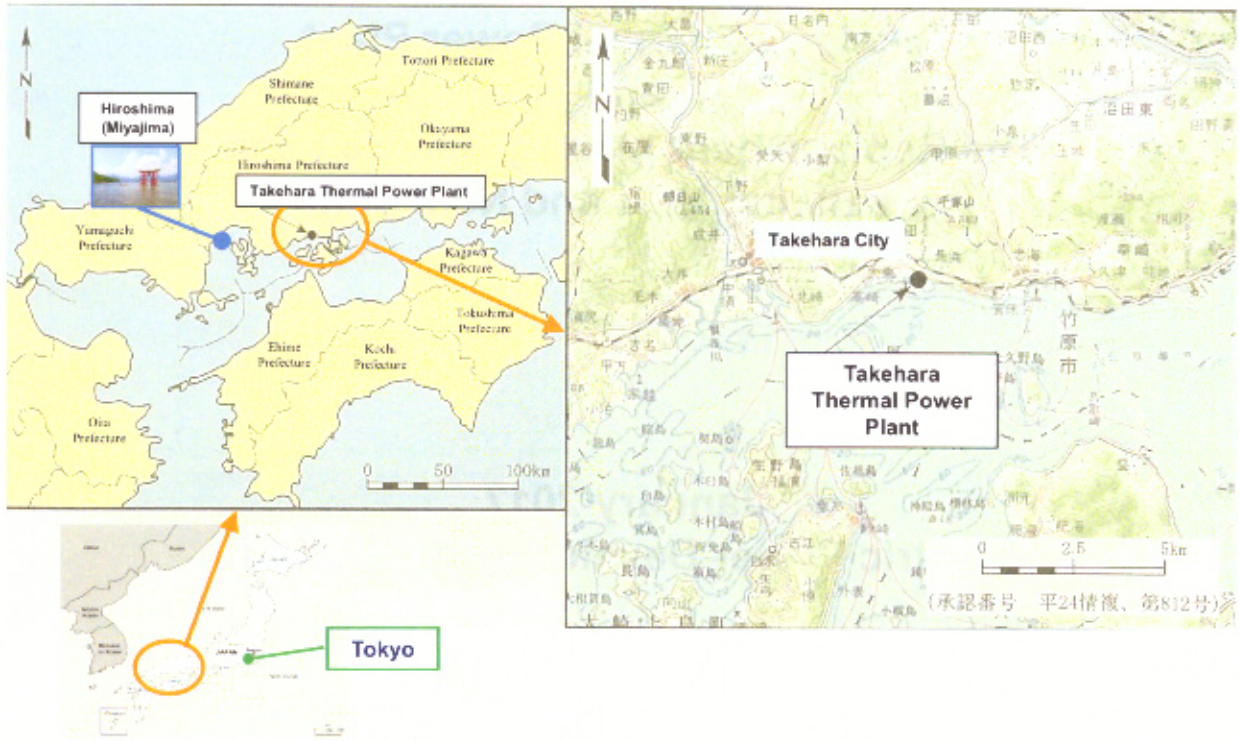


**Takehara Thermal Power Plant
and
The Replacement plan by New No.1 unit
for existing No.1 and No.2 units**

**January 2017
Electric Power Development Co., Ltd.**

Takehara Thermal Power Plant



The city of Takehara features a little "Kyoto" in Aki region.

