

First International Forum on Geologic Sequestration of CO₂ in Deep, Unmineable Coalseams

“Coal-Seq I”

March 14-15, 2002, Houston Hotel Houston, Texas, USA

Japanese Current R&D Effort on Coal Seam Sequestration of CO₂

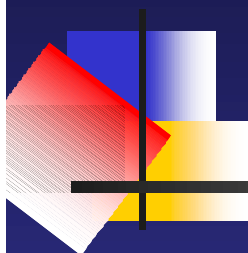
Gota Deguchi

JCOAL

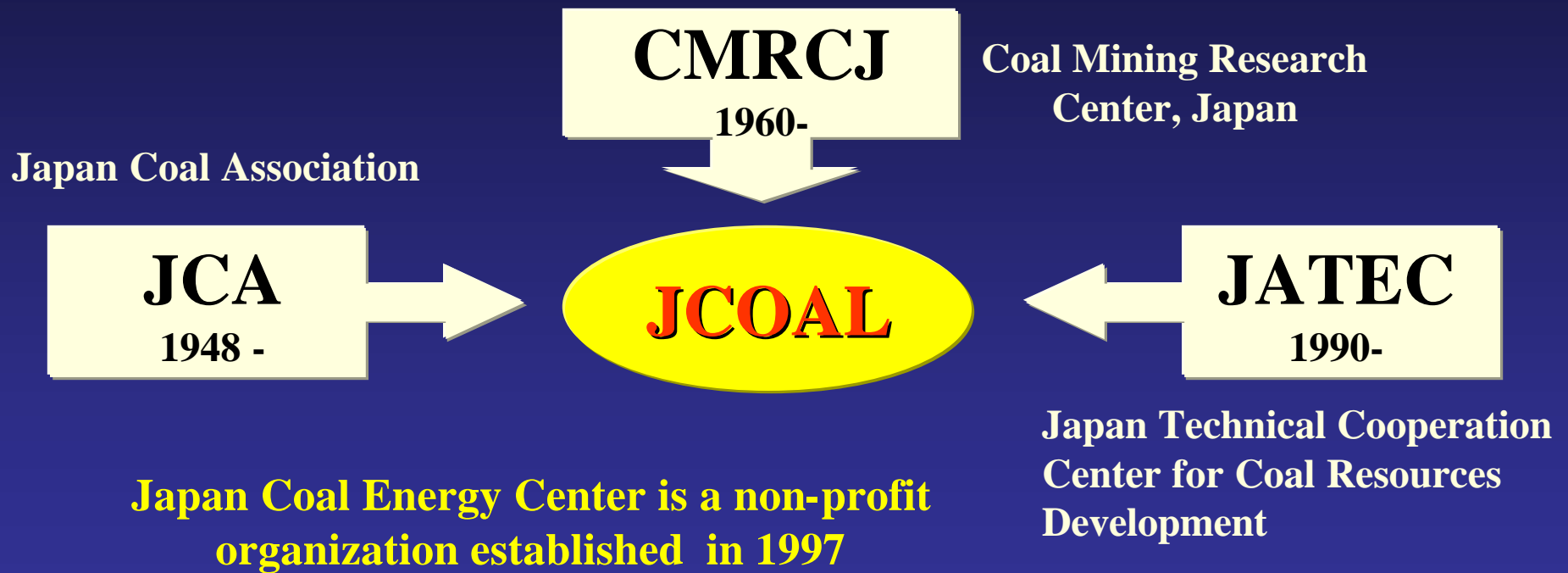
Japan Coal Energy Center

JCOSC

Japan Forum on CO₂ Sequestration in Coal Seam



Outline of JCOAL <http://www.jcoal.or.jp>





Major Activity of JCOAL

- **Technology Development and Transfer Project
- Coal Mining & Safety Technology**
- **Coal Resource Project**
- **Environment Project including Global Warming**
- **Human Resources Development and Technical
Cooperation**
- **Structural Adjustment of Domestic Coal Industry**

Budget in FY2000 : US\$ 30 million

Sponsors : Member Companies

METI, NEDO, JICA, etc.



