NEDO's Clean Coal Technology Development for reduction of CO_2 emissions

May 10, 2017

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2.OCG Demonstration Project
(IGCC + CO_2 Capture + Fuel Cell)

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(Innovative Iron and steelmaking process**)**

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Clean Coal Technology Development

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About NEDO

NEDO: **N**ew **E**nergy & Industrial Technology **D**evelopment **O**rganization

About NEDO

NEDO: **N**ew **E**nergy & Industrial Technology **D**evelopment **O**rganization

✓**Mission:** **Addressing energy and global environmental problems**
Enhancement of Japan's industrial technologies

✓**Organization:** Established in 1980

✓**Location:** Kawasaki City, Japan

✓**Personnel:** About 900

✓**Budget**: Approximately 1.2 Billion US$
(2016 fiscal year)

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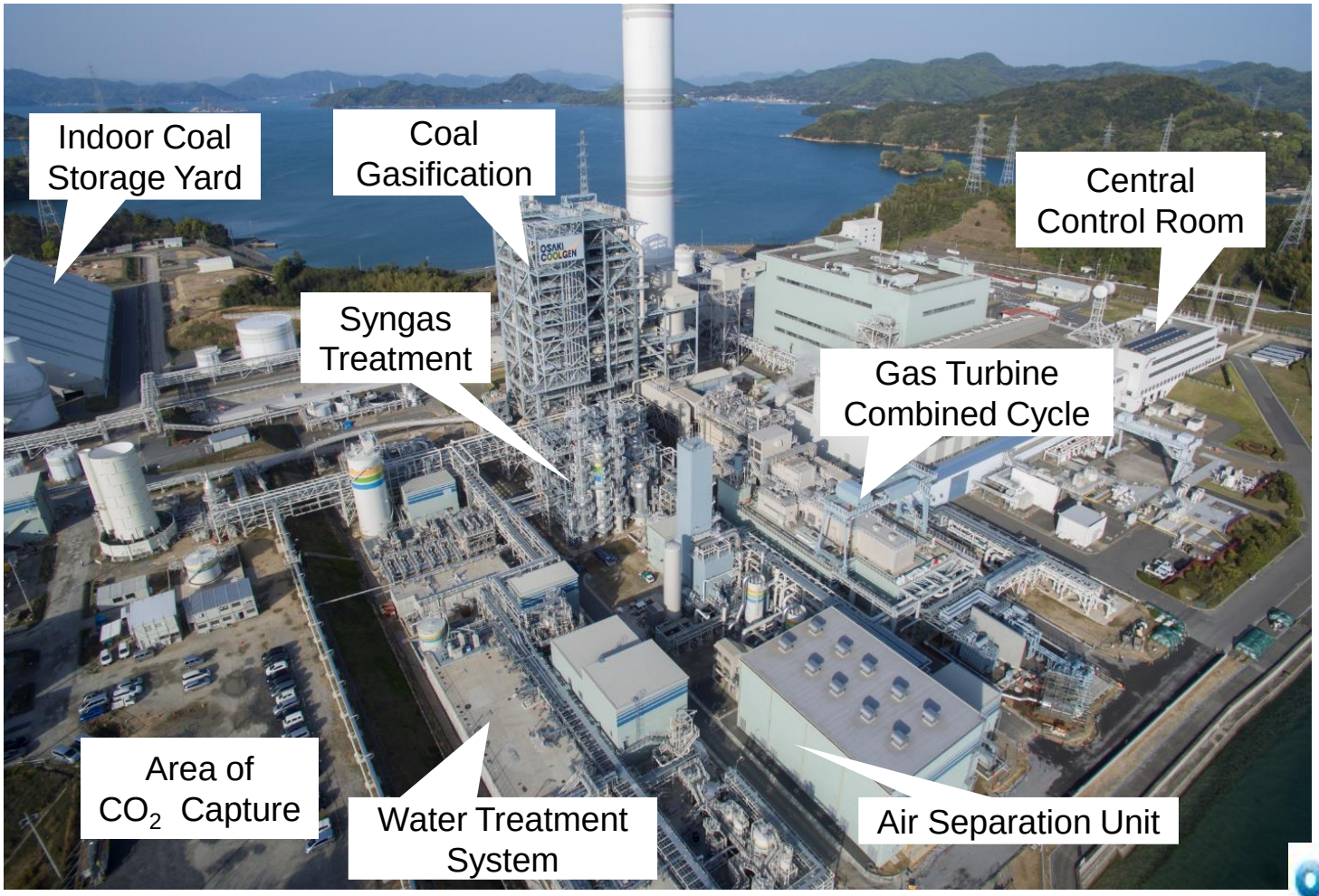
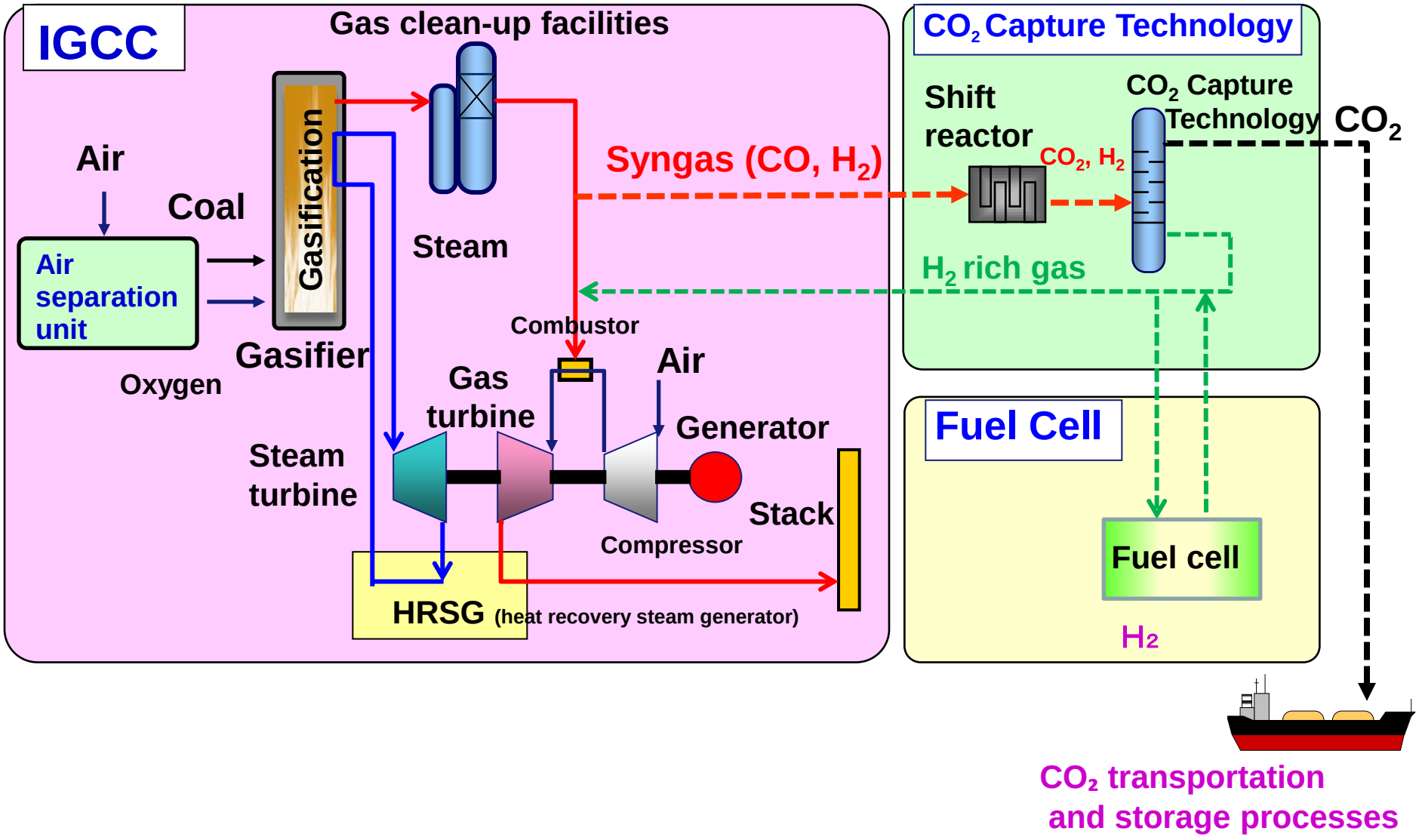
Osaki CoolGen (OCG) Demonstration Project

