Osaki CoolGen Project

September 7, 2011
Osaki CoolGen Corporation
# Overview of Osaki CoolGen Corporation

<table>
<thead>
<tr>
<th>Corporate Name</th>
<th>Osaki CoolGen Corporation (OCG)</th>
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<tbody>
<tr>
<td>Date of Incorporation</td>
<td>July 29, 2009</td>
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</table>
| Owner | Chugoku Electric Power Co., Inc. (EnerGia) [50%]  
Electric Power Development Co., Ltd (J-POWER) [50%] |
| Business Address | 3FL, Delta Bldg, 1-3-29 Kokutaijimachi, Naka-ku, Hiroshima, JAPAN |
| Business Summary | Conducting the large scale demonstration tests on Oxygen-blown IGCC and CO₂ capture technology toward the realization of IGFC which is ultimate high efficiency coal fired power plant |
Project Background
(Positioning of coal)

- Diversification of energy fuel
- Coal is an indispensable source of energy to satisfy global energy demand
- Concerns about greenhouse gas emissions should be resolved with more efficient technologies

IGCC + CO$_2$ Capture
IGFC
Significance of Osaki CoolGen project

- **Realization of zero emission coal fired power plant**
  Osaki project is a large scale demonstration test that is based on oxygen blown coal gasification technology (EAGLE gasifier) as a development step toward IGFC.

1. **Pursuit of the World’s highest efficiency as coal power plant**
   - High gasification efficiency
   - low $N_2$ fuel gas $\Rightarrow$ fuel for FC

2. **Clean technology of coal fired power plant**
   - $CO_2$ Capture system test $\Rightarrow$ IGCC, IGFC+ $CO_2$ Capture

3. **Gasification technology suitable for Japan**
   - Coal in diversity
Roadmap of High-efficiency coal fired power technology

《Source》based on “Cool Earth Energy Innovative Technology Plan” of METI

* Net Efficiency, HHVbase
Significance of Osaki CoolGen project

- Multi-purpose use
  Gasification plant can be used for multi-purpose other than power generation
  \[ \Rightarrow \text{CO and H}_2 \text{ are dense in syngas} \]

Example of multi-purpose use

- Japan
  - Poly-generation in industrial complex

- Overseas
  - Making high-value product or/and raw material from low rank coal at coal mine
Development Step for an Oxygen-blowed IGCC

**EAGLE Project (J-POWER)  <Pilot plant>**

- Test Item: Pilot test of Oxygen blown Gasification and Carbon Capture Technology
- IGCC: Coal Feed Rate: 150 tons/day
- $\text{CO}_2$ Capture
  - Processed Gas Volume: 1,000 m$^3$/N/h
  - $\text{CO}_2$ capture method: Chemical absorption test & Physical absorption test

**Osaki CoolGen Project  <Demonstration plant>**

- Test Item: Large scale IGCC test of Oxygen blown Gasification and Carbon Capture Technology
- IGCC: Coal Feed Rate: 1,100 tons/day, Output: 170MW class
- $\text{CO}_2$ Capture: under planning

**Oxygen blown IGCC commercial plant  <Commercial plant>**

- 300-600MW class
Features of the Gasifier

- High-efficiency gasification
- Stable slag discharge

Upper stage: Lean Oxygen
Coal $\rightarrow$ Char
Char $+$ CO$_2$ $+$ H$_2$O $\rightarrow$ CO $+$ H$_2$

Lower stage: Rich Oxygen
Coal $+$ O$_2$ $\rightarrow$ CO$_2$ $+$ H$_2$O

High-temperature gasification
Stable slag discharge
Schedule

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<td>Environmental Impact Assessment</td>
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<td>Optimization Research &amp; Study</td>
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<td>CO₂ Capture</td>
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NEDO joint research projects

- Design, Manufacturing and Construction
- Test Operation

The Start of Construction
## Specifications of Osaki CoolGen demonstration Plant

<table>
<thead>
<tr>
<th>IGCC Systems</th>
<th>Coal Gasifier</th>
<th>Oxygen-Blown Two-staged Entrained-flow 1,100 tons per day</th>
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<tbody>
<tr>
<td>Clean up System</td>
<td>DeSOx Unit</td>
<td>Methyldiethanol Amine (MDEA)</td>
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<td>Sulfur Recovery Unit</td>
<td>Limestone Wet Scrubbing</td>
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<td>Air Separation Unit</td>
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<td>Pressurized Cryogenic Separation</td>
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<td></td>
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<td>Oxygen  ; 30,000 m³N/ h</td>
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<tr>
<td></td>
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<td>Nitrogen  ; 50,000 m³N/ h</td>
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<td>Combined Cycle</td>
<td>HRSG Unit</td>
<td>Multi Pressures Reheat Natural Circulation boiler</td>
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<td>GT Unit &amp; ST Unity</td>
<td>Single shaft gas turbine (1300℃ Class) Reheat &amp; condensing Steam turbine 170MW class</td>
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<tr>
<td>Carbon Capture Unit</td>
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<td>under consideration</td>
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Features of the demonstration

IGCC Target efficiency 40.5% (NET, HHV base)

Test operation of 170MW class IGCC

Test of GT (H₂ rich gas through CO₂ capture system)

IGCC

Air Separation Unit

Coal

Air

O₂

Fuel gas (H₂, CO)

Steam

GT

Compressor

Generator

ST

Stack

CO₂ Capture

Shift Reactor

CO₂ Capture

Test of CO₂ Capture System

Test of Fuel gas component

Test of gas purification technology
Site Location of Osaki CoolGen Project

EnerGia OSAKI P/S

IGCC Block

CO₂ Capture Block
Image of the Demonstration Plant

- CO₂ Capture Unit
- Air Separation Unit
- Coal Gasifier
- Combined Cycle Unit
- EnerGia OSAKI P/ S
THANK YOU