Australia Japan Coal Technology Workshop
Friday 26 June 2009
Brisbane – Australia

Japan and Australia Partnership on Coal Technology Related to JCOAL

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Agreements and Projects between Japan and Australia Related to JCOAL

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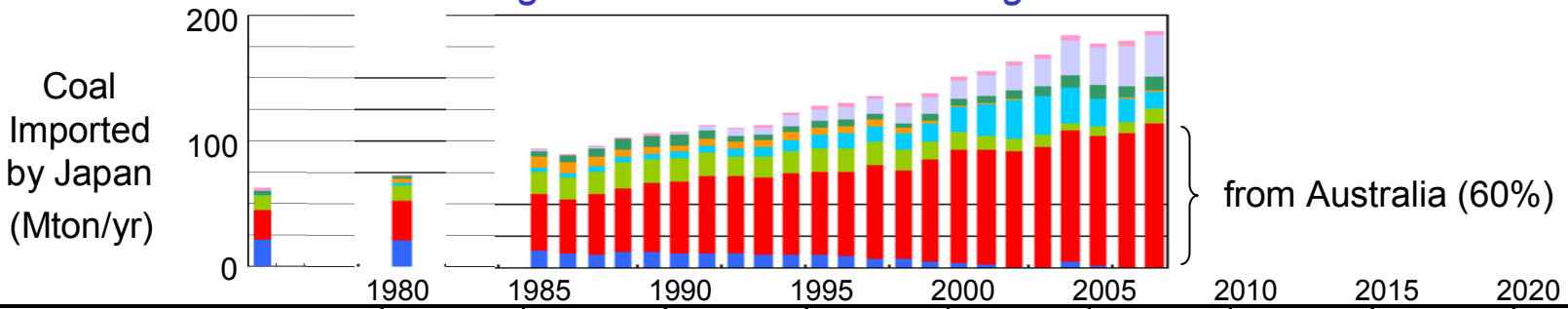
based on the recognition that there are mutual benefits and value to be gained from government, industry and researchers in both countries working together to share information, address similar challenges and achieve common goals.



AGREEMENTS

The Relationship Agreement between CMRCJ and CSIRO

The Aichi Coal R&D Joint Statement between JCOAL and CSIRO

Enhanced Aichi Coal R&D Joint Statement between JCOAL and CSIRO and ACR

Mine safety & coal production + Coal utilization

PROJECTS

Study of New Exploration Technology	(METI, NEDO(JCOAL) - QLD, NSW)
R&D Cooperation on Mine Gas Control	(METI (JCOAL) – CSIRO, Priv com)
Collaborative Study to Evaluate the Production and Utilization of UCC (Ultra Clean Coal)	(METI (JCOAL, Priv com) – CSIRO, Priv com)
R&D of Rapid Roadway Development System	(METI (JCOAL) – CSIRO, Priv com)
Technical Cooperation for Open-cut Coal Mine Rehabilitation Development	(METI, NEDO (JCOAL) - CSIRO,Priv com)
Study of Waste Coal Gasification Technology	(JCOAL (IHI) – CSIRO)
Callide Oxyfuel Project	(METI – DRET, QLD (IHI, JPOWER,Mitsui Co. – CS Energy, ACA etc.))
APP CO2-ECBM Project	(JCOAL, JOGMEC - CSIRO)

