforts to pursue the business strategies, the company will strive to develop human resources 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.







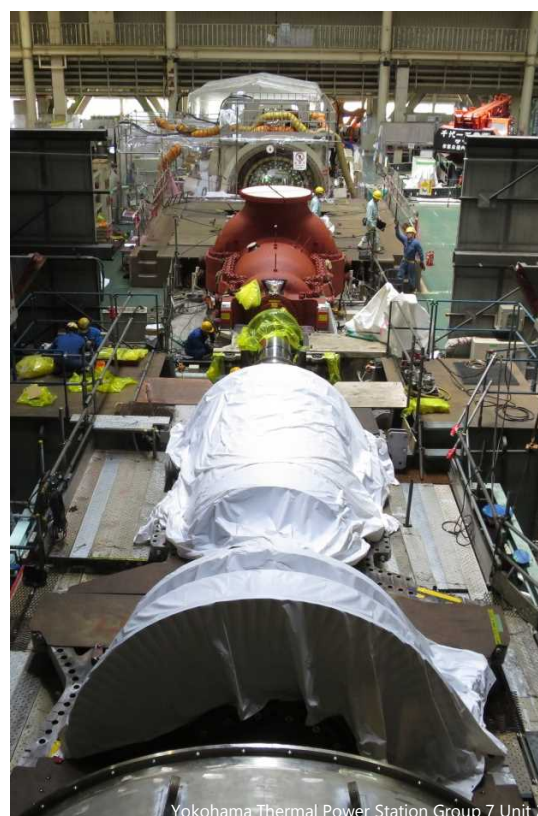
Kawasaki Thermal Power Station Group 2 Unit 2

# Company Information

## Company overview

As of 4.1.2016

<b>Company name</b>	TEPCO Fuel & Power, Incorporated
<b>Business description</b>	Fuel and thermal power generation
<b>Head office location</b>	1-5-3 Uchisaiwai-cho, Chiyoda-ku, Tokyo
<b>Representative</b>	President Toshihiro Sano
<b>Establishment</b>	April 1, 2015*
<b>Paid-in capital</b>	30 billion yen
<b>Parent company</b>	Tokyo Electric Power Company Holdings (100%)
<b>Number of employees</b>	Approx. 2,500
<b>Power plants</b>	15 sites (99 units, approx. 44 million kW)
<b>Thermal power generation</b>	211,791 million kWh (FY2014)



Yokohama Thermal Power Station Group 7 Unit 2

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

## Thermal power generation

\*Unit: million kWh

	FY2010	FY2011	FY2012	FY2013	FY2014
Thermal power generation	168,944	210,287	229,882	225,588	211,791

## Thermal power stations

As of 4.1.2016

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	5,040,000	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 *2	Yokosuka City, Kanagawa Prefecture	2,274,000	Units 3 to 8	Steam	Heavy oil, crude oil
			G/T1	GT	Diesel
			G/T2	GT	City gas, diesel
Kawasaki Thermal Power Station	Kawasaki City, Kanagawa Prefecture	2,710,000	Group 1 (Units 1 to 3)	MACC	LNG
			Group 2 (Unit 1)		
			Group 2 (Unit 2)	MACC II	
Yokohama Thermal Power Station *2	Yokohama City, Kanagawa Prefecture	3,379,000	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, Yokosuka Units3-8, G/T1, G/T2, Yokohama Units5-6, Kashima Units1-4, Oi Units1-3, Hirono Unit1



## LNG terminals

As of 4.1.2016

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
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)

