

# Current Status of CCS in Japan

## Toward Potential of Cost Reduction of CCS Project

---



RITE Headquarters in Kyoto

**January 13, 2010**  
**Brussels**

**Research Institute of Innovative  
Technology for the Earth  
(RITE)**

# Contents

---

- 1. Major challenges of CCS implementation in Japan**
  - (1) Storage site**
  - (2) Capture cost**
  
- 2. Capture technology (Chemical absorption)**
  
- 3. Prospects for CCS**

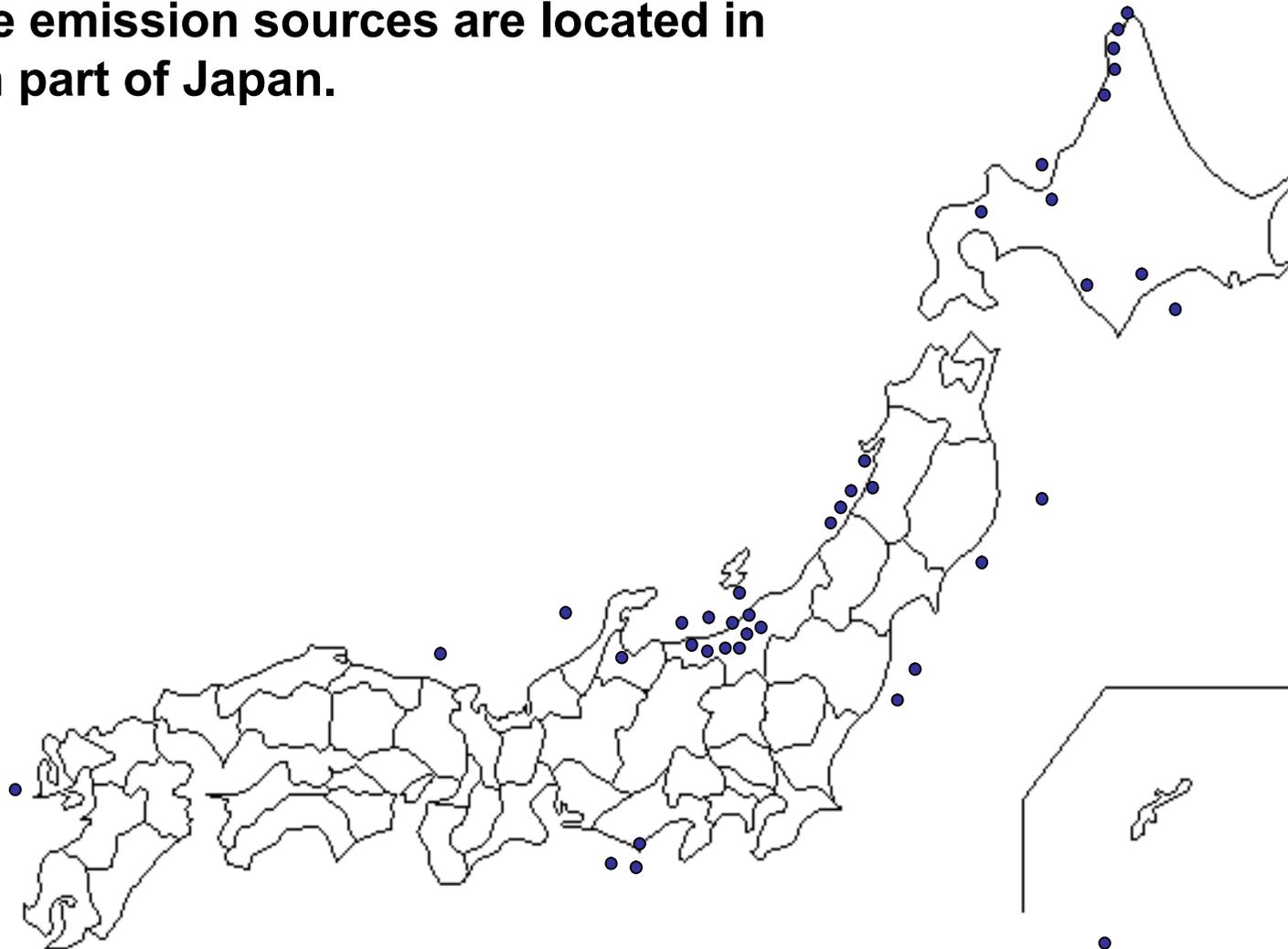
# **1. Major challenges of CCS implementation in Japan**