Japan-Australia Cooperative Activities Already Finished

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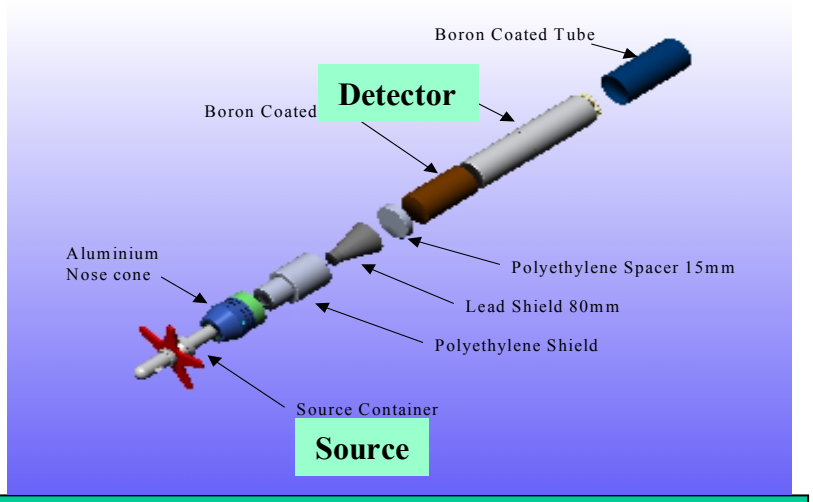
Study of New Exploration Technology

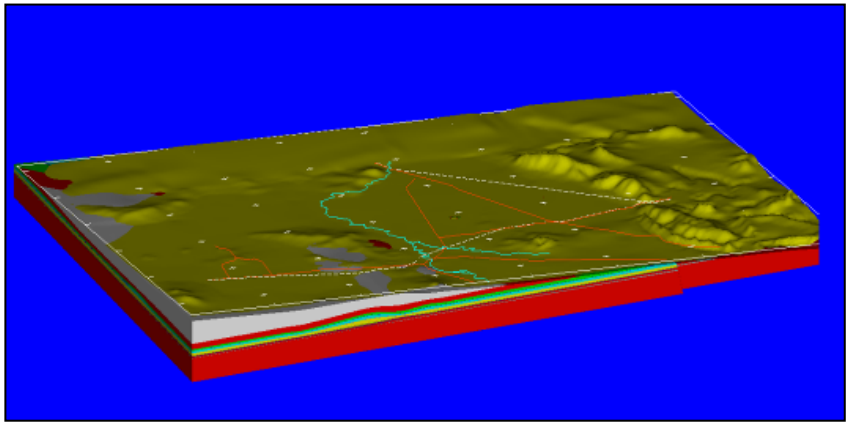
Exploration Sits for the study

Exploration Site	Year	Phase
Bowen Basin (Taroborah)	1992～1996	[Preliminary Exploration]QLD
Gunnedah Basin (Caroona)	1997～1999	[Site Application] NSW
Bowen Basin (Coppabella Mine)	2000～2004	[Verification] QLD



Development of Neutron-Gamma Logging System

Development of an Electric Vibrator



3D Geological Model of Caroona Area in NSW

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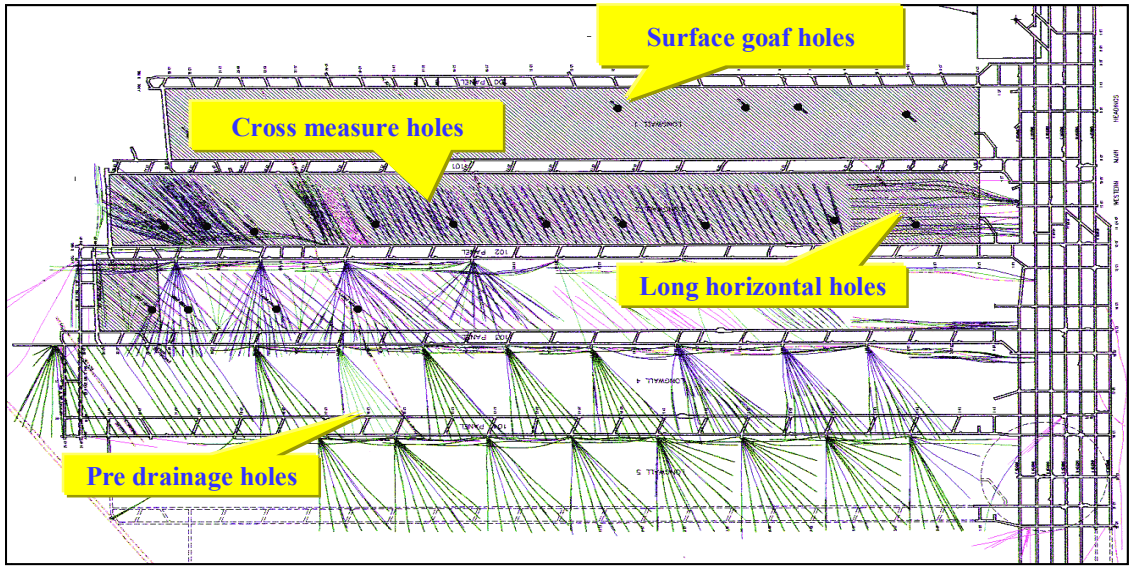
R & D Cooperation on Mine Gas Control