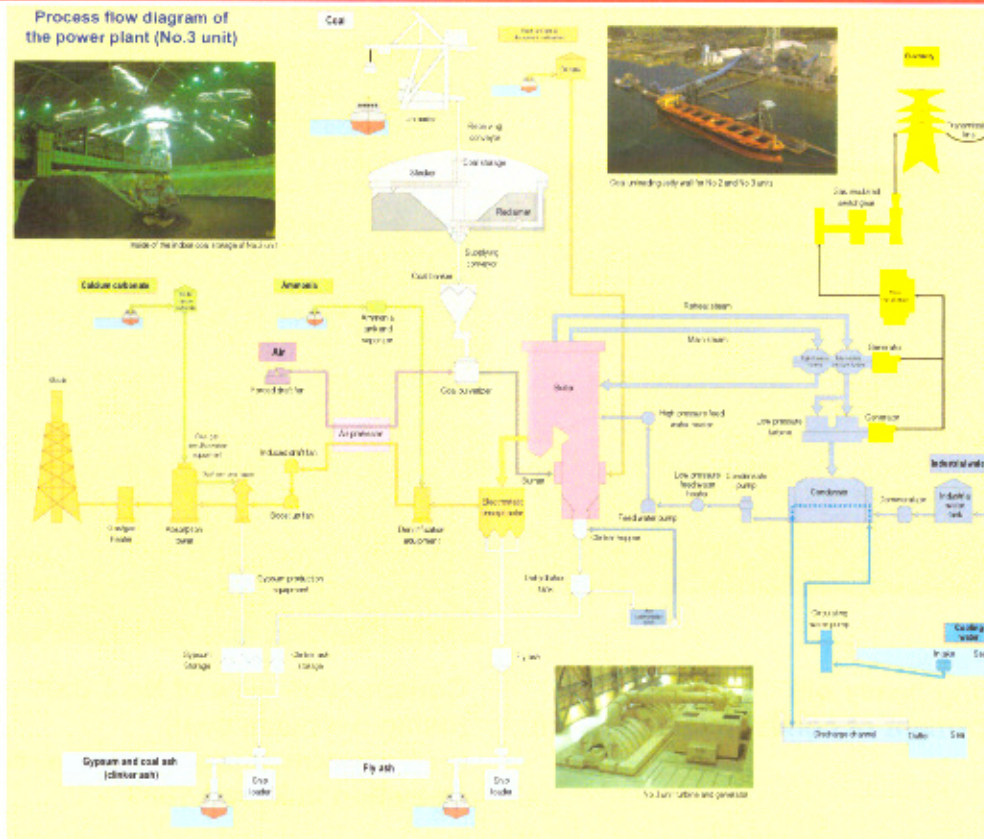


38,000
Population

* Cited from the sightseeing brochure of Takehara City

Mechanism of the coal-fired thermal power plant

Takehara Thermal Power Plant No.3 Unit



Takehara Thermal Power Plant ··· History



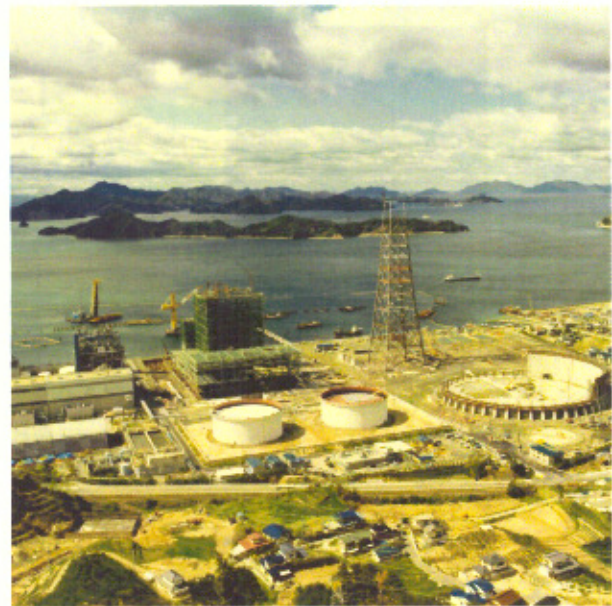
A scene before landfill
(View of Tanabayashiyama-jima island
from Nagahama)



Construction view of No.1 Unit
(using domestic coal)
··· Commencement of commercial
operation in July 1967

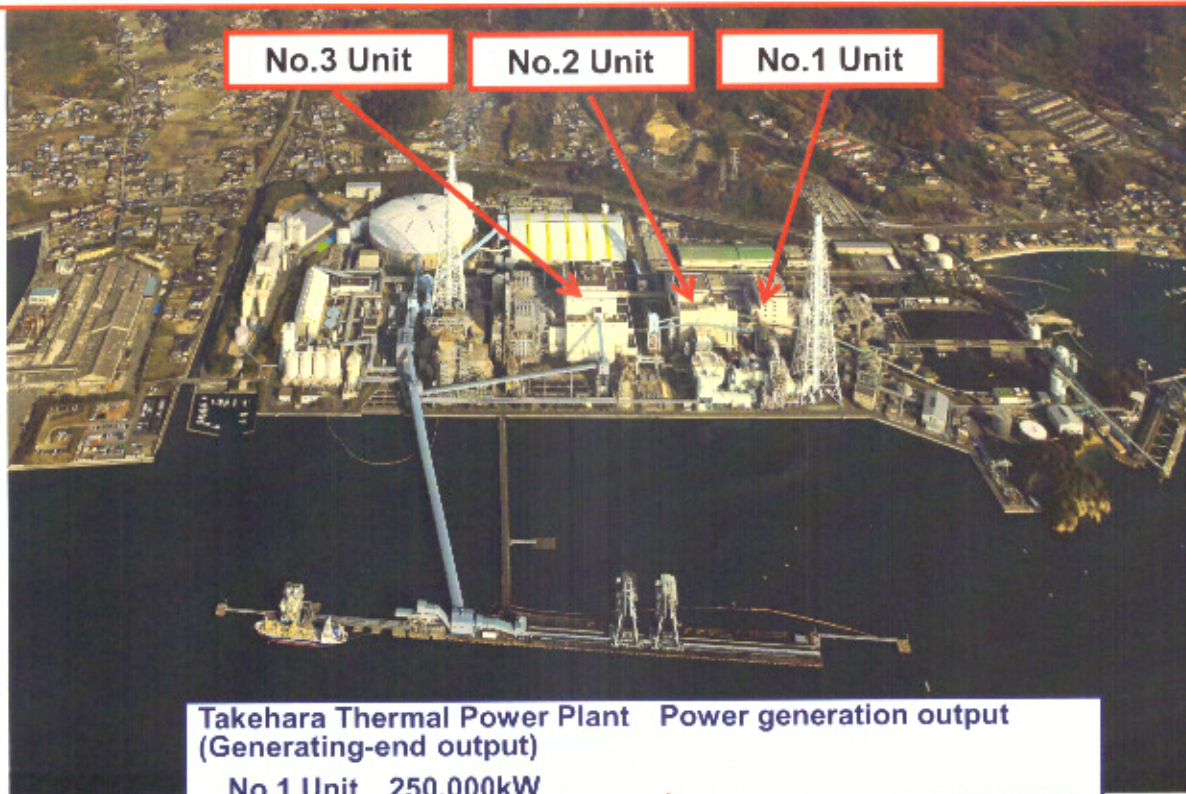


No.2 Unit (using heavy oil)
 ... Commencement of commercial operation
 in June 1974



Construction view of No.3 Unit
 (using overseas coal)
 ... Commencement of commercial
 operation in March 1983

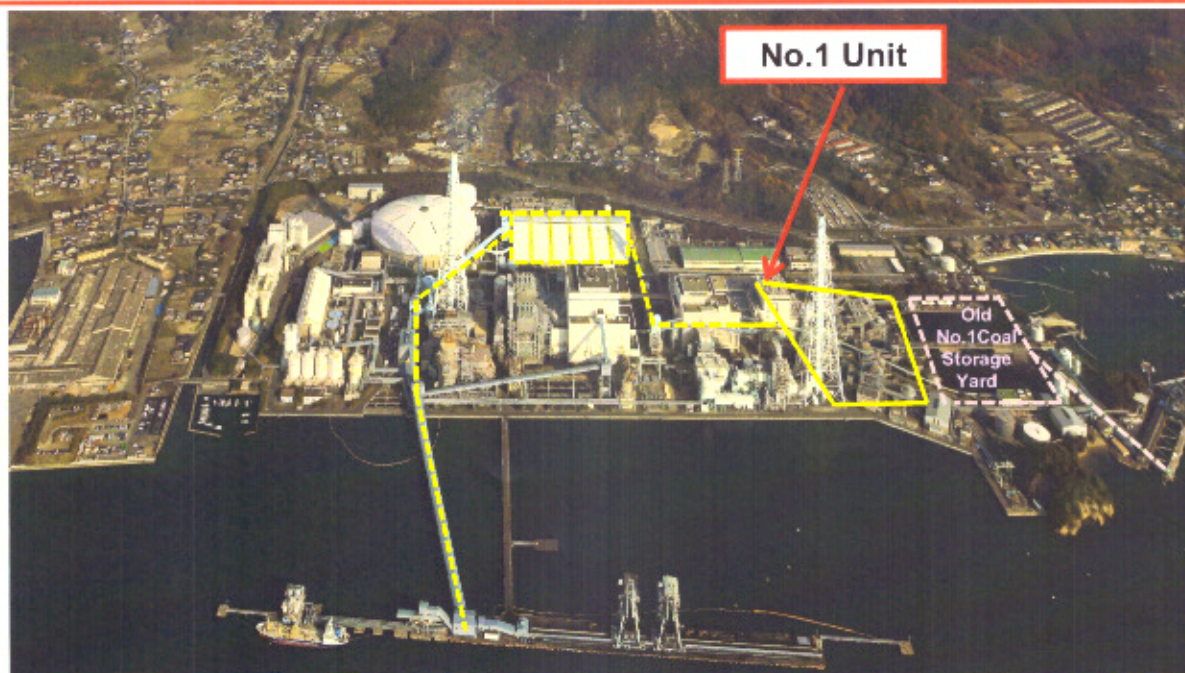
Takehara Thermal Power Plant(1) (Equipment Overview (1))



