



Australian Government

**CCS
Related Activities
Summary**

**CSLF
Joint Policy & Technical Group
Meeting**

Berlin, Germany 26-30 September 2005



SUMMARY OF CCS ACTIVITIES IN AUSTRALIA

Prepared by: Australia Government in consultation with CO2CRC

Technical *(further detail outlined at Attachment A)*

Australia is undertaking a major program of research and development into carbon dioxide (CO₂) capture and geological storage and wherever possible is closely collaborating with international research bodies. Through a number of national road mapping exercises undertaken by COAL21 and the Cooperative Centre for Greenhouse Gas Technologies (CO2CRC), a strongly collaborative program of R&D has been developed. Research into gasification by Centre for Low Emissions Technologies (cLET) and Cooperative Research Centre for Coal in Sustainable Development (CCSD), coupled with pre- and post-combustion research by CO2CRC and Commonwealth Scientific and Industrial Research Organisation (CSIRO,) is providing a strong basis for a future program of demonstration of oxy-fuel, integrated gasification combined-cycle (IGCC) and post-combustion capture option.

A major storage activity focused on the work of CO2CRC but drawing in many research groups is addressing a range of basic and applied issues relating to the behaviour of CO₂ in deep geological environments that will enable Australia to identify and utilise its CO₂ storage capacity in an effective manner. A key component in taking storage forward as a mitigation option is the development of a major pilot project in the Otway Basin accompanied by a major program of monitoring and verification. A range of R&D activities driven by the needs of major commercial proposals that will apply CCS are also underway.

Policy *(further detail outlined at Attachment B)*

The Australian Government's CCS policies reflect the potential role that these technologies will play in addressing the further growth in Australia's greenhouse gas emissions. A current policy priority is the development of regulatory regimes that are needed to be in place before major energy projects involving CCS can take place. The Australian Government's policy framework supports and facilitates Australia's comprehensive technological approach on CCS.

In June 2004, Australia's Prime Minister launched the Energy White Paper. The \$500 million Low Emissions Technology Demonstration Fund was announced in the paper and will provide support for demonstrating new low-emissions technologies with significant long-term abatement potential. This is likely to lead to the construction of technologies that will support carbon capture (e.g. gasification, oxy-fuel combustion) and may support storage. State and Territory Governments are also supporting these technologies, for example, the State of Victoria is offering \$83.5 million under its Energy Technology Innovation Strategy to support the development of demonstration projects relating to brown coal (announced in June 2005).

CCS is a new technology that has not been used in Australia previously, however, a number of CCS projects have been proposed in Australia and as a result, work on regulatory issues has been underway over the last two years. Australia has now developed a set of guiding regulatory principles for CCS in consultation with industry, research groups and community groups, developed with a view to enabling the uptake of CCS technology for commercial purposes. These principles are currently being used to guide the development of legislation and to support the appropriate management of proposed, large-scale commercial CCS projects in Australia.

International Cooperation *(further detail outlined at Attachment C)*

The Australian Government, industry and research organisations recognise the importance of international collaboration in developing CCS technologies, assessing technologies developed offshore and in facilitating the transfer of Australian expertise and technologies. We are also considering how we can use Australia's involvement in new international endeavours such as the Asia-Pacific Partnership on Clean Development and Climate to support CCS. The vision statement of the partnership has identified CCS as one of the technologies that the partnership is likely to focus on developing and transferring.



ATTACHMENT A

CCS Technical Work in Australia

A number of research initiatives have been undertaken or are currently underway to progress CCS projects, technologies and to assess the potential of CO₂ capture and storage sites in Australia.

GEODISC

The GEODISC Project (1999-2003) conducted within the Australian Petroleum Cooperative Research Centre (APCRC) examined over 100 sites as potential geological storage sites, and identified an ultimate storage capacity in excess of 1600 years of Australia's total current emissions. It also developed a methodology to enable the potential of sites to be compared taking into account a range of factors including storage volume, security and proximity to CO₂ sources.