Main Activities

- **Site Test on Gas Drainage Technology**
  - **Subsurface Drainage – Horizontal Borehole**
  - **Surface Drainage – Post Drainage Borehole**
- **Other Site Tests**
  - **Ventilation and Goaf Gas Pressure Monitoring**
  - **Post Drainage Borehole – Variation of Volume**
- **Tracer Gas Test**
- **CFD(Computational Fluid Dynamics) Modelling**
- **Other: Geology, Roof Fall (Micro-Seismic)**

Dartbrook Underground Coal Mine (Test Site)



Layout of many kinds of gas drainage holes at Dartbrook Colliery

Main Outcome

- **Improvement of Gas Drainage Efficiency at LW Panel: 20～25% → 55～60%**
- **Achievement to Drain the Gas from Goaf: 270～370 m^3/min**
- **Horizontal Borehole: 30 m^3/min of Gas Drainage**
- **Tracer Gas showed the Gas Flow at Goaf Area**

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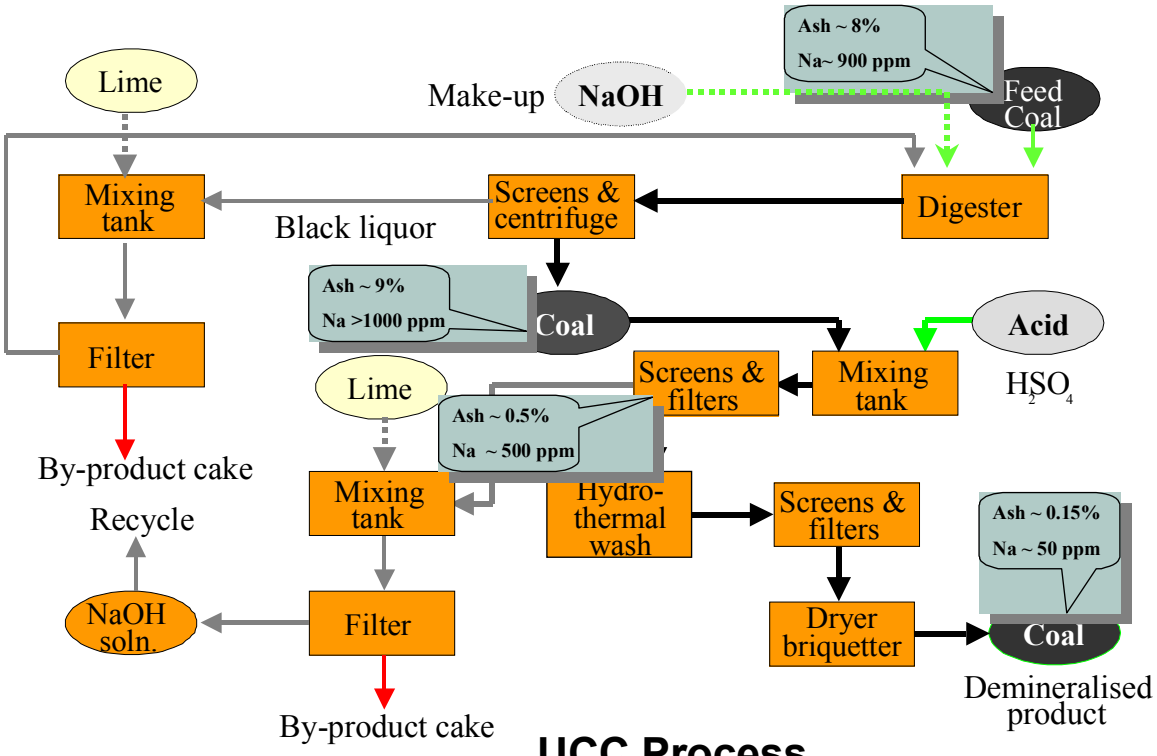
Collaborative Study to Evaluate the Production and Utilization of UCC (Ultra Clean Coal)