Takehara Thermal Power Plant		Power generation output (Generating-end output)
No.1 Unit	250,000kW	Total 1,300,000kW
No.2 Unit	350,000kW	
No.3 Unit	700,000kW	

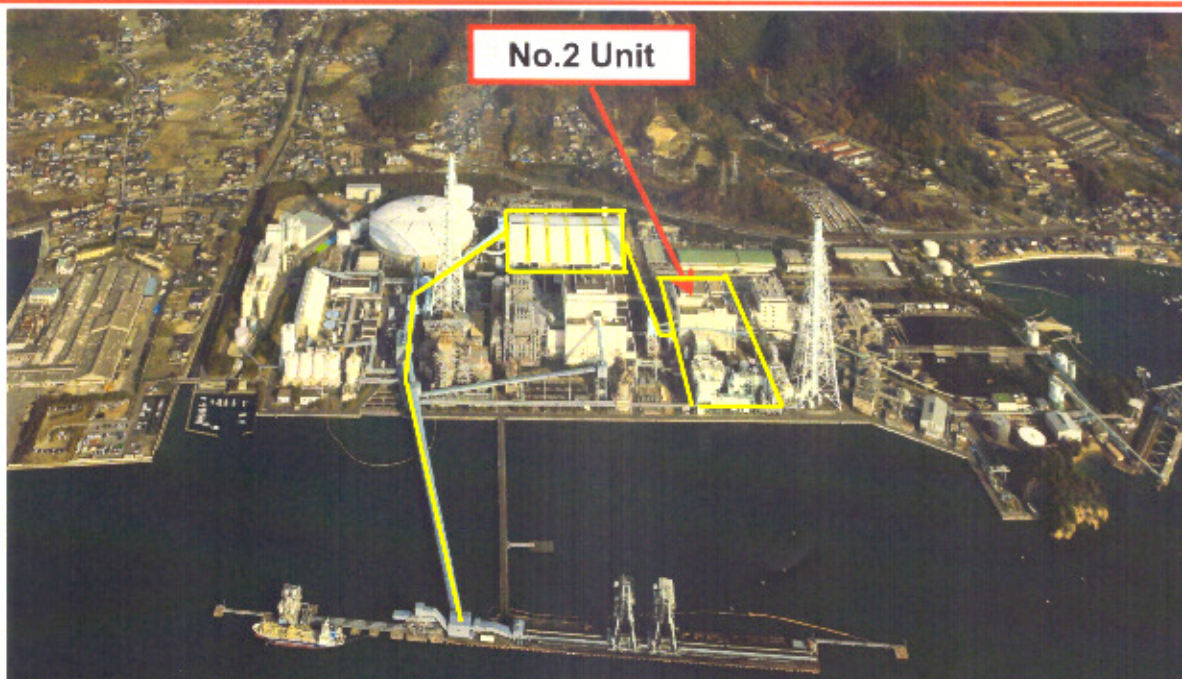
		No.1 Unit	No.2 Unit	No.3 Unit
Rated output		250,000kW	350,000kW	700,000kW
C.O.D		July 25, 1967	June 7, 1974 (Heavy oil) June 30, 1995 (FBC)	March 18, 1983
Main fuel		Overseas coal	Overseas coal	Overseas coal
Boiler type		Natural circulation boiler 810t/h·17.26MPa	Atmospheric fluidized-bed boiler 1,115t/h·17.26MPa	Once-through boiler 2,300t/h·25.00MPa
Turbine type		Tandem compound reheat and regenerative condensing type 16.57MPa·566/538°C 3,600rpm	Tandem compound reheat and regenerative condensing type 16.57MPa·566/538°C 3,600rpm	Cross compound reheat and regenerative condensing type 24.12MPa· 538 /538°C 3,600rpm / 1,800rpm
Environmental measures equipment	Dust collector	Dry high temperature electrostatic precipitator	Dry low temperature electrostatic precipitator	Dry high temperature electrostatic precipitator
	Fuel gas denitrification equipment	Dry ammonium selective catalytic reduction method	Dry activated carbon	Dry ammonium selective catalytic reduction method
	Flue gas desulfurization equipment	Wet limestone-gypsum method	Boiler furnace desulfurization	Wet limestone-gypsum method

Takehara Thermal Power Plant (3) (Equipment Overview ··· No.1 Unit)