Geoscience Australia (GA)

GA (www.ga.gov.au), Australia's national agency for geoscience research and geospatial information, provides much of the primary national geoscience data, along with the State Geological Surveys, that is a crucial part of the information required for the determination of the storage prospectivity of Australia. GA is a major contributor to a number of the CO₂ storage projects undertaken within CO2CRC. In addition, GA provides technical advice to DITR in relation to the regulation of CCS.

Greenhouse Gas Technologies Cooperative Research Centre (CO2CRC)

CO2CRC (www.co2crc.com.au) is a Research Centre jointly funded by government, industry and research bodies. It undertakes an integrated collaborative program of research into and demonstration of into CO₂ capture and geological storage in conjunction with six universities, CSIRO, GA and twelve major energy companies. It has close ties with leading overseas research organizations.

CO₂ Storage

CO2CRC commenced its activities into CCS in 1999 initially through the GEODISC program. That work indicated that Australia has excellent storage prospectivity in a number of areas. Following a major national technology road-mapping exercise for CCS, the Centre now undertakes a wide range of collaborative storage activities involving 50 researchers in order to confirm Australia's storage potential. Activities include:

- Developing technologies for assessing sites for CO₂ storage;
- Understanding subsurface physical, chemical and biological processes involving CO₂;
- Better monitoring and verification;
- Developing risk assessment methodologies for CO₂ storage;
- Providing a technical basis for a regulatory regime;
- Communicating capture and storage technologies to the wider community; and
- Economic modeling of capture and storage technologies.

CO₂ Capture

CO2CRC's capture program has been developed through a consultative and collaborative approach with industry and all of the Australian R&D organizations involved in the fossil fuels energy sectors.



The capture program is researching prospective areas in CO₂ removal from natural gas, post-combustion and pre-combustion separation. The program is structured to critically review all projects against the best available benchmark technology through an end to end capture and storage techno-economic model that has been developed to screen all available technologies across the range of applications. CO₂CRC is active in all the areas of CO₂ separation and has active collaborations with the key international centres in the area. The research is spread across seven universities in Australia and Japan – (the universities of Melbourne, Monash, New South Wales, Queensland, Adelaide, Curtin and Meiji) and incorporates approximately 40 researchers, post doctoral fellows and PhD students. We also have formal links with the University of Regina/ITC/University of Texas at Austin/NTNU Trondheim in Membranes and Post Combustion activities.

Techno-Economic Studies

CO₂CRC has a strong basis in techno-economics through a screening tool covering all aspects of capture and storage economics. It is researching and developing intellectual property (IP) in solvents and solvent processing, membranes, both gas and gas absorption and adsorbents. The focus is on developing processes and materials that will allow significant capture cost reductions. These separation processes are being developed for post combustion, pre combustion and natural gas separation applications and with a range of fuels. Recent work indicates a number of promising opportunities to achieve significant cost reductions.

CO₂CRC is also undertaking a major government-supported project for Monash Energy to assess options to take forward the zero emission hub concept based on a regional study of the Gippsland Basin as a storage site for CO₂ generated in the Latrobe Valley area of Victoria, one of Australia's major emission nodes. Monash Energy, a subsidiary of Anglo American, is developing plans for Latrobe Valley coal gasification plants, for the production of electricity and liquid fuels, in conjunction with carbon capture and storage in the Gippsland Basin.

Pilot Project

CO₂CRC directly participated in the US Frio Brine project in the last year. It is now at an advanced stage of planning for a major pilot project in the Otway Basin. The project will involve separation of CO₂ from a high CO₂ natural gas, transportation by pipeline and injection over two years into a saline formation at a depth of about 2000m of up to 100,000 tonnes of CO₂. An extensive program of analysis of existing data and some field work has been completed and a comprehensive monitoring and verification program developed. Subject to the project receiving all the necessary regulatory approvals, it is hoped to commence CO₂ injection in late 2006.

The CRC is also involved in development of pilot project proposals and provides research services to commercial storage projects.

Cooperative Research Centre for Coal in Sustainable Development (CCSD)

The CRC for Coal in Sustainable Development (www.ccsd.biz) undertakes a range of programs focussed on the use of black coal.