Japanese Target on Global Warming

1. Under the Kyoto Protocol, Japan has a target to reduce GHG emission up to 6% relative to the levels pertaining in 1990, to be achieved on an annual basis from 2008 to 2012.
2. CO₂ emissions sourced by fossil fuel represent 80% of total greenhouse gases, and due to be restrained, by 2010, within the level pertaining in 1990.

**Emission sourced by
fossil fuel in Japan
(million tons C, METI)**

FY 1990	FY 1999	FY2010	
		Standard	Target
287	313 (8.9 %)	307 (6.9 %)	287 (Level)



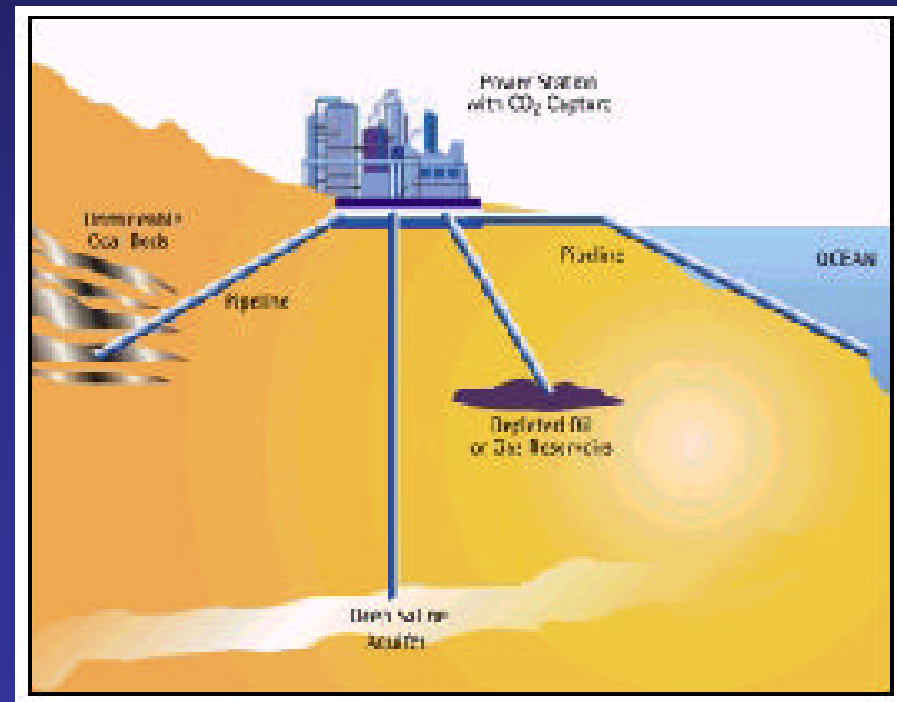
Reduction of GHG Emission

- **Achievement of Target Case ('90 level)**
 - Energy Conservation
 - Nuclear Power Generation
 - New Energy & Renewable Energy
 - Fuel Conversion of Power Generation
- **More 6% Reduction**
 - Reduction of Other CO₂ GHG
 - Forest Sink
 - CDM, JI, Emission Trading
 - Innovative Technology on Global Warming

