

Positioning Australian industry to capture possible market applications

Utilising our science skills

8.1 Australia's strong skills base in earth sciences and engineering makes it well-placed to be a leader in CCS technology. Australia has already developed an enviable reputation as a world leader in CCS science and technology. This reputation has been earned as a result of the work done by CO2CRC, APCRC and Geoscience Australia.

8.2 As the Australian Government submission notes:

The Australian industry and research community is currently well placed to play a key role in facilitating excellence in the demonstration and domestic application of CCS technology. In performing this role, Australia is also creating opportunities to export this technology to key resource markets overseas, as well as the associated intellectual property, expertise and skills.

By encouraging leadership, innovation, and investment to develop and deploy the next generation of CCS technologies, the Australian Government aims to enhance the scope for emerging new industries and jobs, economic growth, together with improved energy security and protection for our environment...

Research into gasification by the Centre for Low Emissions Technologies (cLET) and the Cooperative Research Centre for Coal in Sustainable Development (CCSD), coupled with pre- and post-combustion research by the CO2CRC and the 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 options.¹

8.3 In relation to the skills base required, the Australian Government submission refers to the work of the CSLF policy group, which identified the following skill requirements:

- Geology, including geophysics;
- Geo-engineering, including reservoir engineering, and hydrogeology;
- Process engineering, including electrical & chemical engineering; and
- Power engineering.²

8.4 In its submission to the Committee, Chevron states that the strength of Australia's skills base in this area is dependent upon demonstration projects proceeding and the continuing support of the subjects of earth sciences and engineering in the tertiary education sector and through the CRC for Greenhouse Gas Technologies.³

8.5 The Australian Government submission suggests that while the current science and engineering skills base is adequate to support CCS in the developmental stage, should the technology reach a stage where it is to be deployed on a commercial scale then a more 'substantial' skills base will be required.⁴

8.6 In particular, Anglo Coal maintains that:

The longer term adequacy of the supply of suitably trained young geoscientists will...need to be addressed. Whilst there are a number of positive initiatives in this area being undertaken by the CO2CRC, there appears to be a case for

1 Australian Government, *Submission No. 41*, p. 21.

2 Australian Government, *Submission No. 41*, p. 22.

3 Chevron Australia, *Submission No. 12*, pp. 11 & 15.

4 Australian Government, *Submission No. 41*, p. 20.

establishing a new and more focussed initiative to develop centres of excellence for training petroleum and CCS scientists and technologists.⁵

- 8.7 With regard to capture technology, Australia is fortunate to already have a significant skill base within universities and CSIRO.⁶ It is expected that accessing skills to advance storage technology will improve over time as domestic oil production falls and key technical personnel from the petroleum industry will be able to continue similar employment in the emerging CCS sector.⁷
- 8.8 Unfortunately, the opposite seems to be currently occurring with geoscientists being lured away from CCS research into the petroleum and mining industries by the offer of higher salaries. The current resources boom has made it very difficult for institutions such as CSIRO and CO2CRC to compete for the services of skilled scientists. According to Anglo Coal:
- This skills shortage arises initially from limited numbers of young geoscientists coming through our universities and being trained in petroleum and CCS expertise, but is currently being exacerbated by the competing demand for oil exploration geoscientists. The salaries available for young geoscientists for oil exploration are very much higher than they can earn as employees of CO2CRC organisations, or Geoscience Australia. As a consequence, there has recently been a steady drift of CCS geoscientists to the oil industry, making it difficult to maintain the schedules for established programs or to implement new programs.⁸
- 8.9 In addition to the shortage of scientists, it has also been suggested that there is a need for a greater number of professional engineers.⁹
- 8.10 Nevertheless, continued support for CCS technology is not expected to require new skill sets but will rely on continued support for the development of higher-level skills, particularly those associated with the resources sector.

5 Anglo Coal, *Submission No. 24*, p. 22.

6 Includes activities such as solvent scrubbing, various membrane separators, solid adsorbents, and cryogenic separations.

7 CSIRO, *Submission No. 10*, p. 7.

8 Anglo Coal, *Submission No. 24*, p. 22.

9 Engineers Australia, *Submission No. 21*, p. 4.

- 8.11 A recent report from the National Institute of Labour Studies¹⁰ suggests that more than 7 000 extra professionals will be needed by the resources sector in Australia over the next 10 years, in addition to more than 22 000 skilled workers (e.g. operators) and 26 000 workers in the mechanical and electrical trades.¹¹
- 8.12 To address these needs, the Australian Government submission identifies a number of initiatives intended to meet present and projected skills needs. These include the Industry Skills Councils (ISCs) which provide a way for industry skill needs to be identified, communicated and serviced, as well as having primary responsibility for developing and maintaining training packages. Specifically with regard to the development of skills in resources sector, the submission identifies the Manufacturing Industry Skills Council and the Resources and Infrastructure Industry Skills Council (RIISC).¹²
- 8.13 The submission also describes a number of initiatives intended to promote trades including \$351 million over the next five years from 2004-05 to 2008-09 to assist more young Australians entering traditional trades through the establishment of 25 Australian Technical Colleges. This includes four regionally based colleges that will undertake mining related trade training and industry placements.¹³
- 8.14 Further support from the Australian Government is provided for the science, engineering and technology skills through a number of initiatives under *Backing Australia's Ability*.¹⁴
- 8.15 Australia has also taken a leading role in the development of national and international regulatory frameworks for CCS relying on 'expertise in policy analysis, legal and regulatory issues, and communication skills'.¹⁵

10 National Institute of Labour Studies, Flinders University on behalf of the Chamber of Minerals and Energy of Western Australia, *Labour Force Outlook in the Minerals Resource Sector, 2005-2015*, May 2006.