No.1 unit ··· 250,000kW

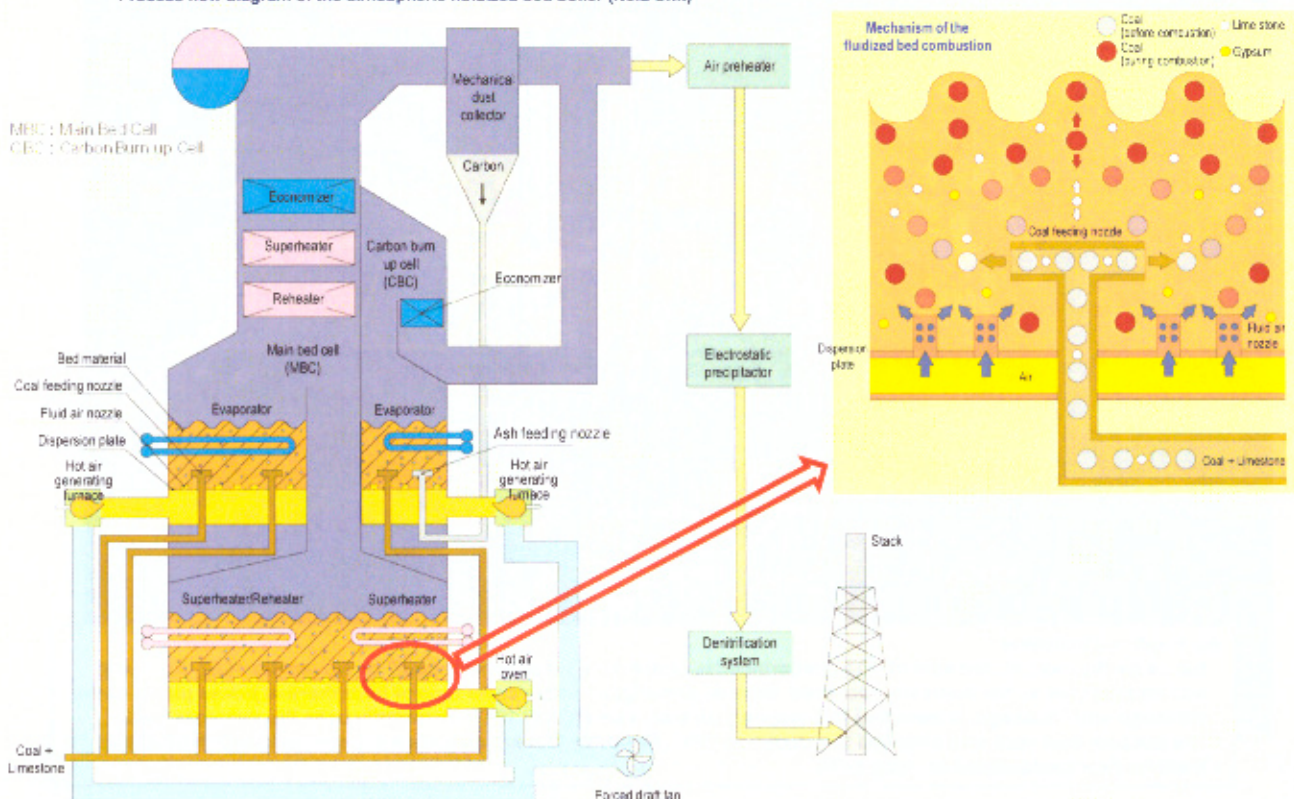
- Based on the cabinet decision of "General principles concerning measures for coal" on November 1962, No.1 unit was constructed as the domestic coal fired thermal power plant at the same time of both thermal power plants of the old Isogo and Takasago. It launched the commercial operation on July 1967. It currently uses the overseas coal.
- The outdoor coal yard was removed in autumn on 2015. Currently it commonly uses the coal yard with No.2 unit.
- It will be decommissioned on April 2018.

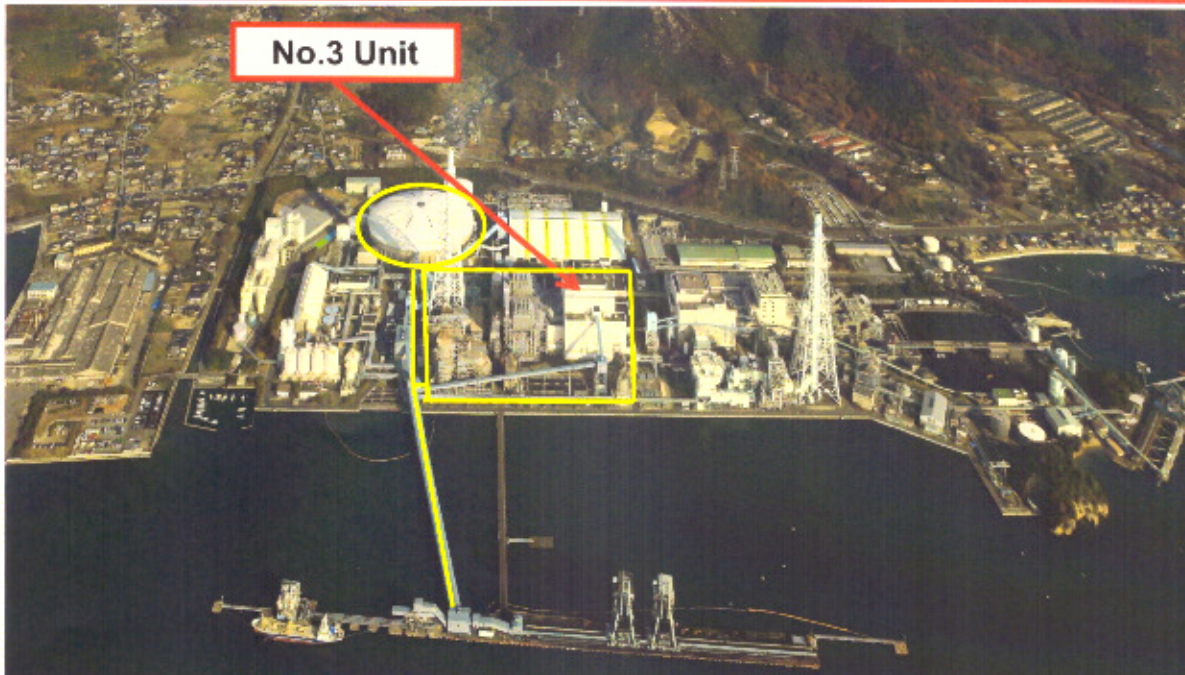


No.2 unit 350,000kW

- No.2 unit launched the commercial operation on June 1974 as the heavy oil-fired thermal power plant. After that affected by the oil price soaring, the boiler was replaced by the coal fluidized bed combustion boiler, and the commercial operation was resumed on June 30, 1995.
- Indoor coal storage equipment
- No.2 unit will be decommissioned on June 2019.