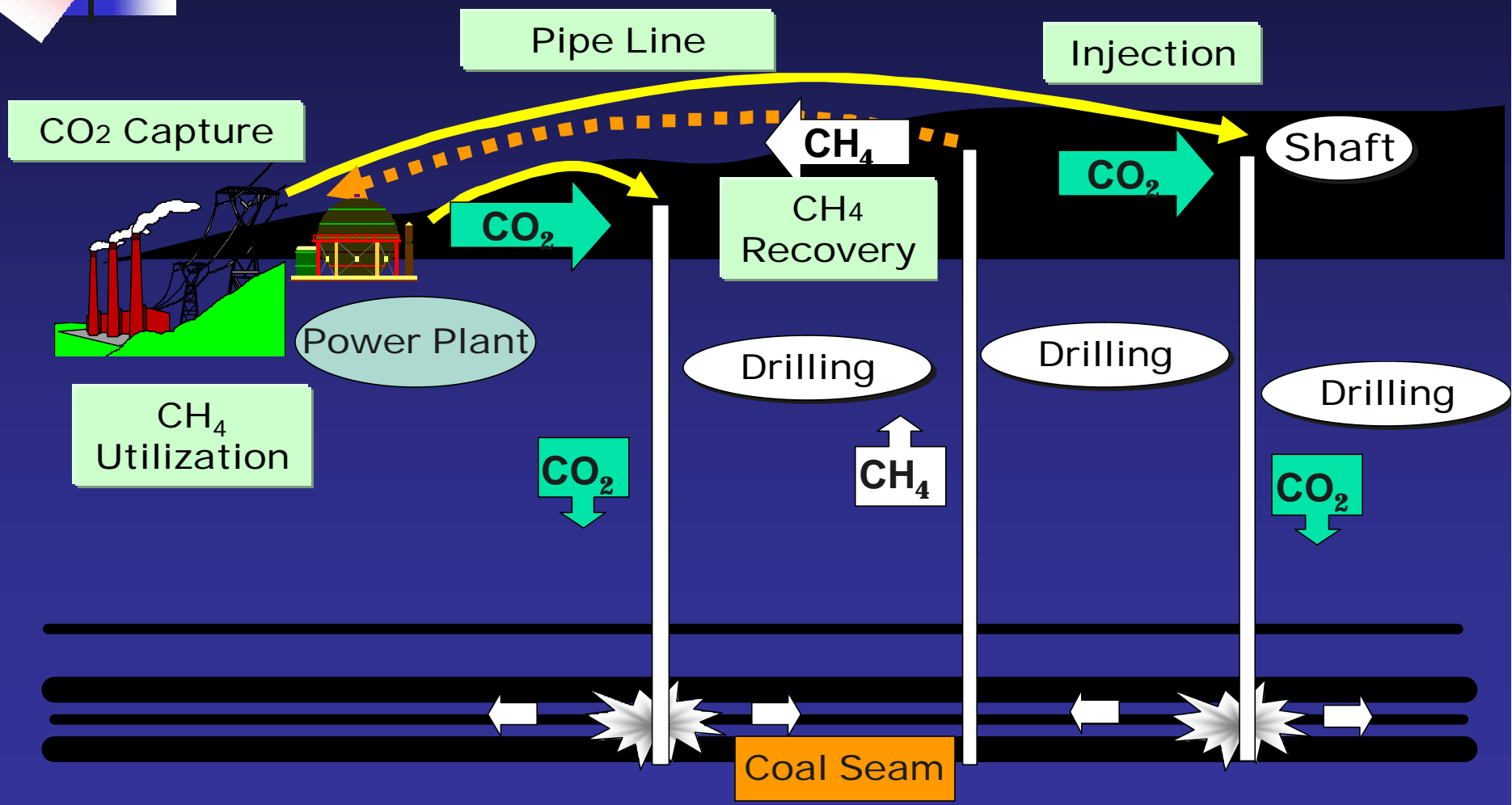
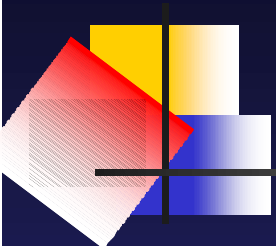
Innovative Technology on Global Warming

- **CO₂ Storage and Utilization Technology**
 - CO₂ Capture
 - CO₂ Utilization
 - **CO₂ Sequestration**

- **Deep Ocean**
- **Depleted oil and Gas Reservoirs**
- **Deep Saline Reservoirs**
- **Unmineable Coal Seam**