An innovative low-carbon emission coal fired power plant, which combines **IGCC** + **CO_2 Capture** + **Fuel Cell**

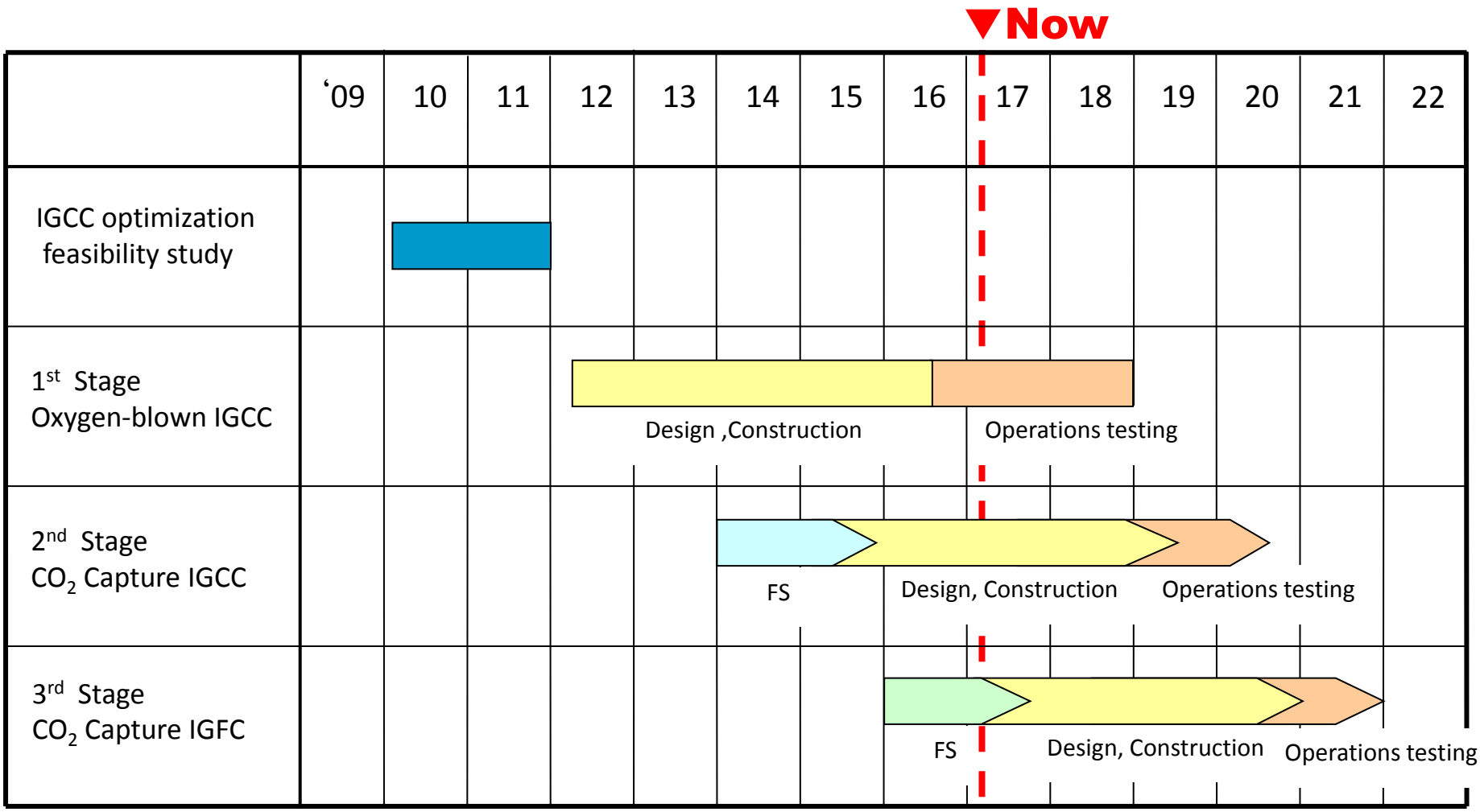


Facility of OCG Demonstration Project



The schedule for OCG Demonstration project

The demonstration test as **1st stage** has conducted since 2016.



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About COURSE50 Project