Process flow diagram of the atmospheric fluidized bed boiler (No.2 Unit)

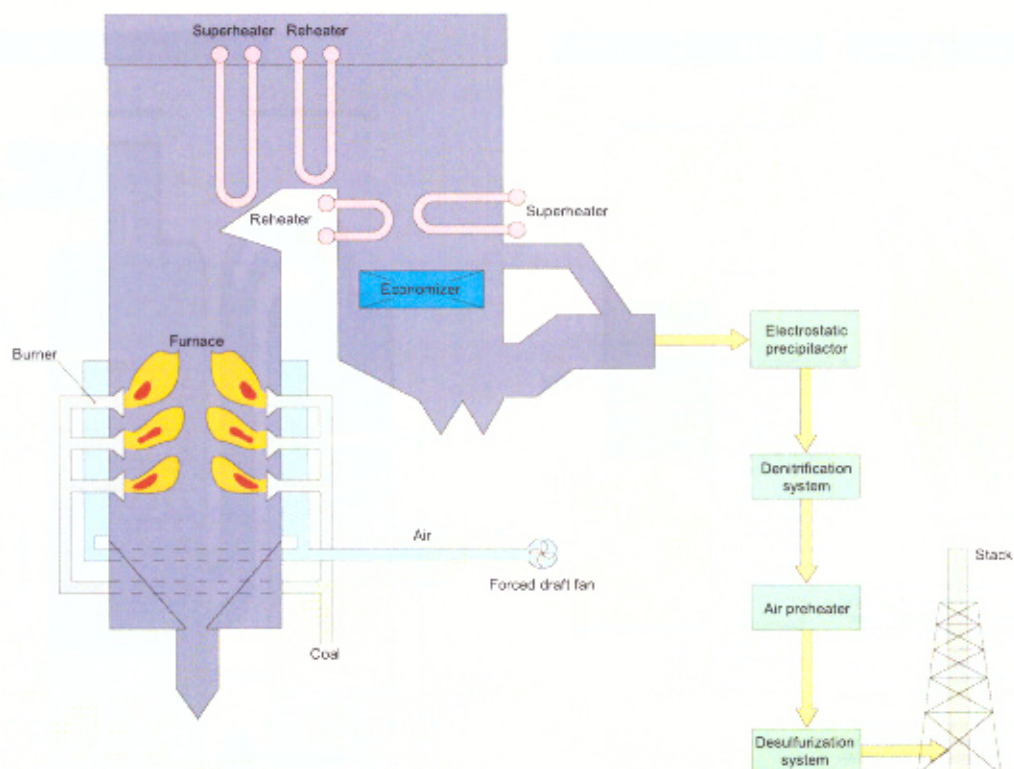


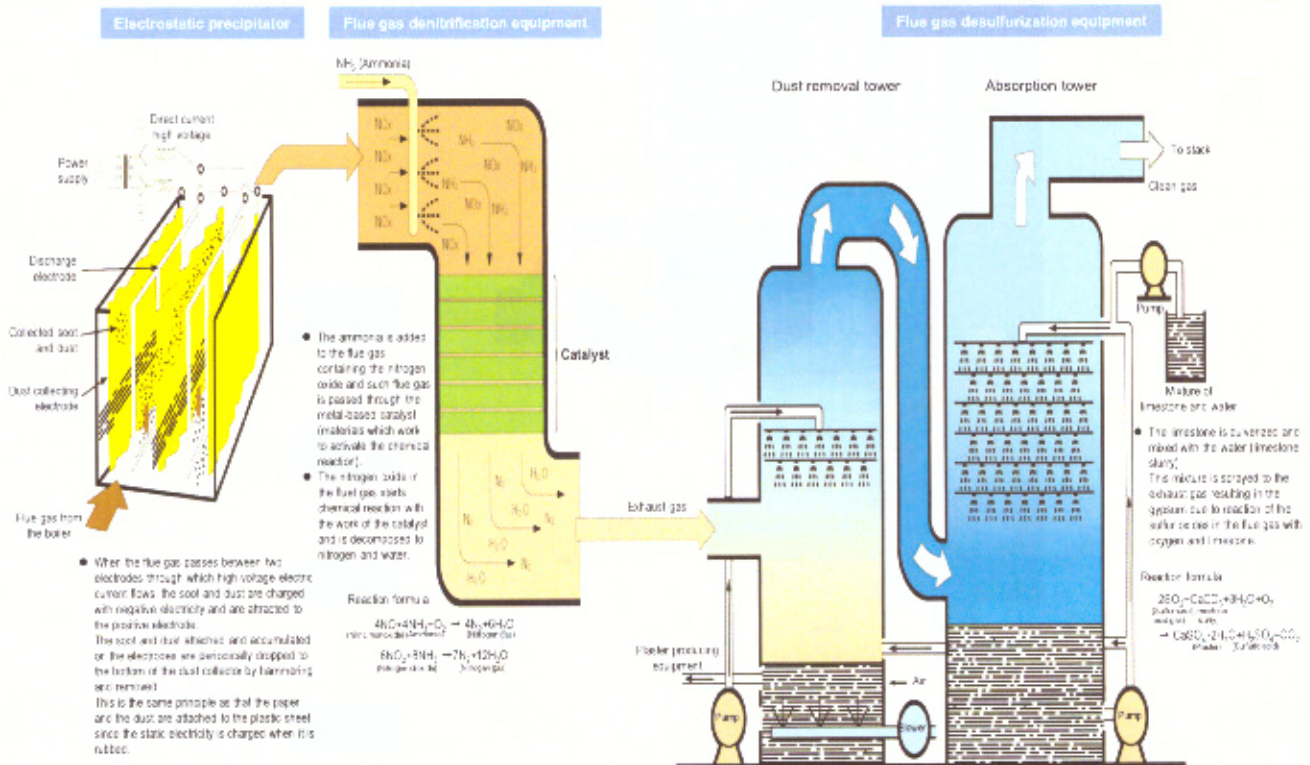
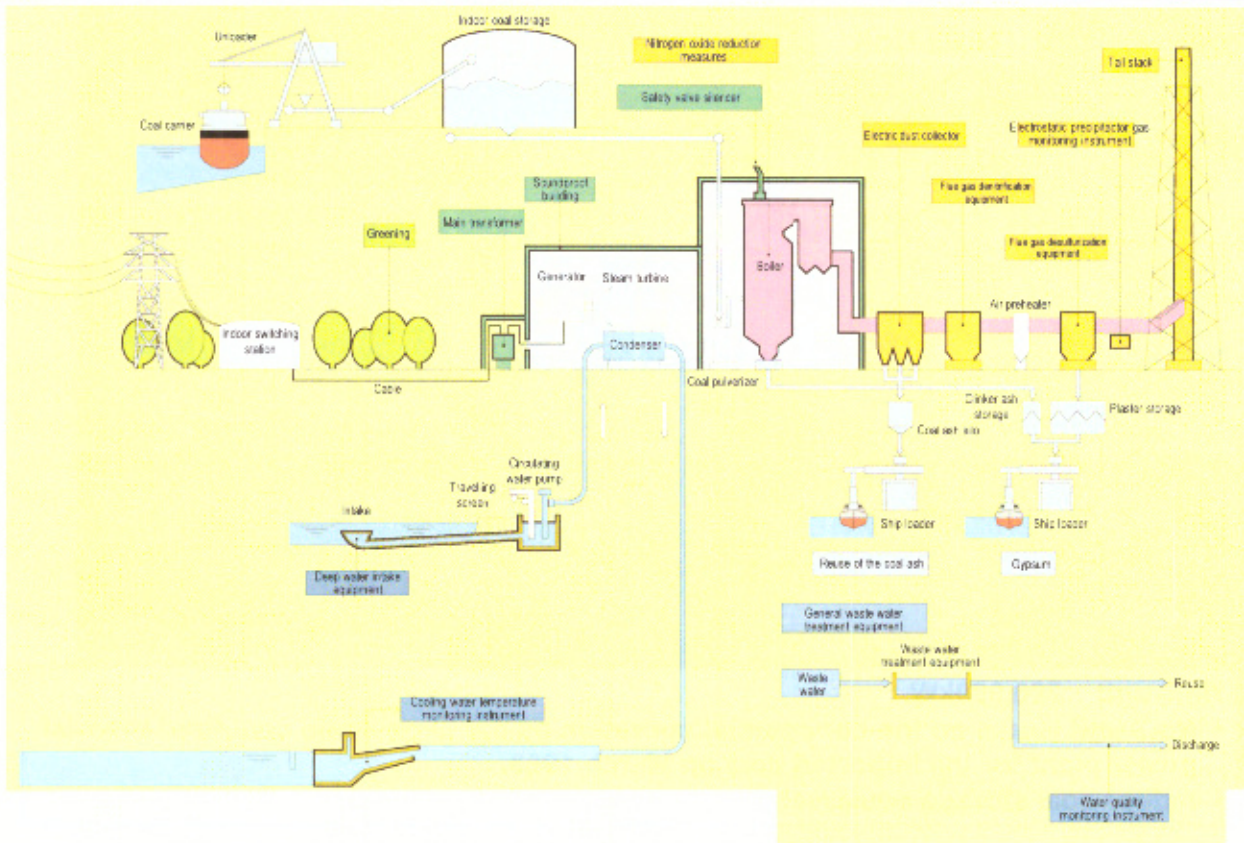