## **(1) Storage site**

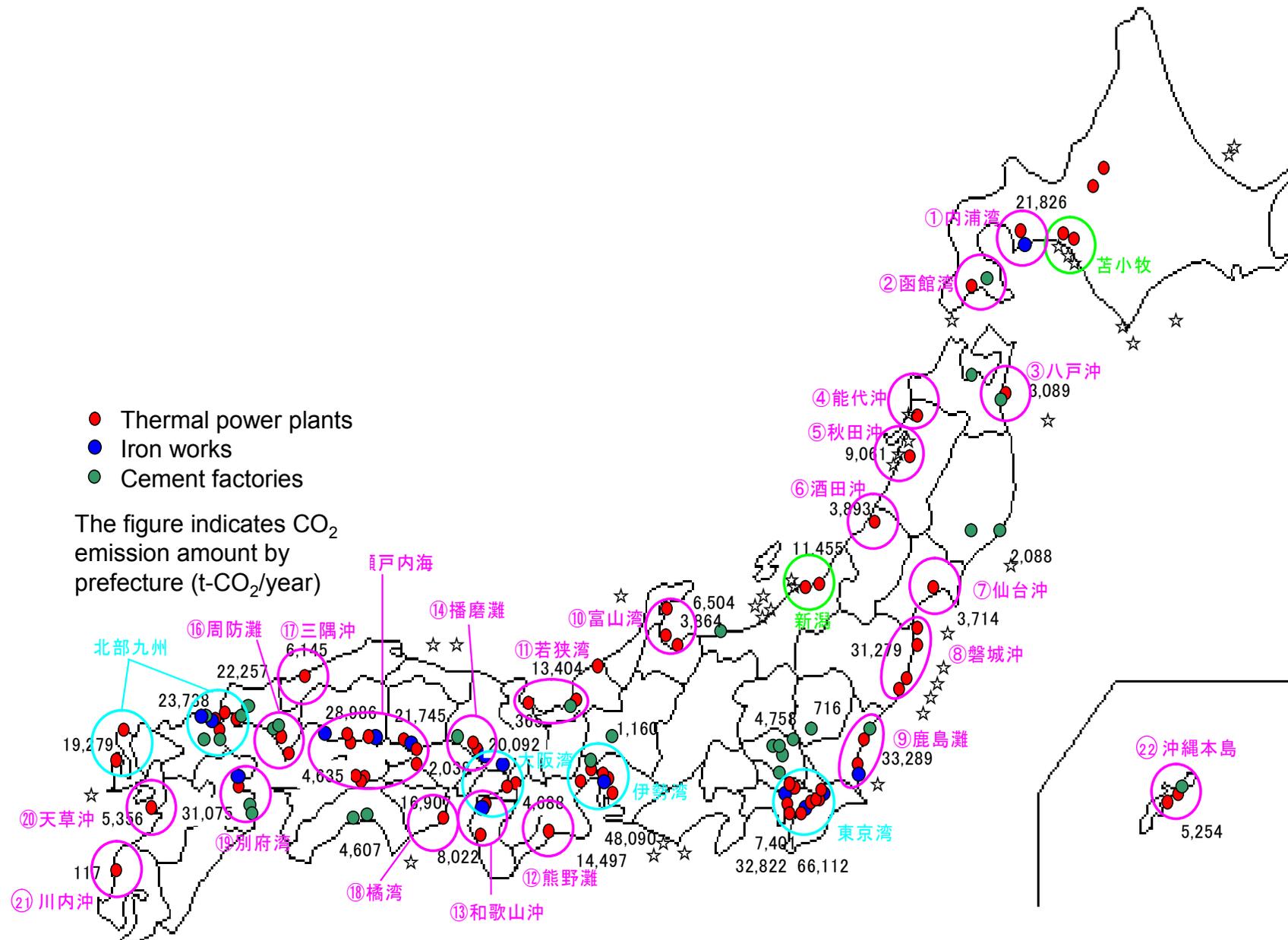
# Storage site

● Storage sites are located in limited area of north-eastern part of Japan, and most of them are not close to large emission sources.

● Large emission sources are located in western part of Japan.



# Major CO<sub>2</sub> emission sources in Japan



# Storage site – Summary

---

- **Based on the existing data, the storage potential in Japan is estimated to be about 5.2 billion tons for relatively reliable reservoir.**
- **Most of the data is for offshore and limited to a distant area from major emission sources.**
- **In order to implement CO<sub>2</sub> storage economically in Japan, it is still necessary to survey and identify the reservoirs near large emission sources.**

