Introduction of Japan Coal Energy Center (JCOAL)

WYOMING/JCOAL FUTURE OF COAL WORKSHOP 2017
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Japan Coal Energy Center (JCOAL)
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1. Introduction of JCOAL

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About us

- Established in 1990, with its origin back to 1948
- Supervision by METI
- Coordinating between governments and between the public sector and the private sector in close collaboration with international and domestic partners including 140 members companies
- Line of business: all energy and coal related issues

Facilitation and promotion of cleaner utilization of coal

Mining & Preparation

Coal utilization technology development

SOURCE: JCOAL
JCOAL’s Activities

Government of Japan
Coal Division, Natural Resources and Fuel Department, Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry (METI)

JOGMEC Japan Oil, Gas, and Metals National Corporation

NEDO New Energy and Industrial Technology Development Organization

JICA Japan International Cooperation Agency

Coal Producing Countries
Coal Using Countries

International Agencies
(World Coal Association(WCA), IEA, etc.)

JCOAL as “One-stop Shop for Coal”

Information Collection & Sharing and Advisory Activities
- Follow-up of Clean Coal Policy and Policy Recommendations
- Enhancement and exploration of JCOAL’s Interorganizational Network
- Enhancement of Organizational Framework of Updated Information Collection and Sharing for Further Development

Programs for Coal Resources Development
- Coal Resources Survey
- Coal Stable Supply
- Human Resources Development

Promotion of Clean Coal Technology Development
- Coal Utilization Technology Development
- Coal Ash Utilization Technology Development
- Other R&D

Programs for Public Relations and Human Resources Development
- Coal-related Public Relations Activities

Strategic Promotion of Priority Projects
- Eco Coal Town Project
- Low Rank Coal Utilization Project
- IGCC, CCS and other CCS-related Projects
- Clean Coal Technology Sharing and Transfer

140 Member Companies
Our Goal to reach:
Innovation of Coal Value Chain toward a Circular Economy

SOURCE: JCOAL
Our Engagements

Toward sustainable energy supply through optimal utilization of coal and balanced energy diversification

- Business and project development for waste treatment and utilization
- Business and project development on CCS and CCUS
- Business and project development
- Technology and knowledge sharing
- R&D
- HRD
- Collection and provision of strategic energy and coal information
- Surveys and studies on energy and coal issues
Our Network through Partner Institutions

*Not all partners are indicated due to the space constraint of this slide.

SOURCE: JCOAL
1. Introduction of JCOAL

2. Future of Coal in Japan
Future of Coal Policy in Japan (1)

- Demand for the coal-fired power generation is expected to increase especially in Asian areas.
- At OECD, November 2015, all participating countries reached a basic agreement on new regulation of financial assistance for coal-fired power plant.
- Consistent promotion of Clean Coal Technology is very important considering the result of COP21.
- The Japanese government will actively work on the development of high efficient coal-fired technology.

Using Joint Crediting Mechanism (JCM)

- Under the JCM, Japan will evaluate its contributions to greenhouse gas emission reductions or removals in a quantitative manner and use them to achieve Japan’s emission reduction.
- Japan has started the JCM with 16 countries and also signed MOU with Philippines for the bilateral agreement on 7th December, 2016.
Action to:

- Increase of electricity demand in development countries
- Protection of regional environment and global warming

- Environmental Protection
- Reduction of CO₂ emission
- Control of coal consumption

Bilateral agreement

Support and make scheme

Business return, JCM etc.

