Japan's experience in incentivizing the development of high-efficiency coal-fired power plants

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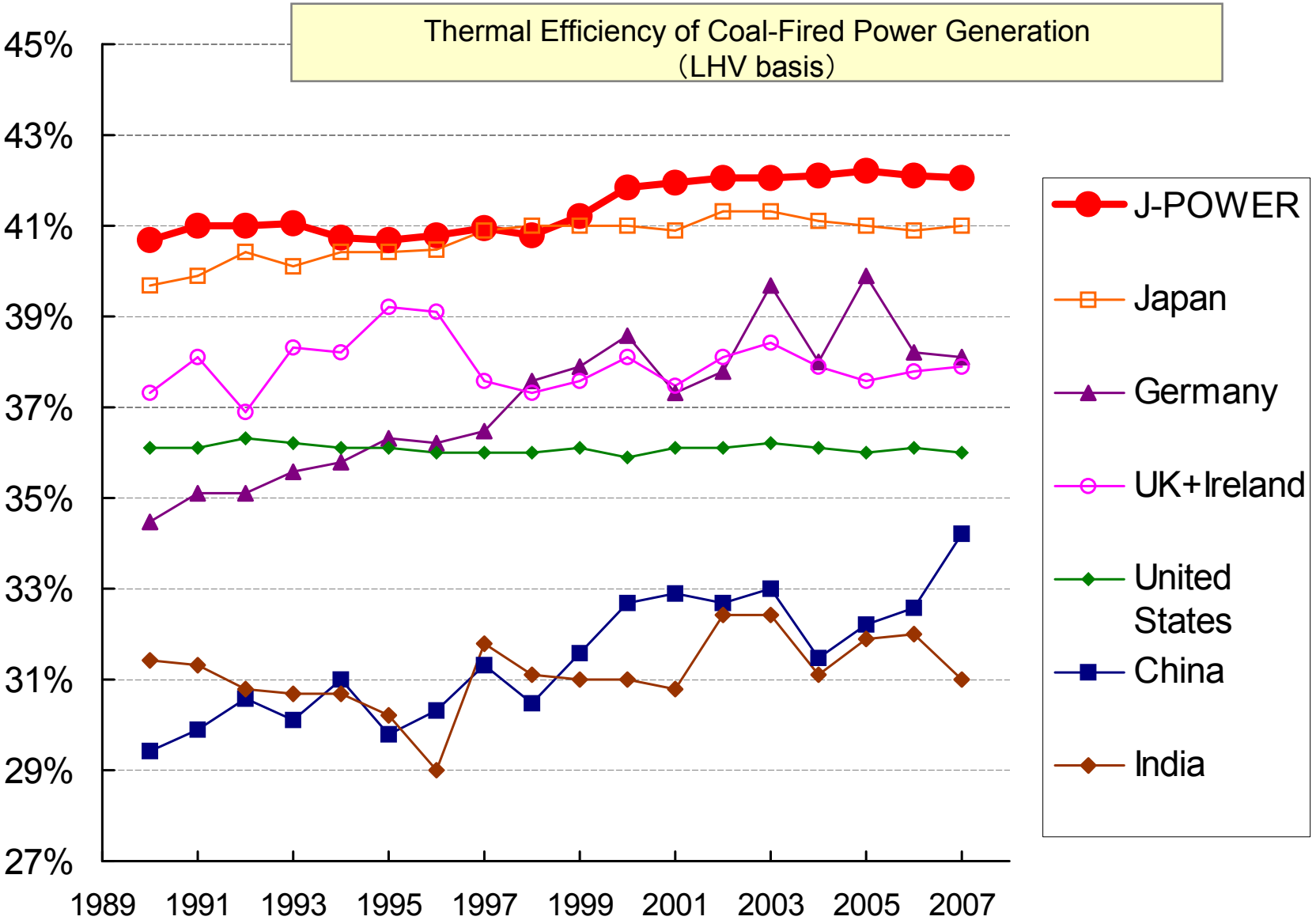
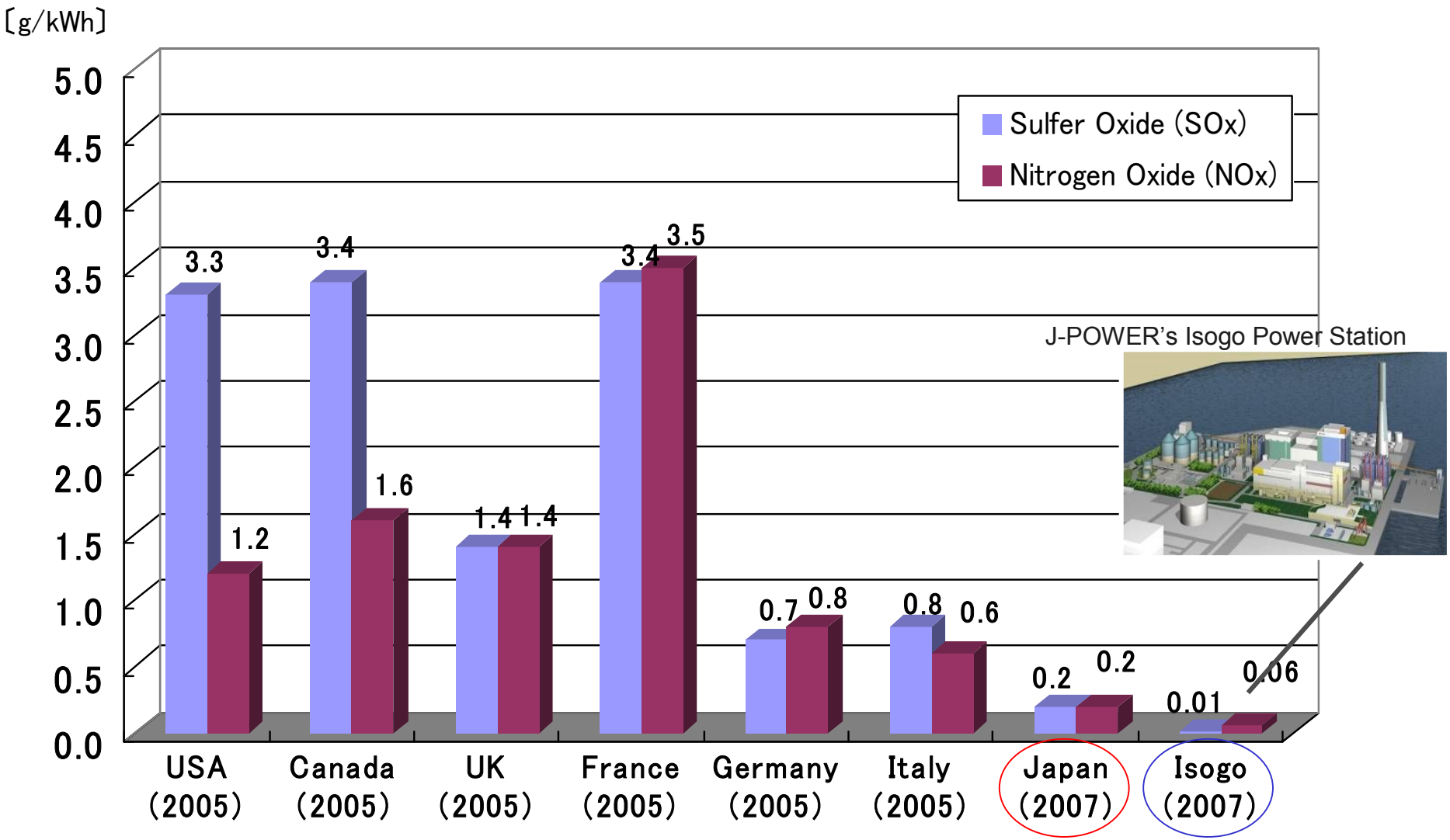
1-1 Energy Efficiency of Coal-Fired Power Plants