Oxy-fuel feasibility study

A Japan/Australia collaboration between industry (coal and plant developers) and research providers (CCSD, CO₂CRC) is underway. Oxy-firing of pulverised fuel (PF) boilers involves the combustion of pulverised coal in a mixture of oxygen and recirculated flue gas in order to reduce the net volume of flue gases from the process and to substantially increase the concentration of carbon dioxide (CO₂) in the flue gases – compared to the normal air-firing case.



Oxy-fuel should therefore both technically and economically facilitate the capture and geological storage of CO₂. CCS and its collaborators has embarked on a 2-year oxy-fuel feasibility study centred on a single Callide A (30 M We) Unit in central Queensland utilising the locally supplied Callide coal.

The feasibility study will be augmented with additional fundamental work on 2 other Queensland coals: Acland (domestic/export thermal coal); and Rolleston premium export thermal coal. The primary deliverable from the feasibility study will be a reference design and comprehensive technical and cost details for an oxy-fired retrofit, as the basis for a first-of-a-kind demonstration plant that will include CO₂ geological storage. In conjunction with this study, CO₂CRC is undertaking an assessment of the CO₂ storage potential of central Queensland both for the oxy-fuel study and for a potential IGCC project.

Techno-Economic Study

CCSD in conjunction with other research organisations/CRCs is carrying out techno-economic modelling in order to provide informed policy choices for future electricity generation in Australia that will address greenhouse gas concerns.

Cooperative Research Centre for Clean Power from Lignite (CPLCRC)

The CRC for Clean Power from Lignite's primary objective is the development of technologies to reduce greenhouse gas emissions from lignite-based power generation by improving efficiency while maintaining a low cost of electricity. The Research Activities address improvements to conventional PF boiler technologies, and new advanced technologies for future power generation.

It also is proposing to construct a demonstration mechanical thermal expression (MTE) coal drying plant. MTE is one technology that may support greater efficiency in combustion of dry coal for gasification and eventual CCS.

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

CSIRO conducts research and technology transfer in pre- and post-combustion capture as well as technical developments in CO₂ storage in relevant Australian situations. Most of this research is conducted collaboratively with the organisations shown below to minimise duplication of effort and to involve industry partners from the outset.

Energy Futures

This CSIRO initiated program is a scenario development and modelling program with Government, industry and community groups to develop possible scenarios for future Australian energy demand/supply and to model the scenarios for their economic and environmental (GHG) impacts. Carbon capture and sequestration is modelled within the scenarios. CSIRO conducts the modelling in conjunction with the Government resource economists at the Australian Bureau of Agricultural and resource Economics (ABARE). The Energy Futures program is conducted within the CSIRO Energy Transformed Flagship (<http://www.energytransformed.csiro.au>).

Pre-combustion

This program of work is designed to develop expertise and knowledge through gasification research of Australian coals that can lead to a broader uptake of clean coal technologies once appropriate performance and cost targets have been attained. A combination of fundamental and applied research has addressed aspects of gasification kinetics, modelling, costing, environmental benefits and technology developments and their impact on the Australian electricity generators. Programs are conducted with the CRC for Coal in Sustainable Development (<http://www.ccsd.biz/>).



Gas Separation

Gas separation is a key technology for clean coal gasification and CO₂ separation with the principal research vehicle the Centre for Low Emissions Technology (<http://www.clet.net/>). The focus areas of work comprise gas cleaning, gas conditioning, gas separation and a social and economic integration project to inform the research agenda through understanding public and industry views of the technology include gasification trials and facility development. A core program of gasification trials and facility development will be conducted to provide data on syngas issues and to be a source of gas for the gas processing units.

Post-Combustion

CSIRO is developing a proposal for demonstration of post-combustion capture for existing black coal and brown coal fired generators. This proposal is conceived around a 50,000 tpa plant based on existing, emerging and novel concepts for CO₂ capture using solvents designed to accommodate the relevant properties of flue gases from the different coal sources and in situations without deNO_x and deSO_x.