CO₂ Sequestration and CH₄ Recovery in Unmineable Coal Seam



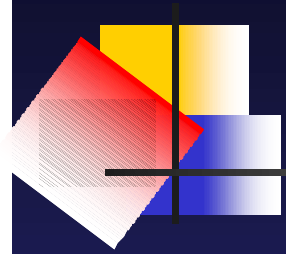


Capacity for CO₂ Sequestration in Japan

Reserve Coal Reserve	Coal Reserve Billion tons	CBM Reserve Billion m³	CO₂ Sequestration Billion m³
Residual Estimated Mineable Reserve	18.2	254	500
Estimated Total Coal Reserve	182	2,540	5,000 (10 billion tons)

(Yamazaki : Waseda
Univ.)

Possible Project Site in Japan



Inland Virgin Basin or Closed Coal Mine

Ishikari Basin

Naie	350MW
Sunagawa	250MW
Tomato-Atsuma	950MW

Kushiro Basin

Coal Mine in Operation

Miike Basin
Sakito Matsushima Basin

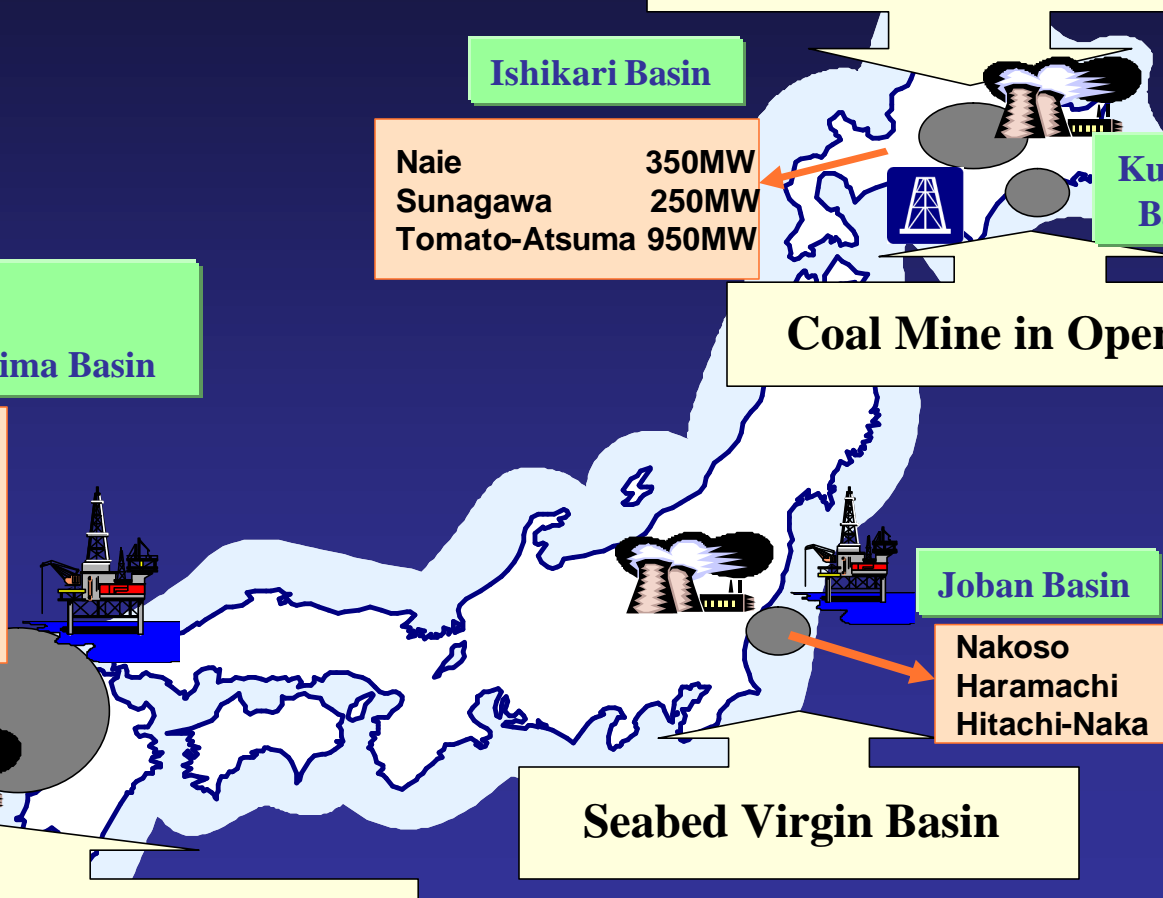
Denpatsu-Matsuura	2,000MW
Matsushima	1,000MW
Matsuura	1,400MW
Reihoku	1,400MW
Minato	156MW
Oomura	156MW