The UCC project aims to clean coal sufficiently that it can be used in new high-efficiency generation systems, one of those is the gas turbine combined-cycle power plant.

Period: 1998-2002
Organization: METI, JCOAL (Private Comp.), CSIRO (Private Comp.)
Objective: It was aimed at utilising Japan's expertise in coal utilisation and gas turbine development together with Australia's expertise in the production of UCC.



UCC Process

Experimental Gas Turbine Combustor

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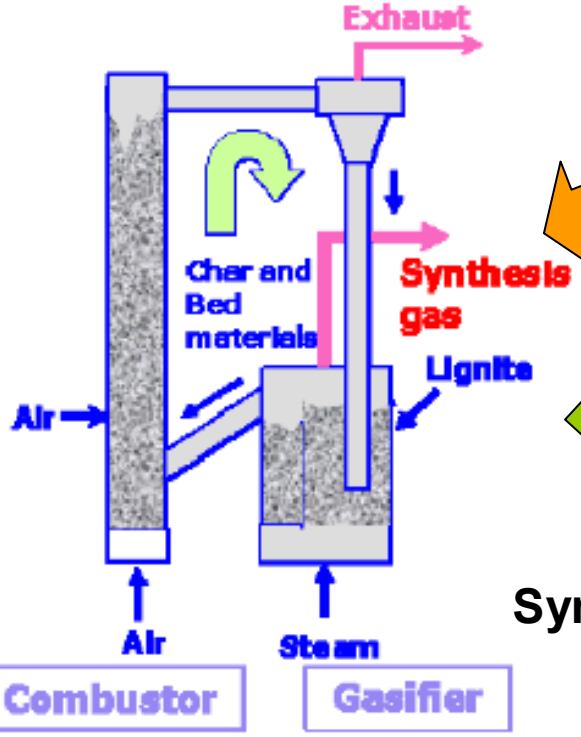
Study of Waste Coal Gasification Technology

Period: 2006-2008 (delayed due to flood)
Organization: JCOAL(IHI), CSIRO
Objective: To study the applicability of fluidized-bed gasifier with steam to waste coal utilization

Coal Preparation Plants



Synthesis

Diesel Oil

TIGAR (Twin IHI Gasifier)

(Developed to gasify lignite)

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Japan-Australia Cooperative Activities on Going

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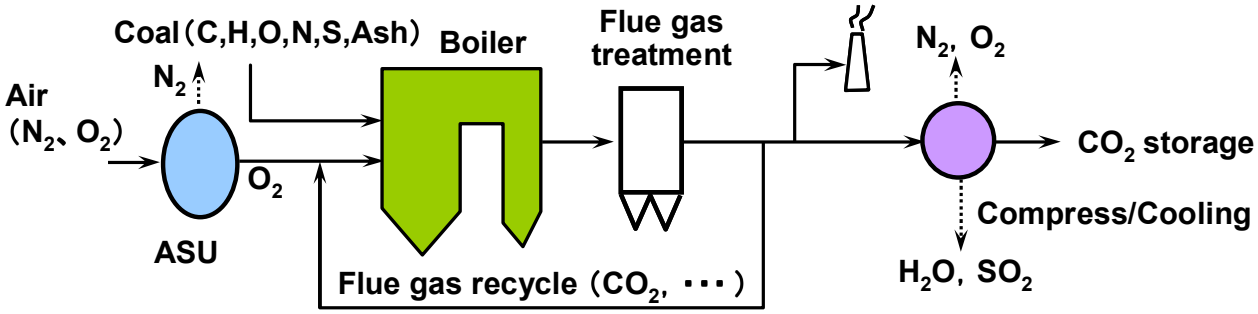
Callide Oxyfuel Project