COURSE50 Project for Innovative Iron and steelmaking process

CO_2 Ultimate Reduction in Steelmaking process by innovative technology for cool Earth 50

The aim:

Reduction of CO_2 emissions by about **30%** to commercialize the first unit by around **2030**.

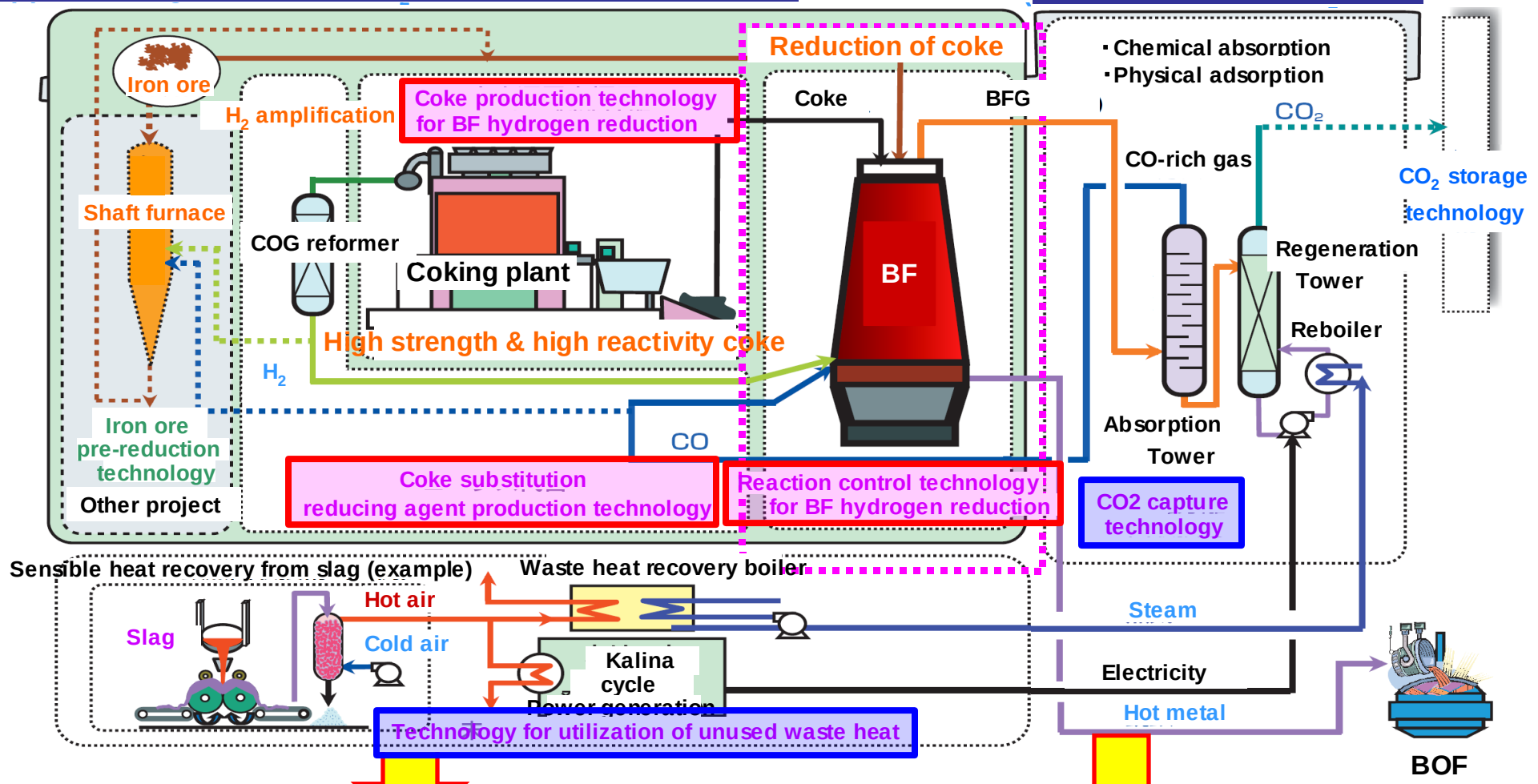
The final goal:

Commercialization and application all furnaces in Japan by **2050**
(Prerequisites for practical mechanization: established CO_2 storage technology and economic viability)

Overview of R&D activities

(1)Technologies to reduce CO_2 emissions from blast furnace

(2)Technologies for CO_2 capture



-10% CO_2 emissions

-20% CO_2 emissions

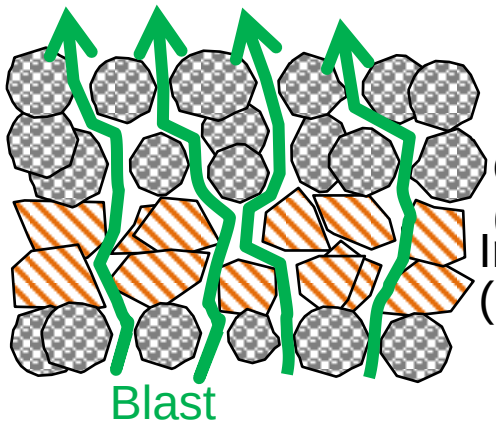
Concept of intensified hydrogen reduction

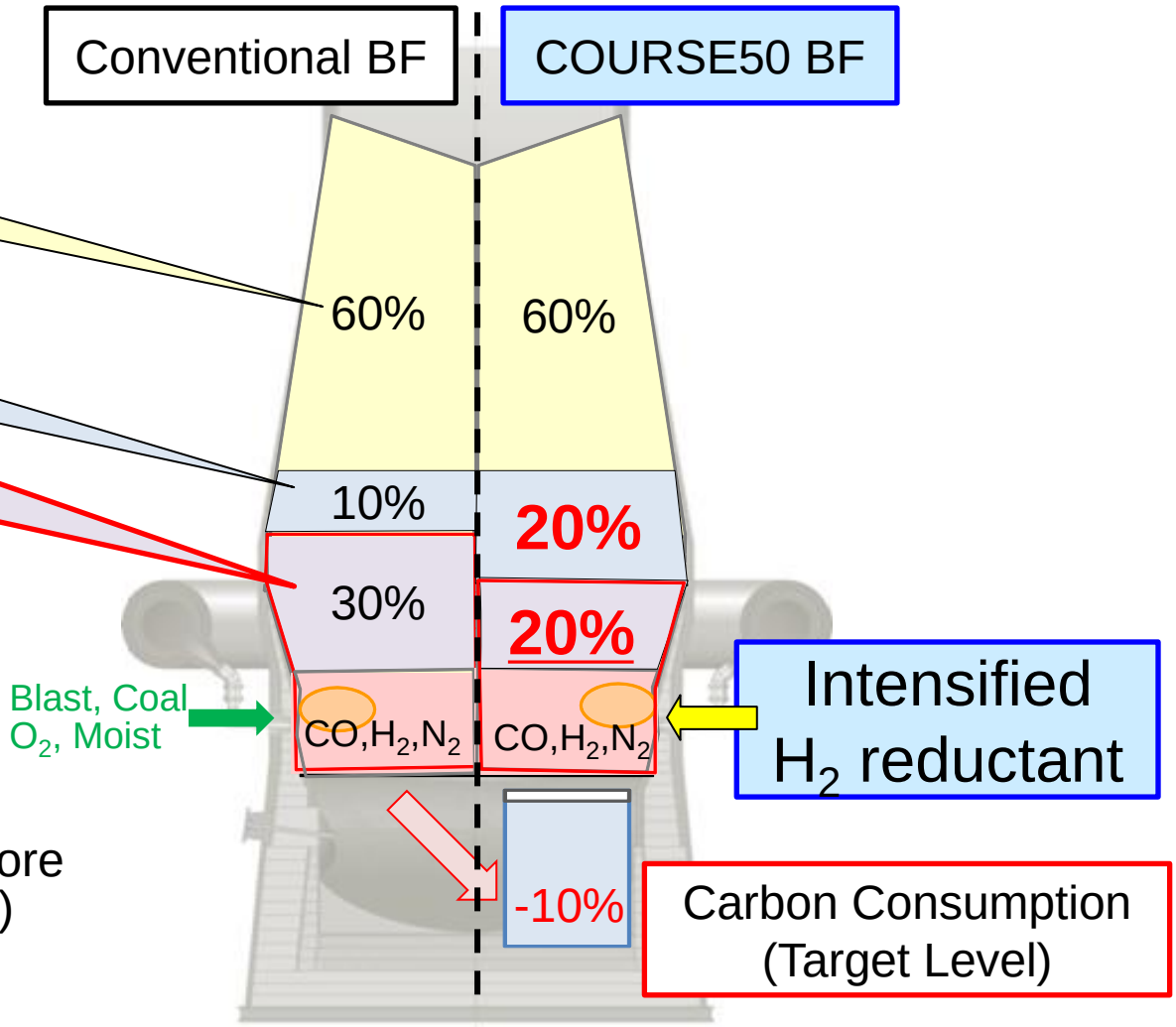
Control reactions for reducing iron ore are occupied by using **H_2 reductant** to decrease carbon consumption in blast furnace.

CO Indirect Reduction:
$FeO+CO \rightarrow Fe+CO_2 +Q_1$

H_2 Indirect Reduction:
$FeO+H_2 \rightarrow Fe+H_2O -Q_2$

Carbon Direct Reduction:
$FeO+C \rightarrow Fe+CO -Q_3$





Pilot-scale experimental blast furnace

The **test operations** have be conducted
on the pilot-scale experimental blast furnace since July 2016.

Experimental Blast Furnace

Sequential operation

CO_2 separation and capture facility

Results of test operations

Effects of CO_2 reduction and reproducibility with **mathematical model** were confirmed in these tests.