Source: Ecofys International Comparison of Fossil Power Efficiency and CO2 Intensity 2010

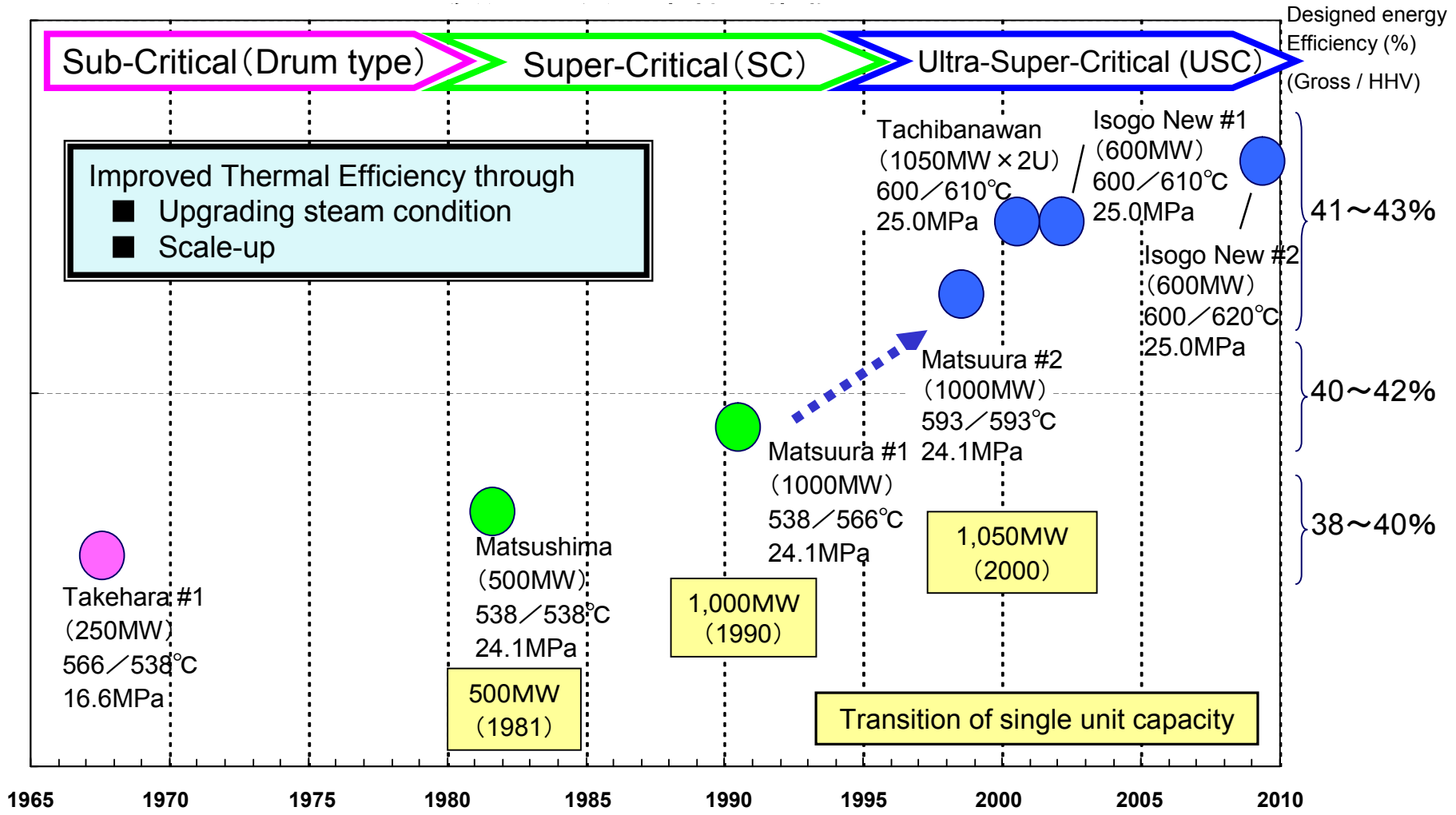
1-2 SOx and NOx emissions of Coal-Fired Power Plants



Source: Federation of Electric Power Companies, Japan (and actual data for Isogo)