Joban Basin

Nakoso	1,450MW
Haramachi	2,000MW
Hitachi-Naka	1,000MW

Seabed Virgin Basin

Seabed Virgin Basin or Closed Coal Mine





JCOSC

Japan Forum on CO₂ Sequestration in Coal Seam

- **Target: Demonstration and Industrialization of Economical and Stable CO₂ Sequestration in Coal Seam by 2010**
- **Foundation: 31 May 2001**
- **Individual Members: 18 & Business Members : 20**
- **Chair Man: Prof. Y. Ashida, Kyoto Univ.**
- **Counselor: Mr. K. Ando, President, JCOAL**
- **Vice-Chair:**
 - Mitsubishi Materials Co.**
 - Kansai Electric Power Co., Inc.**
 - Electric Power Development Co., Ltd**
- **Secretariat: JCOAL**



JCOSC

Japan Forum on CO₂ Sequestration in Coal Seam

Working Group of JCOSC

JCOSC

Planning Group

Leader: Prof. Y. Ashida, Kyoto Univ.

*Fundamental Test
Group*

Leader: Prof. K. Sasaki, Akita Univ.

*Field Test
Group*

Leader: Prof. Y. Suzuki, AIST



JCOSC

Japan Forum on CO₂ Sequestration in Coal Seam

Planning Group

- Review of CO₂ sequestration technology in Coal Seam and Methane Recovery Technology
- Join International Project
 - ARC's ECBMR (Canada)
 - RECOPOL (Netherlands subsidized by EU)
- Estimation of CO₂ Sequestration Effect
- Environmental Assessment Including Legal Regulation
- Economical Assessment