No.3 unit 700,000kW

- No.3 unit launched the commercial operation as the large-scale coal-fired thermal power plant for the imported coal on March 1983.
- Indoor coal storage equipment

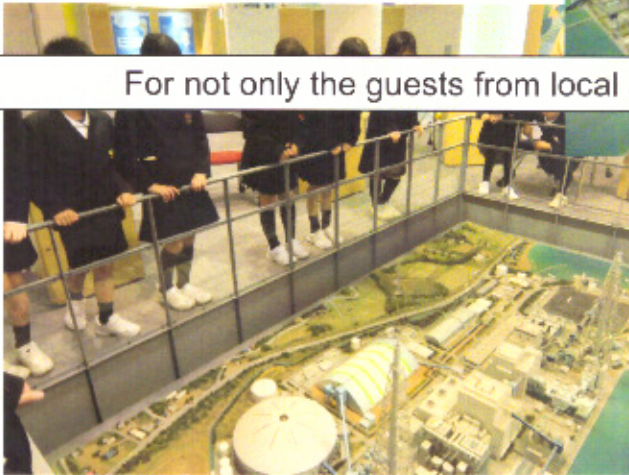
Process flow diagram of the pulverized coal boiler (No.3 unit)







For not only the guests from local area but also the overseas guests



Annual open house day



The Replacement plan by New No.1 unit for existing No.1 and No.2 units

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Takehara Thermal Power Plant New No.1 Unit Installation Plan(1) (Circumstances)

- More than forty (40) years have passed since No.1 and No.2 Unit started operation. It is highly required that we supply low-cost and high-quality electricity to meet market demand through the replacement of the old units.
- It is necessary to promote high efficiency and low carbon emission of the coal-fired thermal power plant to reduce CO₂ per unit amount of generated electricity.



- We will replace the existing No.1 and No.2 Unit with a total capacity of 600MW by a state-of-the-art coal-fired thermal power generating unit (as the new No.1 unit) with the same capacity as the old units combined.
- We completed the environmental impact assessment on January 2014.

20

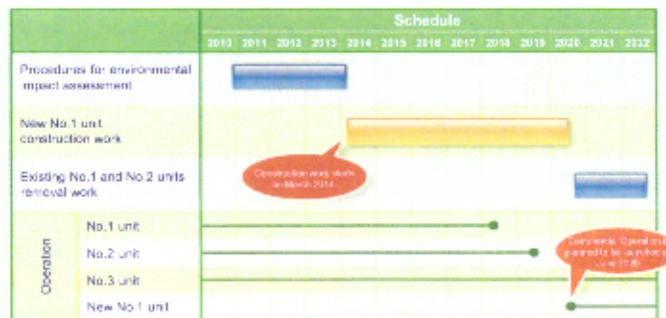
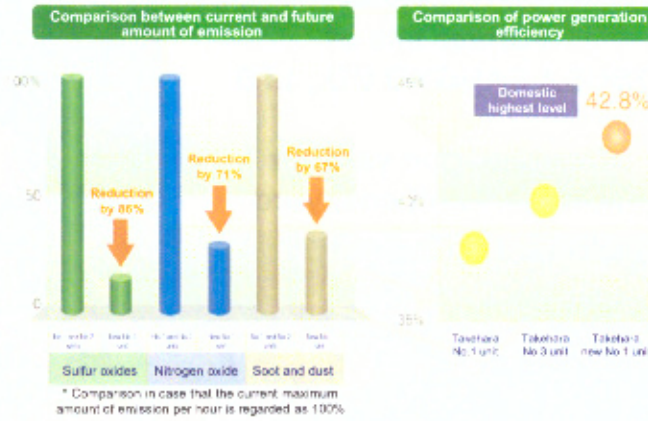
Equipment concept

(1) Replacement with the same capacity

... Taking measures against aging of the existing No.1 and No.2 equipment and reduction of environmental load are promoted.