Callide Oxyfuel Project

Project positioning

World's first "Series system of Coal utilization, Power generation, CO_2 capture and CO_2 storage in the application to existing power plant system"

Oxy-fuel combustion system

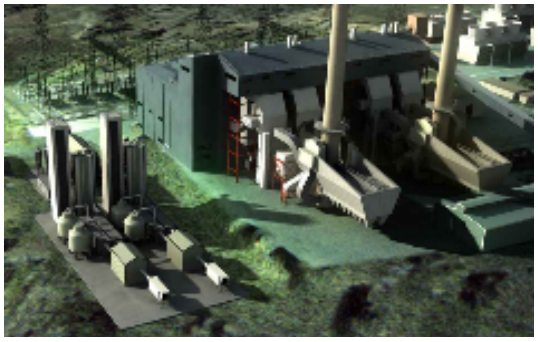


Power Plant
Callide-A #4 unit (30 MWe)

CO_2 storage site
- **Store 50-100 x10^3 tonCO_2**
- **Depleted gas reservoir or Aquifer**
- **Approx. 300km west of power station**

Schedule

- LETDF Announcement: 30 Oct 2006
- APP Flagship Project: 15 Oct 2007
- Signing JV Agreement: 20 March 2008
- Launch Ceremony: 14 Nov 2008
- Oxy-firing: 2011 - 2014
- CO_2 storage & monitoring: 2011 - 2016

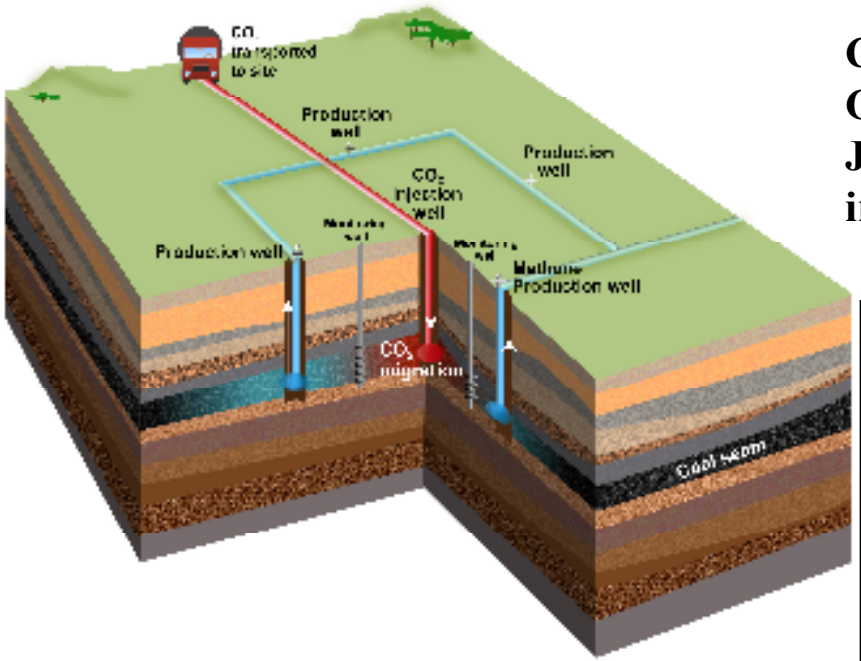


Oxyfuel Project Partners

cs energy generations ahead
IHI
Schlumberger
MITSUI & CO., LTD.
xstrata coal
J-POWER EPDC
COAL21 FUND
Australian Government
Queensland Government
METI Ministry of Economy, Trade and Industry
Supporting Collaborator JCOAL Japan Coal Energy Center

Asia-Pacific Partnership on Clean Development and Climate

Enhanced Coal Bed Methane (CO2-ECBM) Project



Conceptual Design of CO2-ECBM Australian Trial

Yubari CO2-ECBM Pilot Test (Injection well)

Consortium : CSIRO, the Australian Commonwealth Government acting through the AP6 program, JCOAL (Japan) and Australian and international industry.