**JCOSC****Japan Forum on CO₂ Sequestration in Coal Seam**

Fundamental Test Group

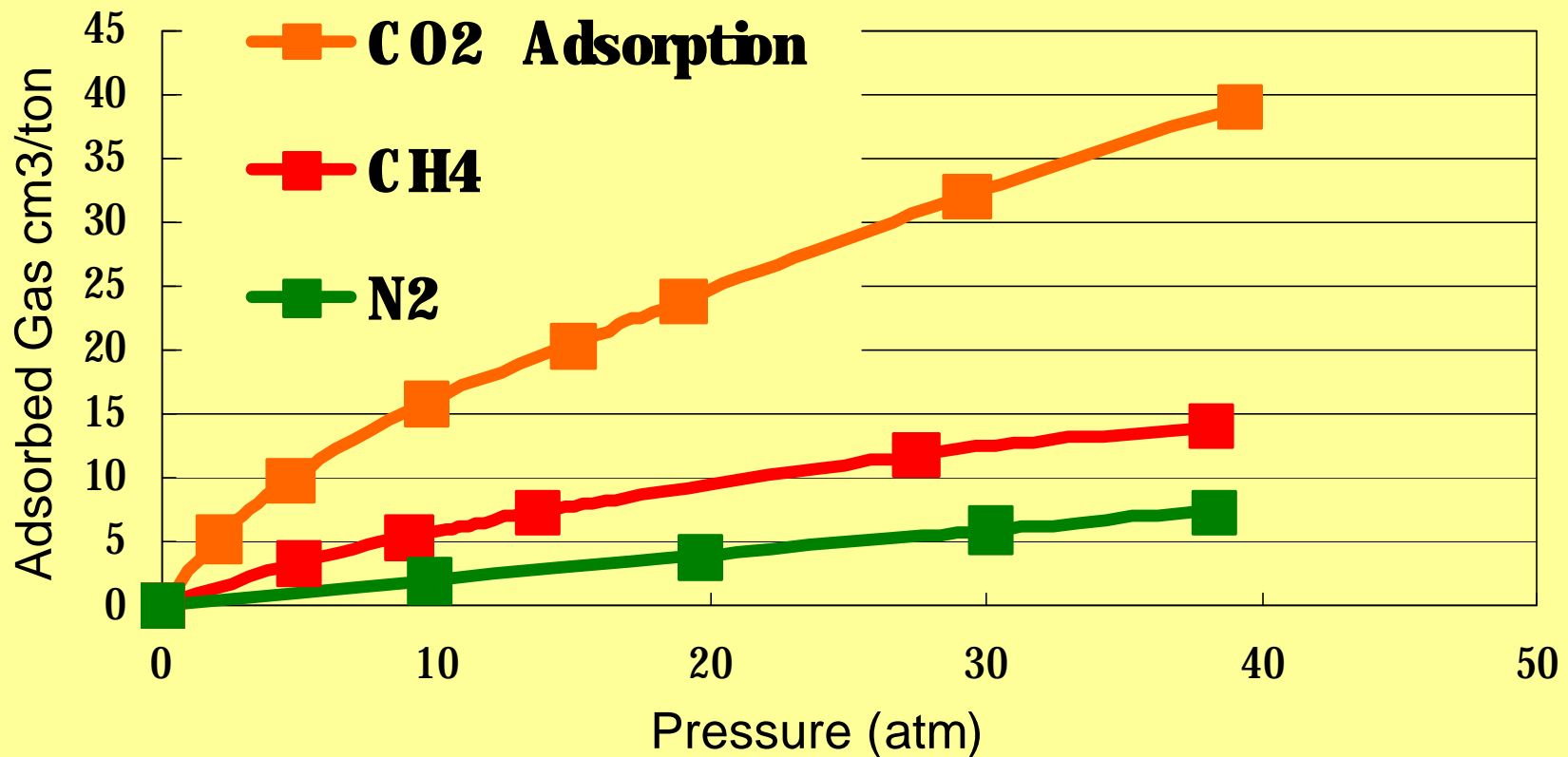
- **Laboratory Test at Universities**
 - CO₂/CH₄ Substitution Mechanism
 - CO₂ Behavior in Supercritical Condition
 - Permeability with Stress Change

- **Development of Simulation Software**

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Typical result of the laboratory test on Akabira Coal





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Field Test Group

- **Potential Assessment on CO₂ Sequestration**
- **Potential Assessment on CO₂ Emission Source**
- **Technical Assessment on Capture, Transport of CO₂**
- **Technical Assessment on CO₂ Injection, and CH₄ Recovery and Utilization**
- **Technical Assessment on Monitoring**
- **Drafting Field Test Program**



New Project for CO₂ Sequestration in Coal Seam by METI

- **Project Term : 5 years (JFY2002 – JFY 2006)**
- **Total Budget : 27 million US\$ (estimated)**
- **Budget in JFY2002 : US\$ 1.9 million**
- **Purpose : Development of cost-effective CO₂ sequestration technology in coal seam**
- **Contents:**
 - **Fundamental research program**
 - **Micro pilot test**
 - **Cost reduction of CO₂ capture from flue gas**



Summary

- **CO₂ sequestration in coal seam has been taken up as innovative technology on global warming by METI.**
- **Japan has considerable amount of unmineable coal reserve to sequestrate CO₂ as well as to utilize CSM.**
- **JCOSC have a target to demonstrate and industrialize the sequestration technology by 2010.**
- **To achieve the target, JCOSC will promote R & D program including industry-university collaboration and international project.**
- **METI will start new 5 years project for CO₂ sequestration in coal seam from JFY2002.**