Establishment and demonstration of CCT

CCT technology transfer and promotion

Install and promotion of reliable CCT equipment
Clean Coal Technology (CCT)

Pretreatment
Preparation

Environmental measure (Region)

Low NOx combustion
De-SOx
De-NOx
De-dust

Exhaust gas treatment

CCT

Global warming countermeasure
CO₂ capture
Coal-biomass mixed firing

High efficiency

pulverized coal combustion

USC, A-USC

Gasification

IGCC, IGFC

CCUS

Coal ash Utilization

Development of Next-Generation Coal-Fired Power Technologies

**Power generation efficiency**

- **Integrated coal Gasification Combined Cycle (1700 deg. C – class (IGCC))**
  - Coal-fired thermal power generated through coal gasification, utilizing the combined cycle combining gas turbine and steam turbine
  - Power generation efficiency: Approximately 46 to 50%
  - CO2 emissions: 650 g/kWh (1700 deg. C class)

- **Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC)**
  - Coal-fired thermal power utilizing the triple combined cycle combining IGCC with fuel cell
  - Power generation efficiency: Approximately 55%
  - CO2 emissions: Approximately 590 g/kWh
  - Technological establishment: Around 2025

- **Advanced Ultra Super Critical (A-USC)**
  - Pulverized coal thermal power utilizing high temperature and pressure steam turbine
  - Power generation efficiency: Approximately 46%
  - CO2 emissions: Approximately 710 g/kWh
  - Technological establishment: Around 2016

- **Ultra Super Critical (USC)**
  - Pulverized coal thermal power utilizing steam power
  - Power generation efficiency: Approximately 40%
  - CO2 emissions: Approximately 820 g/kWh

- **IGCC**
  - Completed verification by blowing air
  - Power generation efficiency: Approximately 45%
  - CO2 emissions: Approximately 750 g/kWh

**Reduction of CO2**

- Reduction of CO2 by approximately 30% (around 2030)
- Reduction of CO2 by approximately 20% (around 2020)


Mr. Yamashita of METI, at Clean Coal Day 2016
CO2 Reduction Potential by Efficiency Improvement

- The CO₂ reduction potential through applying the Japanese USC power plant to existing coal-fired power plants in the USA, China and India is 1.2Gt in total, based on the 2013 data.

Source: IEA World Energy Outlook 2015
About CO₂ low emission as follows

**CO₂ separation and capture cost**

- **High**
  - **Membrane separation method**
    - Separates by using a membrane which penetrates CO₂ selectively.
  - **Chemical absorption method**
    - Uses a solvent, such as amine.
    - Separation and capture cost: 4200 yen/t-CO₂
  - **Oxygen combustion method**
    - Recirculates highly concentrated oxygen in exhaust gas.
    - Separation and capture cost: 3000 yen level/t-CO₂

- **Low**
  - **Physical absorption method**
    - For IGCC
    - CO₂ absorbed into a physical absorption solution under high pressure.
    - Separation and capture cost: Approximately 2000 yen level/t-CO₂
      - Around 2020
  - **Solid absorbent method**
    - Reduces energy requirement and separates CO₂ by combining amine, etc.
  - **Mixed absorbent method**
    - Separates by using a membrane which penetrates CO₂ selectively.

**Storage of CO₂**

- For pulverized coal thermal power
- For IGCC
- For IGCC

**Utilization of CO₂**

- This technology utilizes captured CO₂ to produce valuables such as alternatives to oil and chemical raw material.

**Closed IGCC**

- The oxygen fuel technology to the IGCC technology.

*The cost prospect in the Figure was estimated based on various assumptions at present.*

Prof. Takarada of Gunma Univ. at Clean Coal Day 2016
Conclusion

① Coal is the low-cost and stable energy resource in the world. Coal is sharing about 40% of power source composition in the world. Therefore, Coal is still important energy in the future.

② Coal use has serious issues for SOx, NOx and Particulates. It is important for coal use to apply Clean Coal Technologies (CCT).

③ Reduce of CO2 emission is also important issues for coal use in the future. High efficient technologies and CCUS are solutions to reduce CO2 emission. I consider it is important for JCOAL, Wyoming and US to commercialize zero-emission technologies in cooperation with us.

④ Our aim is to accomplish Zero-Emission for Coal. I hope that Japan and US will tackle and lead to Global Warming Issues of Coal in the world with the Future of Coal Workshop between the State of Wyoming and JCOAL.
Thank you for your attention!!