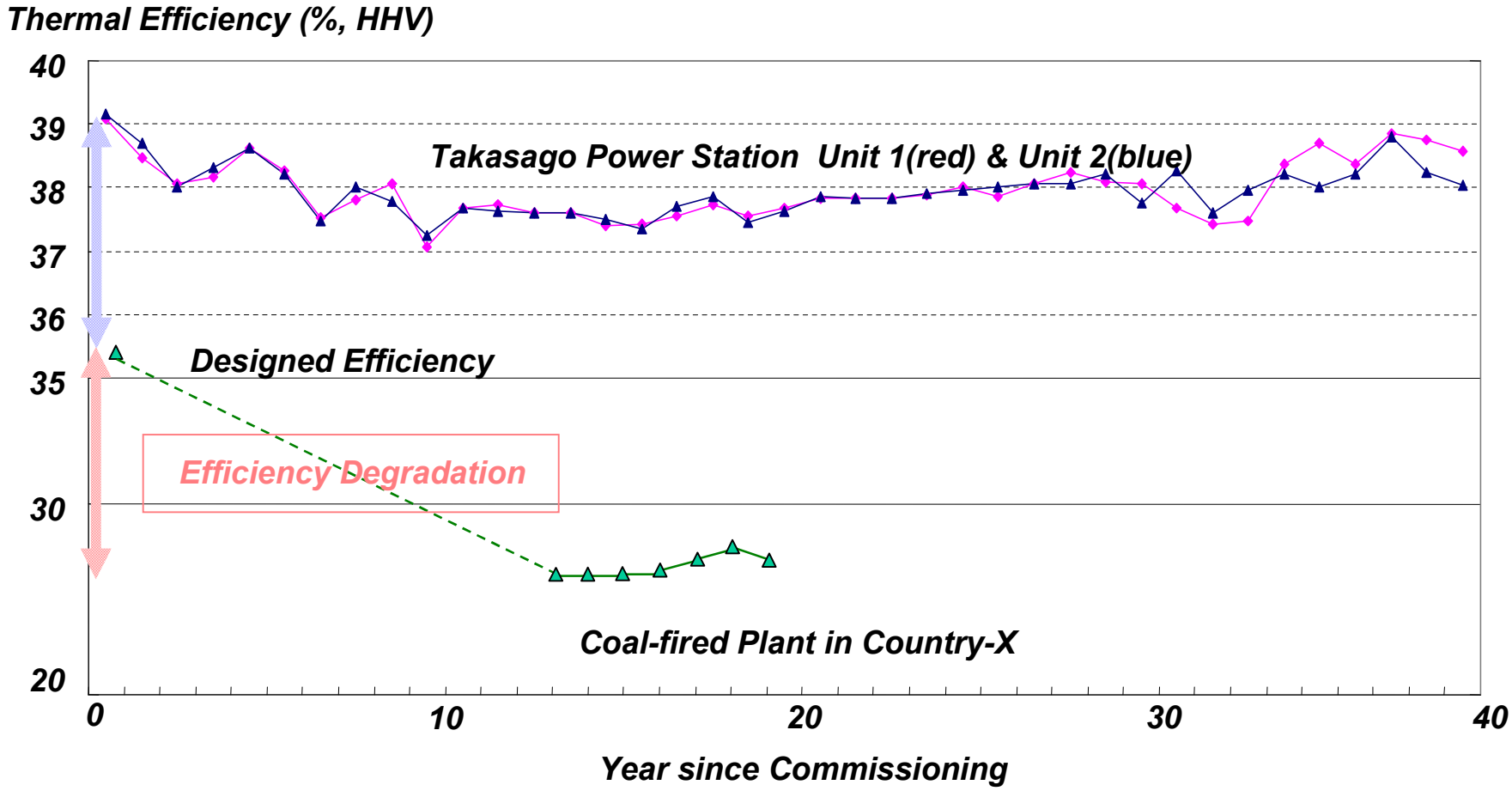
1-3 J-POWER's Thermal Efficiency Development