## Overview of long-term LNG contracts

As of 4.1.2016

Country / region	Contract duration	Annual contracted quantity	Seller
Brunei	10 years (2013.4 to 2023.3)	2.03 million tons	Brunei LNG
Das / U.A.E	17 + 25 years (1977.5 to 2019.3)	LNG: 4.3 million tons LPG: 700,000 tons	Abu Dhabi Gas Liquefaction
Satu / Malaysia	20 + 15 years (1983.2 to 2018.3)	Up to 4.8 million tons	Malaysia LNG
Australia	15 years (2009.4 to 2024.3)	300,000 tons	6 companies*1
Qatar	25 years (1999.6 to 2021.12)	200,000 tons	Qatar Liquefied Gas Company Limited
	10 years (2012.8 to 2021.12)	1 million tons	
Darwin / Australia	17 years (2006.3 to 2022.12)	2 million tons	Darwin LNG
Qalhart / Oman	15 years (2006.4 to 2020.12)	Up to 800,000 tons	CELT INC
Sakhalin II / Russia	20 years (2009.4 to 2029.3)	1.5 million tons	Sakhalin Energy Investment
Papua New Guinea	20 years (2014.11 to 2034.3)	Approx. 1.8 million tons	Papua New Guinea Liquefied Natural Gas Global Company
Wheatstone / Australia	Up to 20 years (supply due to commence in 2017)	Approx. 3.1 million tons	4 companies*2
		Approx. 700,000 tons	PE Wheatstone Pty Ltd
		Approx. 400,000 tons	2 companies*3
Ichthys / Australia	15 years (2017 to 2031)	1.05 million tons	Ichthys LNG Pty Ltd
Cameron / USA	20 years (supply due to commence in 2017)	Approx. 400,000 tons	Mitsui & Co., Ltd.
		Approx. 800,000 tons	Mitsubishi Corporation
Prelude / Australia	8 years (supply due to commence in 2017)	Approx. 560,000 tons	INPEX
BP Singapore	17 years (supply due to commence in 2017)	Up to approx. 1.2 million tons	BP Singapore Pty Ltd

\*1 BHP Billiton Petroleum, BP Developments Australia, Chevron Australia, Japan-Australia LNG, Shell Development, Woodside Energy

\*2 Chevron Australia Pty Ltd, Chevron (TAPL) Pty Ltd., Woodside Julimar Pty Ltd., Kufpec Australia (Julimar) Pty Ltd.

\*3 Chevron Australia Pty Ltd, Chevron (TAPL) Pty Ltd.

## Fuel cost for thermal power generation

\*Unit: 100 million yen

	FY2010	FY2011	FY2012	FY2013	FY2014
Fuel cost for thermal power generation	14,821	22,869	27,885	29,152	26,509

## Fuel volume consumed

\*Breakdown by main types As of 1.1.2016

	FY2010	FY2011	FY2012	FY2013	FY2014
Coal (K tons)	3,017	3,222	2,887	7,758	7,534
Heavy oil (K kiloliters)	3,200	5,761	7,473	4,976	2,521
crude oil (K kiloliters)	1,566	2,317	3,023	1,847	578
LNG (K tons)	19,462	22,884	23,707	23,779	23,486
LPG (K tons)	326	952	1,459	642	331

## Main overseas investment projects

As of 1.1.2016

Country / region	Project name, etc.	Facility capacity
Taiwan	①Chang Bin, Fong Der and Star Buck project	Chang Bin : 490,000 kW (19.5%) Fong Der : 980,000 kW (19.5%) Star Buck : 490,000 kW (22.7%)
Vietnam	②Phu My 2-2 project	715,000 kW (15.6%)
U.A.E.	③Umm Al Nar project	2.2 million kW (20%)
Indonesia	④Paiton I and III project	Paiton I : 1.23 million kW (14%) Paiton III : 815,000 kW (14%)
Philippines	⑤Team Energy project	3.204 million kW (50%)
Thailand	⑥EGCO	3.928 million kW (12.3%)
Qatar	⑦Umm Al Haul project	2.4 million kW (10%)

\*Figures in brackets represent TEPCO Fuel &amp; Power's stake



## Group companies

As of 4.1.2016

### Consolidated subsidiaries

- Tokyo Electric Power Company International B.V.
- TEPCO Australia Pty. Ltd.
- Bio Fuel Co., Inc.
- Fuel TEPCO
- Project Development
- TOKYO WATERFRONT RECYCLE POWER CO., LTD.
- KAWASAKI STEAM NET CO., LTD.
- Tokyo Timor Sea Resources Inc. (USA)
- TEPCO Darwin LNG Pty. Ltd.
- Tokyo Timor Sea Resources Pty, Ltd. (Australia)
- NANSO SERVICE CO., LTD.

### Affiliates \*Equity Method Affiliated Companies only

- Kimitsu Cooperative Thermal Power Company, Inc.
- KASHIMA KYODO ELECTRIC POWER Co., Ltd.
- Soma Kyodo Power Company, Ltd.
- Joban Joint Power Co., Ltd.
- TeaM Energy Corporation
- TEPDIA Generating B.V.
- JERA
- ITM Investment Company Limited



Hirono Thermal Power Station