Experimental Blast Furnace

Test conditions

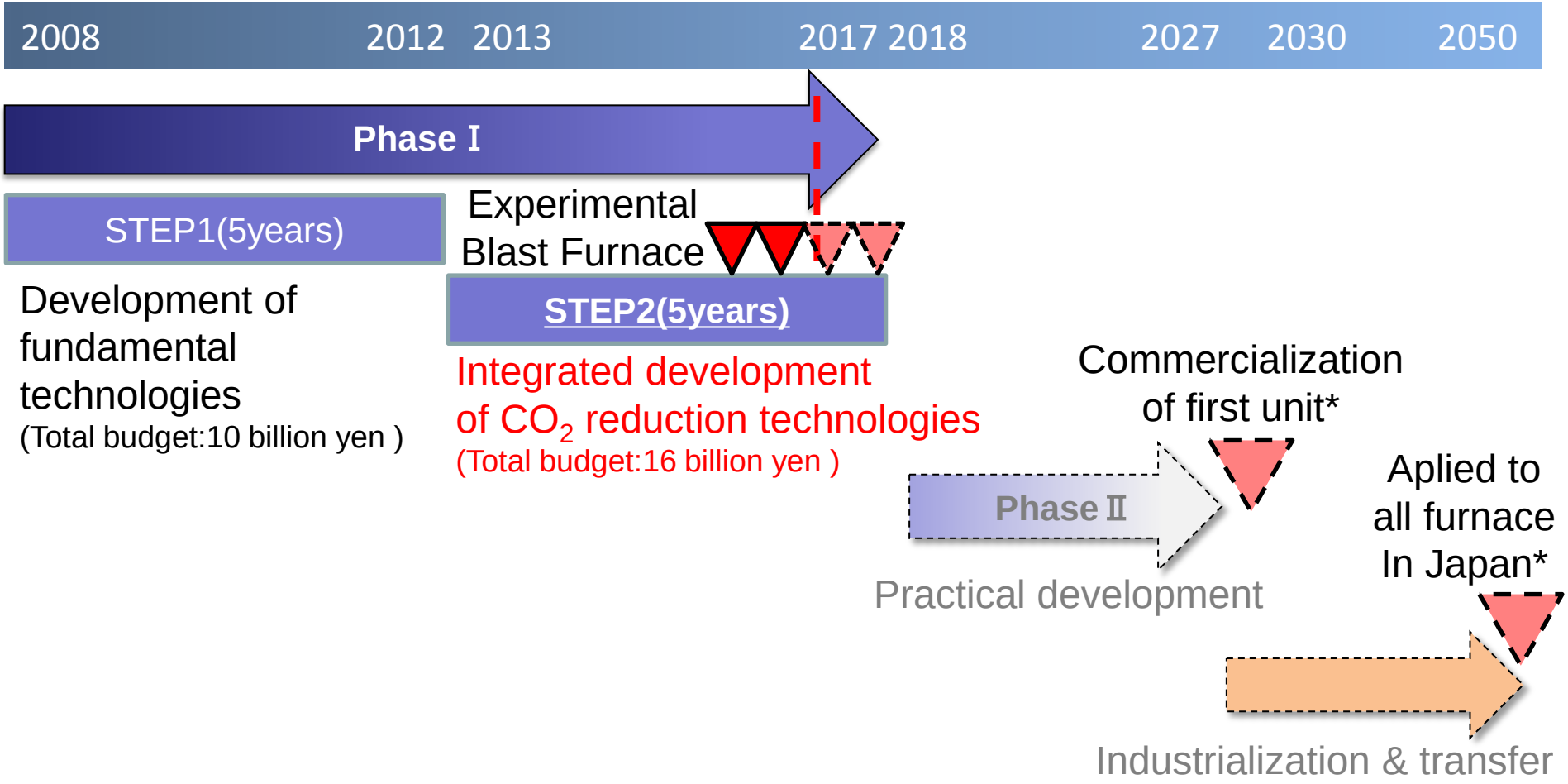
- ✓ Test periods :1month ×4 times from 2016 to 2017
- ✓ Number of conditions: 4 conditions

Test results

- ✓ Hydrogen reaction rate: up to 9.3%
- ✓ Reproducibility with mathematical model: Verified

R&D schedule

In 2017, the test operations will be conducted to confirm performances by the experimental blast furnace.



*:Based on assumption that CO2 retaining infrastructure and commercialization are economically rationalized.

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Concluding remarks

Osaki CoolGen Project

1. "Osaki CoolGen Project" that aims to establish the ultimate high-efficiency coal-fired power technology.

2. The demonstration test has been conducted to verify the performance, reliability, and economic efficiency of the coal-fired power system since May 2017.

COURSE50 Project

1. COURSE50 aims to develop new drastic CO_2 reduction technologies. The CO_2 emissions reduction target is approximately 30% in the steel works.

2. The goal of the project is to establish the CO_2 reduction technologies which contribute technically to commercialize the first unit by around 2030 and to generalize the technologies by 2050, considering the timing of the replacement of blast furnace equipment.

Thank you for your attention.

http://www.nedo.go.jp/