# **1. Major Challenges of CCS implementation in Japan**

## **(2) Capture Cost**

# Comparison with cost in IPCC Report

Capture & Compression cost ranges from 60% to 85% of CCS total cost

Case	Japan (US\$/t-CO <sub>2</sub> ※)	IPCC SRCCS (US\$/t-CO <sub>2</sub> )		
	New PC plant -Aquifer storage	New PC plant -Aquifer storage	New NGCC plant -Aquifer storage	New PC plant -EOR
Capture & Compression	38	29-51	37-74	29-51
Transportation	7 1Mt-CO <sub>2</sub> /y-20km	1-8 5-40Mt-CO <sub>2</sub> t/y-250km		
Storage	21 0.1Mt/well/yr, ERD	0.5-8		△ 10-16
Total	66 1Mt-CO <sub>2</sub> /y 20km-ERD	30-70	40-90	9-44

※Exchange rate: 110yen/US \$

## **2. Capture technology**

### **Chemical absorption**

# CO<sub>2</sub> capture technology development in Japan

Capture technology	CO <sub>2</sub> source	Development Phase
Chemical absorption	Natural gas production H <sub>2</sub> 、NH <sub>3</sub> production	Commercial
	NG power plant	Pilot
	PC power plant	Demonstration
	Ironworks	Bench
Membrane	IGCC	Laboratory

# Demonstration test of chemical absorption capture technology

**Post-combustion from PC power plant**

**At J-Power Matsushima Thermal Power Plant**

**Carried out by Mitsubishi Heavy Industry**

<b>Client</b>	<b>Power Station, Japan</b>
<b>Solvent</b>	<b>KS-1</b>
<b>Capacity</b>	<b>10 T/d</b>
<b>Feed Gas</b>	<b>Coal Fired Boiler</b>
<b>Start-up</b>	<b>2006</b>
<b>Location</b>	<b>Nagasaki, Japan</b>