CO₂ Sequestration

CSIRO is a partner in the CRC for Greenhouse technologies (<http://www.co2crc.com.au/>). CSIRO conducts independent research into CO₂ sequestration in coal which has revealed a greater than expected reservoir capacity for storage in coal and has developed models for the sequestration of CO₂ in conjunction with methane displacement. Plans are under discussion with a consortium (including CO₂CRC) for a possible demonstration of the cycle of power generation from coal seam methane, CO₂ capture and injection into the depleted coal.

cLET

The Centre for Low Emissions Technology (cLET) is a partnership between the Queensland Government, CSIRO, Stanwell, Tarong, ACARP and the University of Queensland.

The primary focus of the Centre is on research and development of next-generation low emission technologies with an emphasis on improved gas cleaning, gas separation and gas conditioning technologies for the development of Pulverised Coal (PC) and IGCC based, advanced power and/or hydrogen and syngas production technologies.

Five main programme areas of work associated with the development of the core technologies identified above will be pursued in the work undertaken by the centre. These include gasification and core facility development, gas cleaning, gas processing (or conditioning), gas separation and social and economic integration. Projects include:

- *Gasification performance of Australian coals*
This project will provide the first coherent set of gasification performance data for a suite of Australian coals (benchmarking, validation and applications data to support and extend Australian gasification R&D and determine criteria for coal tests for gasification applications).
- *National low emissions gasification research facility*
This is an initiative aimed at developing a proposal to build and operate a 5MW, national low emission gasification research and test facility for black coal. The purpose of the facility would be to undertake ongoing research critical to improving our understanding of the gasification performance of Australian coals improve gasification technologies and provide a means for the larger scale pilot and pre-commercial testing of key enabling technologies for applications in advanced IGCC power plants, H₂ burning processes, fuel cells and gas to liquid processes.

- *Syngas generator for the cLET research program*
This project will address the design, construction and operation of a small pressurised, wet and dry feed, pilot syngas generator unit rated at a 0.2 MW capacity. The pilot unit will also support some technology learning on the gasification performance and slag behaviour of Australian black coals under wet and dry feed conditions.
- *Catalysts for Water Gas Shift reaction with coal-derived syngases in fixed-bed and catalytic membrane reactors*
This project is important in providing key information on the performance of water gas shift (WGS) reaction catalysts on coal derived syngas streams.
- *Water gas shift reactions in high temperature membrane reactors*
This project addresses the breakthrough needed to extend the operating temperature regime for WGS operations at higher temperatures (up to 800 C) that increase the power cycle efficiency, and which also enable operation of future power plant with high temperature fuel cells.
- *Proof-of-concept engineering systems for membranes and catalytic membrane reactors (CMR) in coal gasification*
This project addresses the scale-up of molecular sieve silica membranes for H₂ separation and in developing a second catalytic membrane reactor (CMR) module incorporating a WGS reactor with H₂ separation.
- *Thin film metal membranes for hydrogen separation*
This project addresses H₂ separation from syngas streams at high temperature (up to 800 C) for the implementation of more advanced and higher efficiency IGCC and fuel cell based power generation cycles. It also proposes the development of thin film metal membranes that are not Palladium (Pd) based - which currently is an expensive and a scarce rare metal resource.
- *Assessing and integrating stakeholder perspectives*
The purpose of this project is to inform important stakeholders about research into cleaner generation of power from coal with near zero emissions into the atmosphere, and to provide an opportunity for those stakeholders to influence the research agenda.

Proposed CCS Projects in Australia

The application of geological storage of CO₂ in Australia will benefit from the demonstration of CCS in order to further demonstrate and verify the associated technology, operating procedures and monitoring arrangements. Australian demonstrations of CCS will also assist in formulating operating procedures and regulatory arrangements.

There are a number of CCS projects being proposed in Australia including the Gorgon Project in Western Australia, the Otway Basin Pilot Project in Victoria, the Monash Energy Project in Gippsland Basin, Victoria and the Stanwell Project in Queensland.