(2) Build and scrap method

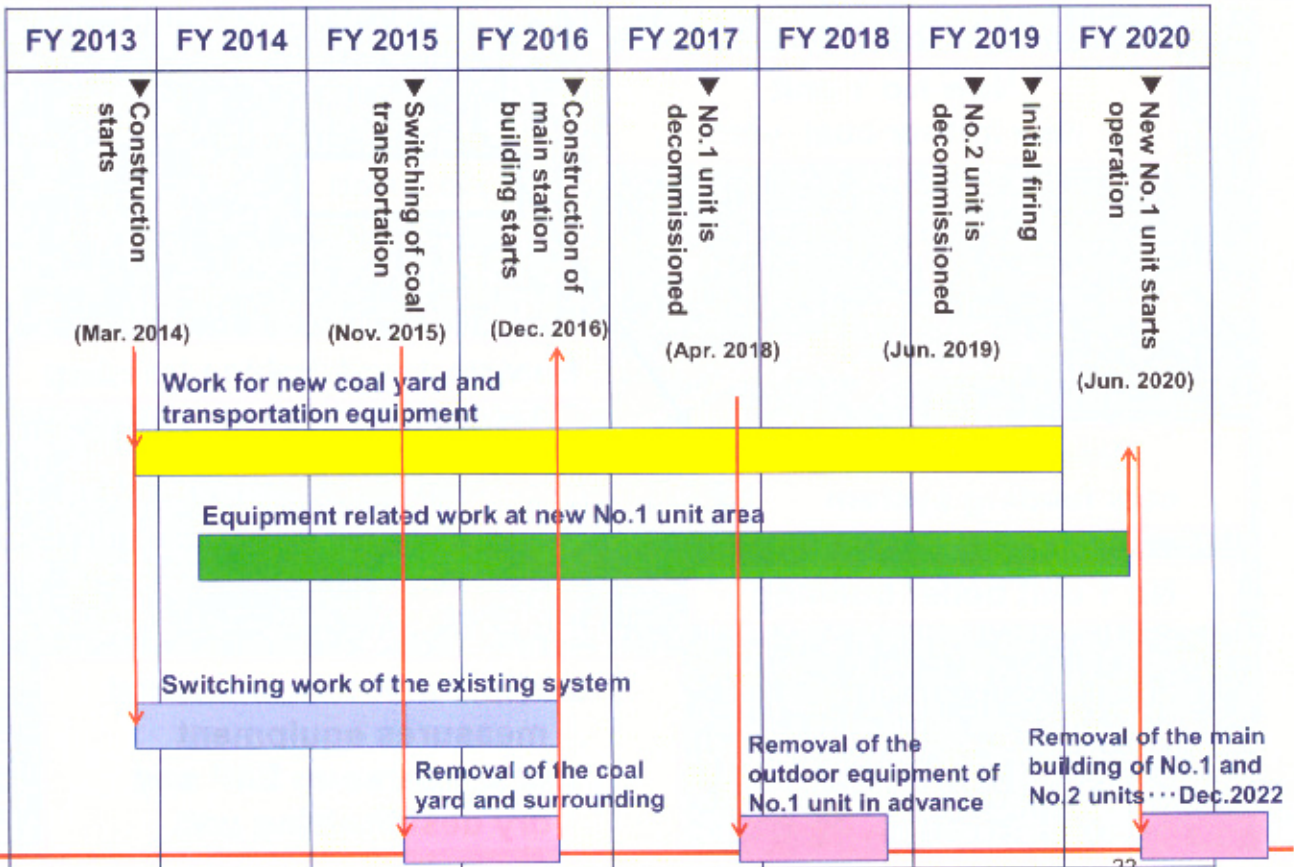
... The new No.1 unit is being constructed while the existing No.1 and No.2 units are being operated as long as possible. The existing No.1 and No.2 units will be removed after COD of new No.1 unit.

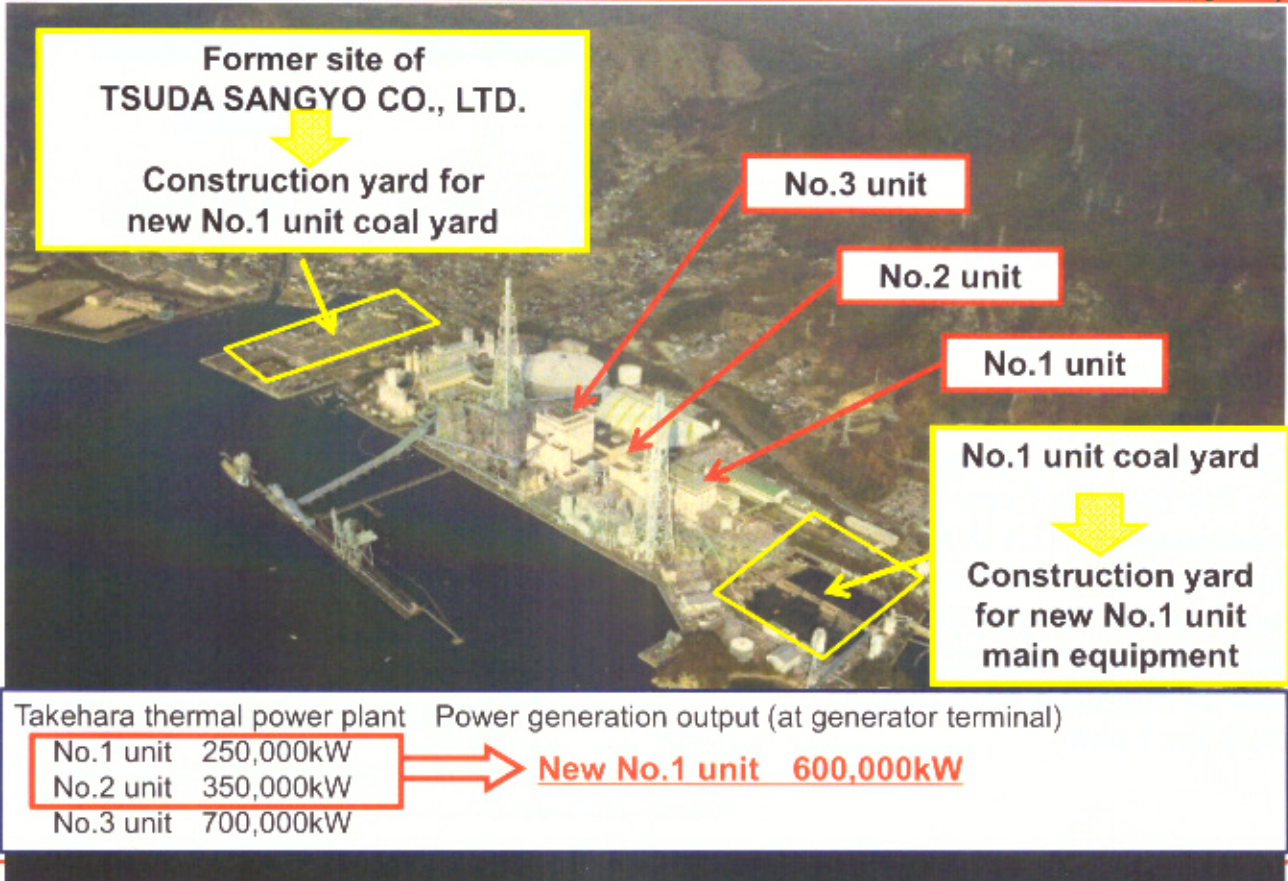


Takehara Thermal Power Plant New No.1 Unit

※FY:From April to March

Equipment Replacement Plan (3) (Major processes)