Development of Coal Power plant steam conditions



Vertical Line: Steam Condition ; primary/ reheat temperature & pressure

1-4 Maintaining Thermal Efficiency at its Designed Level



Source: Federation of Electric Power Companies, Japan (actual data for Takasago)

2. Power Mix before Fukushima

After Oil Crisis (1973,1979)

- Away from Oil : Development of Nuclear and Renewables
- High-efficiency power technology development

- Kyoto Protocol (1997) : CO2 emissions 6% cut from 1990 level
- Law of Alternative Energy (2009) : Non-fossil power portfolio regulation
- “Basic Energy Plan” (June 2010) :

		2009	2030
CO2 emissions（compared to1990）		▲6%（～2012）	▲30%
Power mix	Renewable	9%	21%
	Nuclear	29%	**53%**
	Coal-fired	25%	**11%**
	LNG-fired	29%	13%
	Oil-fired	7%	2%

3-1 Power Mix after Fukushima

Japan's "Innovative Energy and Environment Strategy" (Sep 2012)

- Realization of a society without nuclear power

→ Mobilize all policy resources to enable zero operation of nuclear power plants in the 2030's

		2010	2030's
Power mix	Renweable	10%	35%
	Nuclear	26%	**0%**
	Coal-fired	24%	**21%**
	LNG-fired	29%	38%
	Oil-fired	10%	6%

3-2 Opposition to the "Strategy" and Reaction of the Cabinet

- Oppositions from Keidanren and other organizations
  - Jeopardizes stable power supply
  - Inconsistency with economic growth strategy
  - Loss of contribution opportunities to peacefully use of nuclear energy worldwide

- Concerns from various countries
  - USA: Nuclear proliferation problems
  - France: Nowhere to go for the fuel reprocessed in France

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The Cabinet in disarray
- "Strategy" failed to be endorsed by the Cabinet.
- Retardation of formulating new "Basic Energy Plan"

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Uncertainty of Japan's energy policy

4-1 Coal-Fired Power to be Re-valued in Japan

Energy-Mix to be

■Well-balanced-mix
■Flexibility and Substitutability

Time for Coal to be Re-valued in Japan

Critical Path: Demonstrate Potential of Coal for Climate Change Issue

Continuous efforts for;

- Development of High-Efficiency Coal Power
- Readiness for CCS
- Contribution to worldwide CO2 emissions reduction through CCTs

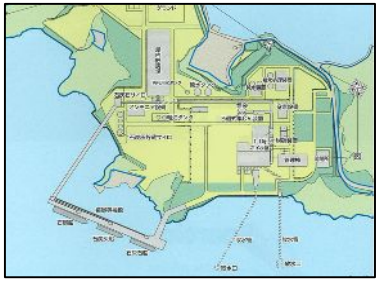
4-2 Future Technology Development for High-Efficiency