In particular, the CO₂CRC, together with the Australian Government, the Victorian State Government and industry will conduct the first CO₂ capture and storage project, known as the Otway Basin Pilot Project, in Australia in late 2006. The CO₂ source for the project will be natural gas with a high CO₂ content. The CO₂ will be separated and compressed, transported by pipeline and then selectively injected into storage horizons potentially ranging in depth from below 1000 metres to almost 2,000 metres. A major part of this project will be an extensive modelling and monitoring program to ensure that the movement of CO₂ can be predicted and to assess different monitoring technologies.



ATTACHMENT B

CCS Policy Issues in Australia

Prime Minister's Energy White Paper

In June 2004, Australia's Prime Minister launched the Energy White Paper. The \$500 million Low Emissions Technology Demonstration Fund was announced in the paper and will provide support for demonstrating new low-emissions technologies with significant long-term abatement potential. Eligible technologies include renewable and fossil fuel technologies as well as energy efficiency in both the stationary and transport sectors. The technologies will need to be able to achieve abatement of at least 2 per cent of energy sector greenhouse emissions in the long term and be commercially available by 2020 to 2030. The fund will leverage at least \$1 billion in private sector investment.

The Fund is currently in its development stage. Public consultations were conducted between 7 June and 8 July 2005 using the Statement of Challenges and Opportunities, which described the policy context for the Fund and explains how it would operate. It is expected that the first round of project proposals will be invited between August to December 2005. Current planning is for project proposals to be assessed in the first half of 2006, with funding being made available to successful projects in 2006-07.

Regulatory Guiding Principles for CCS

In the absence of predictable and transparent regulatory mechanisms specific to CCS and uncertainty as to the adequacy or otherwise of generic regulatory processes, the Ministerial Council on Mineral and Petroleum Resources (MCMPR), in September 2003, established a Regulatory Working Group for CCS to develop a set of draft regulatory guiding principles for CCS. On 29-30 July 2004, MCMPR agreed to draft guiding regulatory principles for CCS on the condition that broader public consultation take place on the draft principles prior to Council agreement on final principles. The Commonwealth Office of Regulation Review (ORR) determined that a COAG Regulation Impact Statement (RIS) was required. A Consultation COAG RIS was subsequently released for public comment on 8 October 2004 with the public comment period closing on 29 November 2004. All submissions are available at www.industry.gov.au/ccs.

A key message from the COAG RIS submissions was that broader consultation was a necessary component in the revision of the COAG RIS and guiding regulatory principles, to ensure community understanding and acceptance of CCS as a safe technology in dealing with climate change. As a result, a highly consultative process was undertaken and this consultation, in addition to the public submissions and the further advice commissioned by MCMPR, was used to revise the principles and associated COAG RIS. A CCS Stakeholder Group (CCSSG) was established in December 2004 to provide specific expertise to the Regulatory Working Group. The CCSSG, comprising of Commonwealth and State Governments, industry, green non-government organisations and research groups, The CCSSG to consider legal, technical and financial advice commissioned by MCMPR, review COAG RIS submissions and consider other comments received to revise the principles and COAG RIS.



The regulatory guiding principles for CCS relate to areas that need to be addressed for project proponents, in particular the following six key issues:

- property rights, especially in relation to access to storage sites;
- what the requirements might be for authorisation and compliance;
- what regulatory regime will apply to the transport of CCS streams;
- what the requirements might be for monitoring and verification;
- how liabilities will apply, especially given the long-term nature of CCS projects; and
- what arrangements will apply to various post closure matters, such as meeting obligations after injection ceases and any long term liability costs from CCS activities.

On 17 June 2005, MCMPR's Standing Committee of Officials (SCO) recommended that MCMPR Ministers agree to:

- the set of draft regulatory guiding principles on CCS;
- jurisdictions implementing the principles for a regulatory framework for CCS in a nationally consistent manner; and
- launch the agreed guiding regulatory principles and associated COAG RIS.