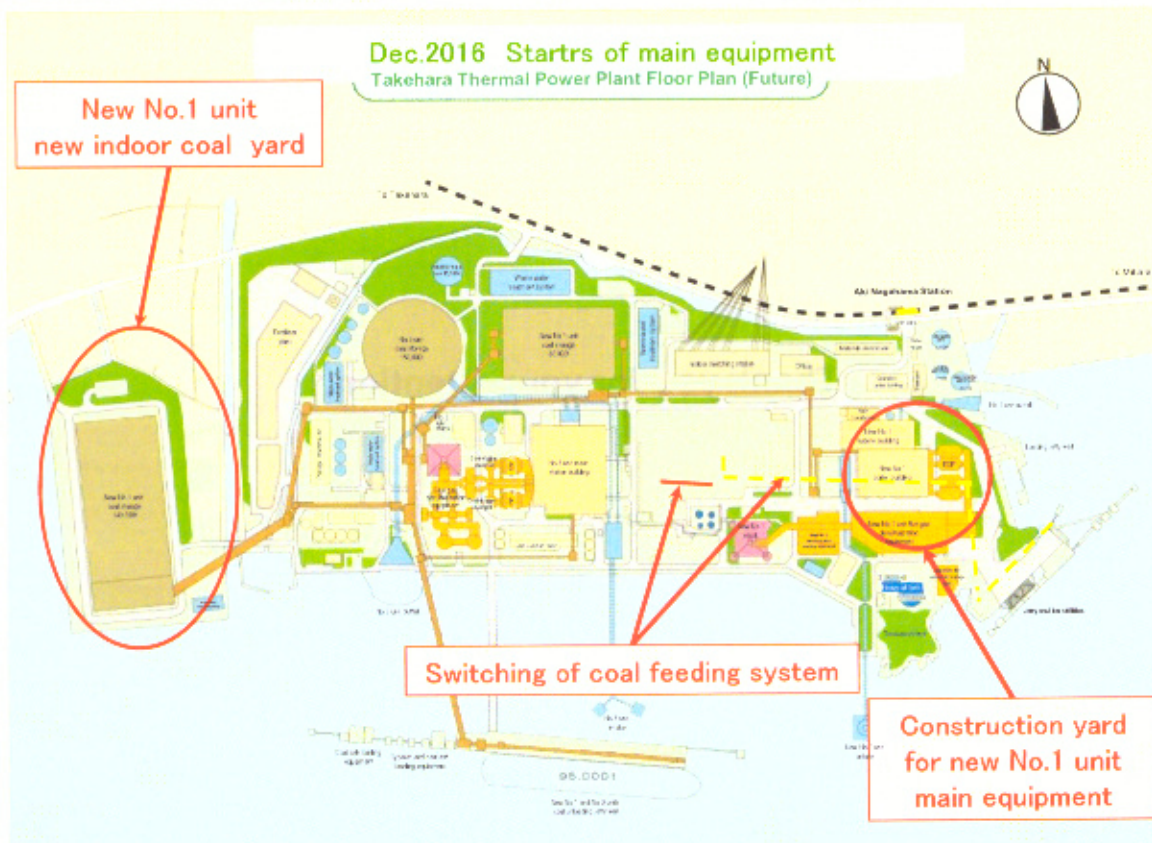


Takehara Thermal Power Plant New No.1 Unit Equipment Replacement Plan (6) (Performance Improvement due to Replacement)



	Unit	No.1 unit	No.2 unit	New No.1 unit
Rated output (at generator terminal)	10,000kW	25	35	60
Main steam pressure	MPa	16.6	16.6	25.0
Main steam temperature	°C	566	566	600
Reheat steam temperature	°C	538	538	630
Sulfur oxides (SOx)	ppm	184	98	18
Nitrogen oxide (NOx)	ppm	75	60	20
Soot and dust	mg/m ³ _N	35	10	7
Seawater usage for condenser cooling	m ³ /s	10.55	12.77	23.33
Gross thermal efficiency (Higher Heating Value)	%	39.2	36.6	42.8
CO2 emissions basic unit	kg-CO ₂ /kWh	0.848	0.892	0.766

Takehara Thermal Power Plant New No.1 Unit Equipment Replacement Plan (7) (Build and Scrap)

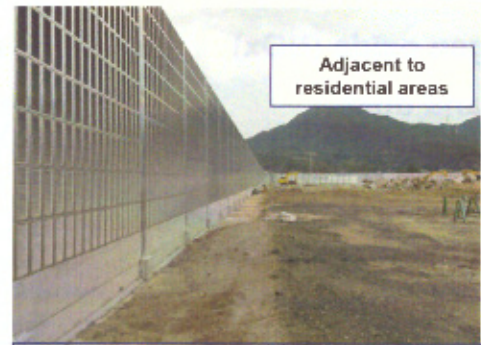


Plant is very close to the residential area.
It is necessary to take into comprehensive
consideration of the local community.

- (1) Information session is held to provide information.
 - Information session is held for local residents once a year.
 - Replacement communication paper is issued (twice a year).
- (2) Consideration for local community on construction work schedule
 - No work on Sunday in principle
 - Normal working time is from 8am to 6pm.
- (3) Other consideration items for construction work implementation
 - Environmental measures (Noise, vibration, dust, etc.)
 - Considerations for traffics on the surrounding road (Reduction of number of work vehicles and commuting cars, compliance with traffic rules, display of sticker for trucks, installation of right turn lane at the work gate, etc.)



Photo of information session for residents



Soundproof wall surrounding the new coal yard

Adjacent to residential areas

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Thank you for your attention.