The Project Objectives are:

- To develop techniques to maximise CO2 injection and methane recovery rates and to overcome the loss of permeability that is associated with CO2 adsorption;
- To inject sufficient quantities of CO_2 such that the migration behaviour of CO_2 within coal can be monitored;
- To verify the reliability of CO_2 storage through monitoring; and
- To verify the displacement of coal seam methane by injected CO_2 and the enhancement of methane recovery; in particular characterise the sweep efficiency of the enhanced recovery.

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Japan-Australia Cooperative Activities under Examination

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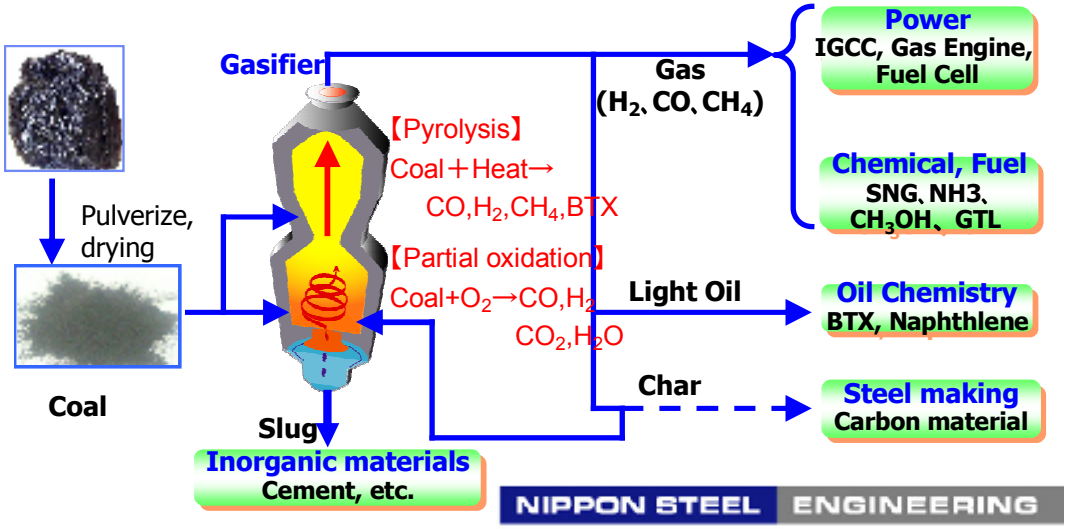
Conversion to Liquid/Gas Fuel from Brown Coal with CCS by ECOPRO

Efficient Co-Production with Coal Flash Partial Hydro-pyrolysis Technology (ECOPRO)

Coal partial oxidation reaction

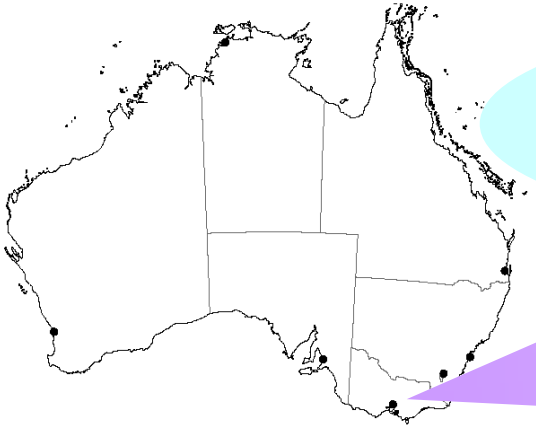
Plus Coal pyrolysis reaction

Highly energy efficiency
(more than *85%*)