The principles will now be put forward to MCMPR Ministers for endorsement in late 2005. The principles are high-level, non-binding and will underpin the development of a nationally-consistent regulatory framework for CCS in Australia. These processes are required to give effect to a nationally consistent framework for CCS which will provide industry with an investment climate conducive to the uptake of CCS and ensure integrity of abatement of long-term storage for carbon dioxide.

Current Regulation

Advice from the Australian Government Solicitor (AGS) cites the issues surrounding the regulation of CCS activities vary between jurisdictions. For some CCS activities in some jurisdictions, such as South Australia and Queensland which already cover the injection of carbon dioxide into storage sites, no new regulation is required. However, in all jurisdictions existing pipeline regulation can be readily adapted to include the transportation of a CCS stream. The requirements for the regulation of CCS offshore in the Australian EEZ are also being considered in the context of existing national legislation and international obligations. In addition, environmental principles in the context of CCS have been adequately addressed by all Australian governments in the past, and any regulatory framework for CCS would need to adhere to the Ecologically Sustainable Development (ESD) principles agreed to by the Council of Australian Governments (COAG) in 1992. Further, the Intergovernmental Agreement on the Environment (between the Commonwealth of Australia and all States and Territories and the Australian Local Government Association) (1992) outlines that all parties agreed that the precautionary principle, intergenerational equity and the notion of polluter pays should inform policy making and program implementation. Similarly, there are a number of COAG agreed principles relating to occupational health and safety, with the most applicable to CCS being those agreed in relation to minesite safety.

Work is now underway in a number of jurisdictions to ensure that legislative changes required for proposed projects are made and that the principles are implemented in a nationally consistent manner. Without a nationally consistent framework, key areas of concern for industry would include potential duplication of administration and additional costs and inefficiencies caused by different requirements across jurisdictions. Similarly, without a nationally consistent approach it may be difficult to obtain overall community acceptance of CCS as a safe and viable technology for dealing with climate change.



COAL21

COAL21 is a collaborative partnership between the coal and electricity industries, Australian Federal and State Governments, labour unions and the research community. The partnership commenced in 2003 with the aim of first identifying and then realising the potential for reducing or eliminating greenhouse gas emissions that arise from the use of coal in electricity generation in Australia. In March 2004, the Minister for Industry Tourism and Resources, the Hon Ian Macfarlane MP, launched the COAL21 National Action Plan. This plan identifies key clean coal technologies for Australia and a clean coal technology road map. The key COAL21 technologies and activities identified in the National Action Plan are:

- Facilitate CO₂ capture and geological storage through research, pilot plants and large scale demonstrations
- IGCC demonstration plants for black and brown coal
- Research potential for retrofit options including oxyfuel combustion and post combustion capture
- Further development of lignite drying and dewatering technologies
- Further development of Ultra Clean Coal
- Improve efficiency of existing technologies
- Ensure new plants use best available technologies and/or are sequestration ready
- Utilise coal seam methane and flyash to reduce life cycle emission in other sectors
- Foster greater community awareness of the role of clean coal technologies and low emissions technologies in reducing greenhouse gas emission.

The Inaugural COAL21 Annual Conference in Sydney in April 2005 brought together industry stakeholders, government and community representatives from Australia and internationally to review initial progress in implementing the National Action Plan. The 2005 COAL21 Annual Review, which was formally presented to Minister Macfarlane at the conference, highlighted the increase in research activity since the launch of the National Action Plan, both within Australia and internationally. A number of proposals also emerged in Australia for pilot or demonstration plants which are being facilitated by the Australian Government's \$500 million Low Emission Technology Demonstration Fund. The COAL21 network has also been strengthened with a number of new members including two coal industry participants from New Zealand.

A major focus of COAL21 activities since April 2005 has been the COAL21 Review of Australian R,D&D Activities by the IEA Clean Coal Centre. More recently COAL21 has initiated a review of funding and institutional arrangements for coal R&D in Australia. The review of R,D&D Activities is necessary to ensure R&D resources are efficiently allocated, to identify and address research gaps and to ensure proposed demonstration projects are supported and value added through adequate R&D programs. The review of funding and institutional arrangements takes into consideration that major coal industry research institutions such as the Cooperative Research Centre for Coal in Sustainable Development (CCSD) and the Centre for Low Emission Technologies (cLET) are only guaranteed funding through to around the end of 2007.