Future Technology Development

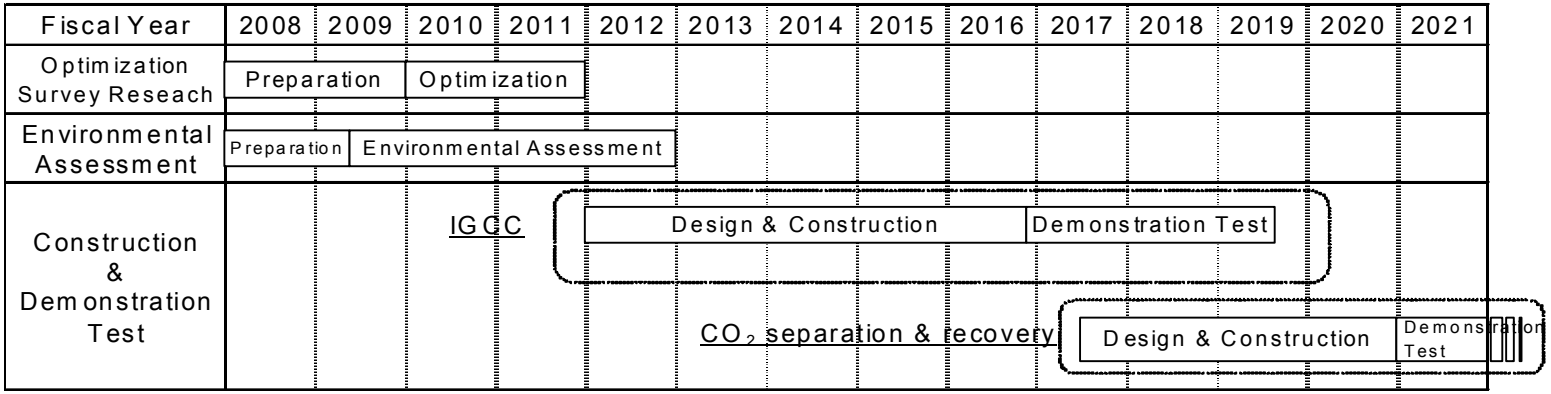
Ageing coal-fired	Latest coal-fired	Next generation coal-fired power plant		
Sub-Critical	**USC** (Ultra Super Critical)	**A-USC** (Advanced-USC)	**IGCC** (Integrated Coal Gasification Combined Cycle)	**IGFC** (Integrated Coal Gasification Fuel Cell Combined Cycle)
Efficiency: 36% (Net / HHV basis)	Efficiency: 41%	Efficiency: 46%	Efficiency: 46～48%	Efficiency: at least 55%
（Pulverized coal-fired）			（Coal gasification）	

Osaki project ~Oxygen-blown Coal Gasification~

- Demonstration project for large scale IGCC[170MWe]
- Construction starts in 2013, demonstration from 2016
- J-POWER and Chugoku-Electric joint project



Osaki (Hiroshima Pref.)



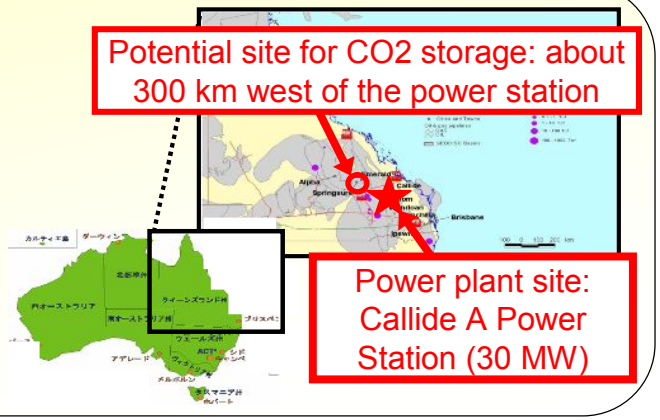
4-3 Technology Development for CCS-Ready

1. Osaki Project

- Demonstration project for large scale IGCC
- CO2 capture

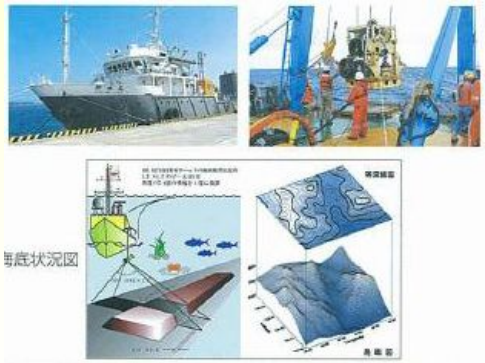
2. Australia Callide Project (Oxy-Fuel and CCS)

- Demonstration project for oxy-fuel CO2 capture and storage
- Japan and Australia joint project (J-POWER participates)