# Decreasing CO2 recovery energy by new chemical absorbent

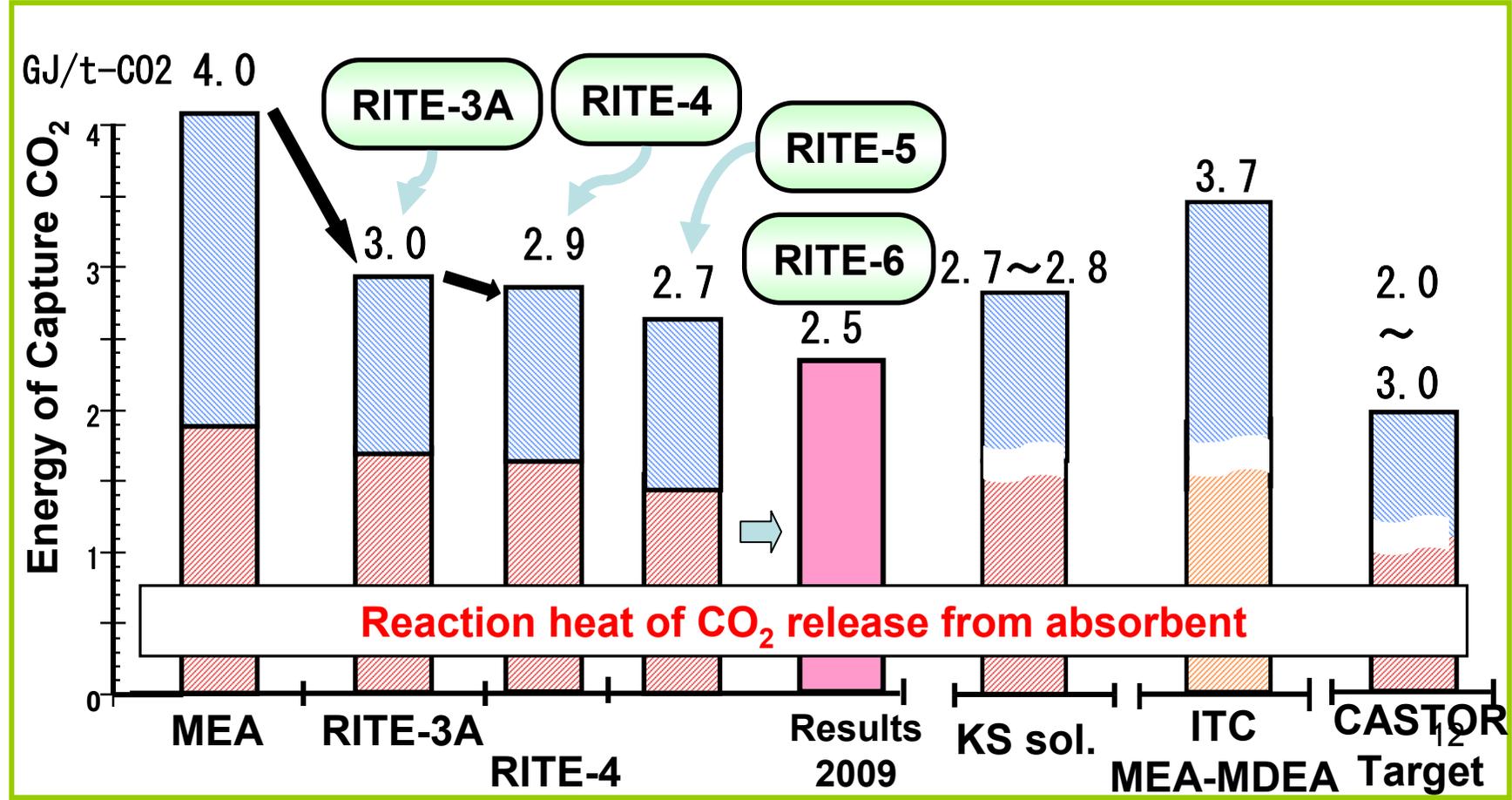
Method

Screening of reaction rate

Screening of reaction heat

Results ⇒ Target

2.5 GJ/t-CO<sub>2</sub>(in 2009) ⇒ 2.0 GJ/t-CO<sub>2</sub> (in 2012)



# Capture Technology – Summary

---

- On capture technology for post-combustion system, demonstration test of chemical absorption method for PC power plant has being carried out and bench-scale test has being carried out for ironworks.
- Major challenge of chemical absorption technology is reduction of recovery energy needed for CO<sub>2</sub> absorbent regeneration.
- Long term cost target of chemical absorption is 2,000 yen/t-CO<sub>2</sub> (20 US\$/t-CO<sub>2</sub>)

# **3. Prospects for CCS**

# Japanese government CCS initiative

---

- **CCS Working Group of METI has concluded that large scale demonstration test is necessary for implementing a large scale demonstration projects ASAP.**
- **CO<sub>2</sub> zero-emission coal fired power plant feasibility study is under way.**

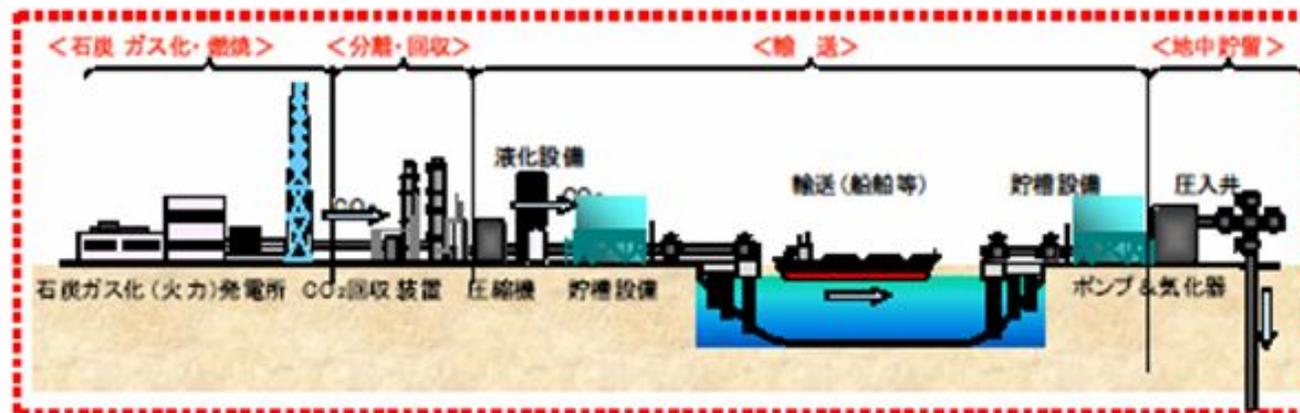
# Innovative Zero Emission IGCC Project in Japan

## Feasibility study for IGCC+CCS total system

Project period: 2008-2012FY

Study items:

1. Conceptual design of IGCC+CO<sub>2</sub> capture system
2. Conceptual design of CO<sub>2</sub> transportation system
3. Conceptual design of CO<sub>2</sub> storage system and storage potential study
4. Total system evaluation
5. Conceptual design of IGCC+CCS system on specific site
6. Basic research for advanced coal gasification technology



# Summary

- **Major challenges for implementation of CCS in Japan**
  1. **To identify safe storage site near emission source**
  2. **To reduce integrated CCS system cost, particularly, through innovative technology of capture and separation**
- **A demonstration projects for integrated coal power station with CCS has just started to operate. The project scale is 30MWth equivalent to 10MWe.**
- **Electric utility considers 500MWe-1000MWe as commercial scale.**

**To achieve this goal, it will still take much time.**
- **Large scale CCS demonstration is necessary to start ASAP for accelerating commercial deployment with a considerable of government subsidy.**



Thank you  
for your attention