ATTACHMENT C

Australian Government International Collaboration on CCS

CSLF

Internationally, Australia has been an active member of the CSLF since its inception in June 2003. Australia remains Vice President of the Policy Group. On the Technical Group side of the forum, Australia chairs a taskforce on storage capacity estimation methodologies. The Minister for Industry, Tourism and Resources (Commonwealth) and Minister for Energy Industries and Resources (Victoria) hosted a very successful 2nd Ministerial Level meeting of the CSLF in Melbourne from 13-15 September 2004. Importantly, the Ministerial Meeting confirmed the participants' continued support for the cooperation in the development of CCS.

A key policy benefit gained by Australia from its membership in the Carbon Sequestration Leadership Forum (CSLF) is a greater understanding of CCS policy in other countries, particularly in relation to liability issues.

IEA (International Energy Agency)

At the recent IEA Working Party on Fossil Fuels meeting in Lisbon, it was agreed that a legal issues committee comprising the Netherlands, Norway, UK and Australia (Chair) be established to progress legal issues associated with carbon capture and storage (CCS) activities. Subsequently, it was proposed that an IEA Legal Issues Workshop be held in mid 2006.

This work will follow on from the joint IEA (Working Party on Fossil Fuels)/CSLF *Legal Aspects of CCS* Workshop held in Paris in July 2004. This workshop was an important step to improve understanding of legal aspects of storing CO₂. Uncertainties and gaps were identified and participants noted their desire for continued co-operation on these issues. An overview of the main legal and regulatory issues raised during the Paris Workshop were also highlighted in the IEA's *Legal Aspects of Storing CO₂* publication released in March 2005. The publication highlighted five priority areas for future work, including:

1. **Increase the number of CO₂ storage demonstration projects, including CO₂ enhanced oil recovery (EOR), focusing on long-term storage and monitoring aspects** in order to establish criteria for optimal siting, verify the results and assess environmental impacts of carbon storage and establish monitoring benchmarks and risk management practices. Increase public-private partnerships to achieve this goal.
2. In the short-term, governments should ensure that there is an **appropriate national legal and regulatory framework for more storage demonstration projects**. In the interest of time, and given the diversity of institutional setups and policy processes between States, working at the national and/or provincial/state level using existing legal frameworks might be the preferred route. Longer term national frameworks should be formulated on the basis of adequate empirical knowledge about the conditions and risks of long-term storage.
3. Contracting parties to international instruments should **take a pro-active approach to clarifying the legal status of carbon storage in the marine environment protection instruments**, taking into consideration not only their marine environment protection objectives, but also their objectives regarding climate change mitigation, energy security, sustainable economic development and poverty reduction.
4. **Governments should create a level-playing field for CCS with other climate change mitigation technologies** in the various climate change mitigation instruments, including market-oriented emission trading schemes.
5. Both the public and private sectors should **increase public awareness and work on gaining public acceptance** of CCS by increasing the transparency of their activities and making information about on-going projects available to the public.



London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention) & the 1996 Protocol to the London Convention

Australia is a Party to the London Convention and the 1996 Protocol, which aim to prevent marine pollution caused by dumping. (Note: the 1996 Protocol is not yet in force). The issue of CCS was raised at the Consultative Meeting of the Parties to the London Convention in 2004. Australia became a member of the 'Working Group on CO₂ Sequestration in Geological Structures', which was established at that forum to examine CCS in the marine environment and its consistency with the London Convention and the 1996 Protocol.

CCS is an item on the Agenda for the 2005 London Convention Meeting in October, and the Australian delegation will be discussing the role of the Convention and Protocol with other Parties at that time.