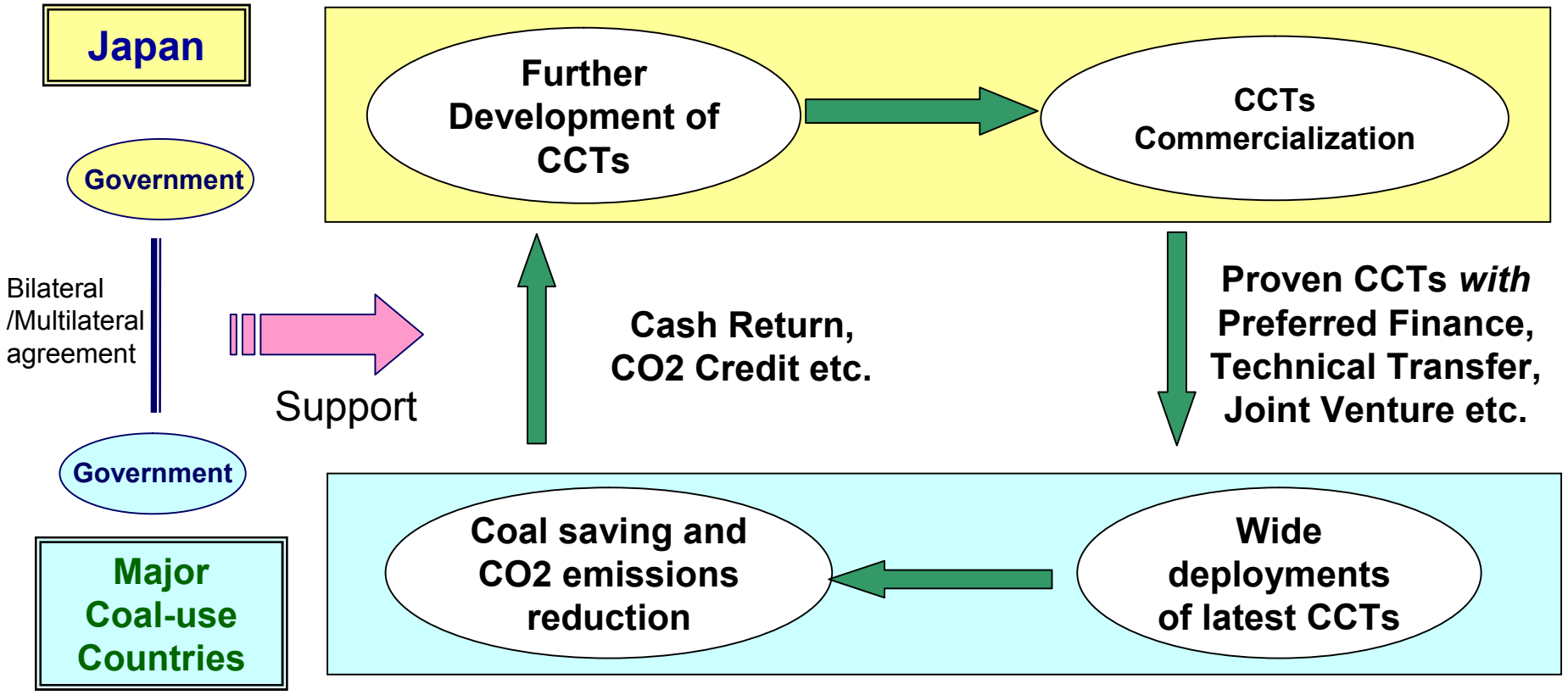


3.Japan CCS Co., Ltd.

- Established in 2008 by Japanese leading companies (J-POWER participates)
- Investigating the operability of large-scale CCS demonstration projects in Japan
- Conducting surveys and studies on 3 sites



4-4 Contribute to Worldwide CO_2 Emissions Cut through CCTs



New Coal-fired Project in Indonesia

- Large scale base-load power plant in Central Java
- 1000MW X 2units, one of the largest scale Asian IPP
- USC for the first time in Indonesia

Project Location:
250 km east of Jakarta

5 Summary

Before Fukushima : Nuclear Dependency / Coal-Phasing-out

After Fukushima : Nuclear-Phasing-out, Confusion

Energy-Mix to be

- Well-balanced-mix
- Flexibility and Substitutability

Time for Coal to be re-valued in Japan

Demonstrating the potential of coal

- Development of Higher-Efficiency Coal Power
- Development of CCS technology
- Dissemination of High-Efficiency technology to the world

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http://www.jpower.co.jp/