NIPPON STEEL ENGINEERING

- Investigation of possibility for demonstration stage in Victoria
- Demonstration in Victoria



Victoria

The plan of the gasification test with blown coal by the pilot plant

20t/d pilot plant located in Yawata Works of Nippon Steel Corporation

For Sustainable Development of Coal related Industries and Global Contribution of Japan and Australia

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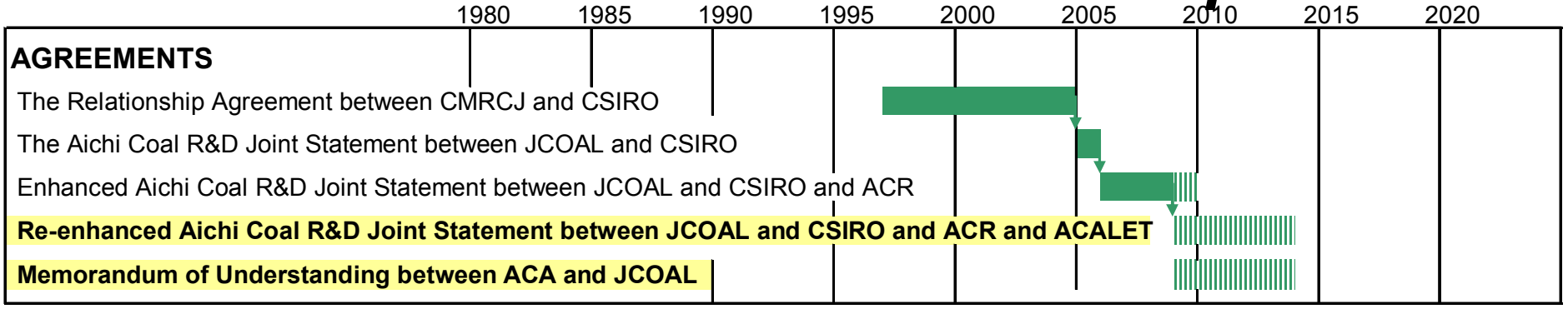
Enhancement of Partnership



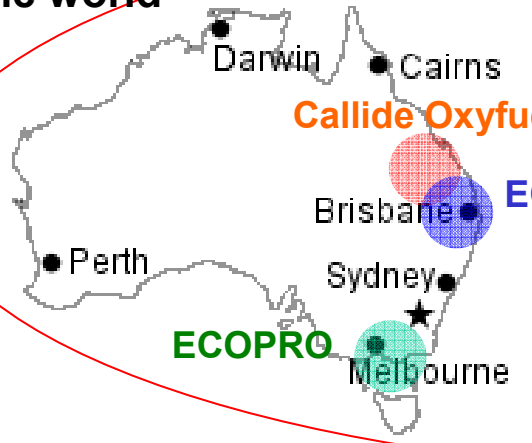
Re-enhanced Joint Statement btw JCOAL-CSIRO-ACR-ACALET

To continue the existing relationship and to include Low Emissions Coal technologies in it, Re-enhanced Joint Statement expands Enhanced Aichi Coal R&D Joint Statement through the inclusion of ACALET as a party.

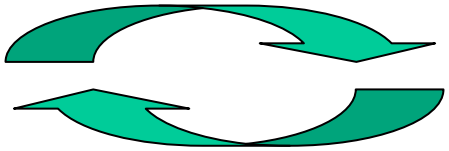
Memorandum of Understanding btw ACA-JCOAL

ACA and JCOAL confirm their agreement for the sake of the further development of mutual cooperation henceforth between both parties by facilitating the environmentally friendly and stable production, transportation and utilization of coal.

Apply trial results and lead the world



Sustainable Production & Stable Supply
Information on production, utilization, infrastructure, policy and regulation of coal



Win-win relationship btw companies

Clean Coal Technology Investigation
Information on energy and coal market, policy and utilization of coal

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