APEC

The Asia Pacific Economic Cooperation established the Energy Working Group (EWG) in 1990. Australia has played a lead role within the EWG since its inception, serving as both Chair and Secretariat. The Energy Working Group has recently begun a multi-phase project to promote the adoption of CCS technologies in the Asia Pacific region.

The first phase is a desk top study of the geological prospectivity for carbon dioxide subsurface storage in selected Member Economies. The study was undertaken on behalf of the EWG by Australia's Cooperative Research Centre for CO₂ (CO₂CRC) with the assistance of Geoscience Australia. The project was managed within the Expert Group on Clean Fossil Energy by Canada. The study focused on China, Indonesia, South Korea, Malaysia, Philippines, Chinese Taipei and Thailand. The report found that some countries may have to plan the location of CO₂ emitting power stations. The report, entitled "CO₂ Storage Prospectively of Selected Sedimentary Basins in the Region of China and South East Asia", is available on the EWG website.

The second phase, involving preparation of training materials on geological sequestration for use by APEC has recently been completed. The project was undertaken by a consortium lead by Delphi Group from Canada, with the project overseen by Australia under the Expert Group on Clean Fossil Energy. The project produced written materials on issues associated with carbon capture and geosequestration. As part of the project, the EWG held a two-day workshop to go through the training materials and gain feedback from participants. The workshop was held in Seoul, South Korea, 20-21 January 2005, immediately after the 1st International Symposium on CO₂ Reduction and Sequestration. Over 100 Koreans from industry, government, academia, and non-government organisations attended the APEC training workshop with the consultants receiving valuable feedback on the training materials. The project has been completed and the training materials are available on the EWG website.

A third phase will commence this year and will be overseen by Australia. It will continue the work of both the previous projects, by refining the training materials produced by the Phase 2 project, and delivering the training materials in at least 2 additional APEC Economies. The project is in its initial stages with workshops proposed in the near future.



Bilateral Work

- Japan

Australia and Japan have common interests in the development of clean coal technologies. There are mutual benefits and value to be gained from industry and researchers in both countries working together to share information, address similar challenges and achieve common goals. These opportunities will be explored further at a workshop to be held in Aichi in September 2005 on 'CO₂ Capture & Separation'. The workshop will bring together researchers from Australia and Japan with the aim of sharing results on current research and development activities and facilitate future collaborative projects. At the workshop, CSIRO from Australia and JCoal from Japan, as leading coal research agencies in both countries, will sign a R&D Joint Statement – *The Aichi Coal Agreement* - outlining their commitment to cooperation and collaboration.

The CO₂CRC will also be signing a research cooperation agreement with Meiji University.

- China

Australia is exploring ways that it can support the development of China's CO₂ capture and storage capabilities. Australia is formulating a project with China that will identify China's CO₂ storage reservoir potential and help match these with major sources of CO₂ especially coal gasification plants with low-cost CO₂ capture potential. This work will require industry backing and in-kind support from Australia's research community. The proposed bilateral project will draw on Australia's expertise and experience in mapping Australia's CO₂ reservoir potential under the GEODISC program. Opportunity for cooperation on CO₂ capture plants is also considered by Australian industry and researchers.

Asia-Pacific Clean Development and Climate Partnership

The announcement of the formation and launch of the *Asia-Pacific Clean Development and Climate Partnership* was made on Thursday, 28 July 2005 by Ministers from Australia, India, Japan, China, the Republic of Korea, and the US, at a press conference within the margins of the ASEAN Forum in Laos.

Through the *Asia-Pacific Clean Development and Climate Partnership* key developed and developing countries will cooperate to meet increasing energy needs and associated challenges, including those related to climate change and air pollution, whilst also recognising the importance of economic development. The Partnership will promote the development and deployment of energy technologies (fossil, renewable and new generation such as hydrogen and nano-technologies) and is designed to complement the UNFCCC, Kyoto Protocol and other bilateral and multilateral initiatives such as the Carbon Sequestration Leadership Forum and the G8 dialogue process.

Australia will be hosting the inaugural Ministerial meeting of the Partnership in November of this year, which is expected to agree to a charter and initial work program for the Partnership.