11 Australian Government, *Submission No. 41*, p. 23.

12 Australian Government, *Submission No. 41*, pp. 23-24.

13 Australian Government, *Submission No. 41*, p. 24.

14 Australian Government, *Submission No. 41*, pp. 25-26.

15 Australian Government, *Submission No. 41*, pp. 21-22.

Building and marketing our skill base

8.16 The Committee was advised of a number of initiatives taking place, which are designed to build and market Australia's skill base in this area:

- As part of its role in furthering the science of CCS, CO2CRC has 32 post-graduate students on placement in select universities. The development of capture technologies within these universities is being carried out within the CO2CRC program. These students will play a key role in shaping the future of CCS technology. However, given the likely size of the CCS industry, more specialists will be needed.¹⁶
- cLET is a joint venture partnership between the Queensland Government, CSIRO, University of Queensland, Australian Coal Research Limited, Stanwell Corporation and Tarong Energy Corporation. This centre has two main objectives; to develop technologies to produce low emission electricity and to produce hydrogen from coal.¹⁷
- CSIRO is building up skills through its work performed within the Energy Transformed National Research Flagship program. The focus of the CSIRO work is the application of capture technology to power generation systems utilising both the conventional pulverised fuel fired plants and the next generation IGCC plants. The pilot plant has been designed to be relocated to different power stations around Australia to test results of operational conditions.¹⁸
- The Centre for Energy and Environmental Markets, University of NSW, brings together the research skills of various faculties to undertake key research into operational and environmental issues in the relation to electricity markets.¹⁹

8.17 CO2CRC refer to a "Team Australia" approach which has enabled Australia to develop a significant body of CCS expertise in a relatively short period of time and this, in turn, has allowed Australia to "punch

16 CO2CRC, *Submission No. 36*, p. 21.

17 Centre for Low Emission Technology, *Submission No. 7, Position Paper*, p. 2.

18 CSIRO, *Submission No. 10*, p. 7.

19 The Centre for Energy and Environmental Markets, University of NSW, *Submission No. 33*, p. 2.

above its weight" in global CCS research, development and deployment.²⁰

- 8.18 According to CO2CRC, such an approach must be retained and strengthened:

Having a range of separate organisations in Australia all aspiring to develop their own expertise in geosequestration research and education would lead to loss of critical research mass and diminish Australia's standing in this crucial topic. It is also essential that a coordinated approach is taken to university education and training in the evolving area of geosequestration.

Training in geosequestration is to be encouraged and supported, but it must be coordinated through a body such as CO2CRC, to ensure quality, leading edge, user-focussed education and training, not only for the benefit of Australia, but also for the benefit of other countries such as India and China, which face major challenges in addressing future energy and greenhouse gas issues.²¹

- 8.19 CO2CRC went on to assert that:

if Australia is to maintain its world standing, it makes no sense to develop numbers of small, potentially non-viable geosequestration research groups.Australia's science base can only afford one major program focussed on geosequestration. CO2CRC and its Core Participants, working in collaboration with organisations such as [cLET] and with international partners, can meet national and industry CO₂ mitigation needs as well as make a major contribution to the resolution of international greenhouse gas issues.²²

- 8.20 The skills base will develop further as a number of CCS demonstration projects commence over the coming years. The first hand experience gained from bringing these demonstration projects to fruition will further enhance our reputation in CCS science. However, a more critical obstacle needs to be addressed: that of the lack of students entering universities to study science. Currently this problem is being compounded due to the resources boom and the
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20 CO2CRC, *Submission No. 36*, pp. 21-22.

21 CO2CRC, *Submission No. 36*, p. 22.

22 CO2CRC, *Submission No. 36*, p. 22.

ability of this sector to offer far more attractive salaries to the already scarce science labour market.

- 8.21 Both the Victorian and Western Australian Government submissions highlighted the skills base that has been developed in Australia and the need to ensure this is developed further to secure Australia's lead position in CCS technology and regulation.²³
- 8.22 If Australia hopes to market the emerging technology to other major coal-using countries such as China and India then the commitment to develop and broaden the skills base must be given the same level of attention as the commitment to RD&D.

Developing and identifying CCS market opportunities

- 8.23 CCS technology is just one of a number of strategies that are presently under consideration throughout the world to combat the problem of greenhouse gas emissions. Realistically, if Australia were to just develop CCS to deal with its own CO₂ emissions then very little will be achieved in the fight against climate change. Therefore, in order to make significant inroads into greenhouse gas abatement, any CCS technology that is successfully developed and demonstrated in Australia should be on-sold to other countries that are still very dependent on fossil fuels.
- 8.24 BP Australia stated:
- With its world-class knowledge base, well-defined storage capacity and vast reserves of fossil fuels, Australia is exceptionally well-placed to become a world leader in CCS technology, both to secure the value of its own resources, and to export technology and know-how internationally.²⁴
- 8.25 While noting that the main purpose for CCS is climate change mitigation, the Australian Government submission also notes that development of the technology presents possible market opportunities for Australian industry. Specifically, the submission notes Australia's expertise in site mapping may be valuable.²⁵

23 WA Government, *Submission No. 26*, p. 7; Government of Victoria, *Submission No. 42*, p. 5.

24 BP Australia, *Submission No. 43*, p. 14.

25 Australian Government, *Submission No. 41*, p. 34.

- 8.26 CSIRO said that in order to position Australian industry to take advantage of market opportunities that will arise from CCS, it is necessary to undertake pilot or commercial demonstration projects to identify the key challenges and develop the technology.²⁶ If Australia develops the technology then it will be in a position to access a potentially very large international market including the provision of technical expertise, research, collaboration, bilateral agreements and technology transfer.²⁷ CSIRO is not just talking about the CCS industry but all the flow-on activities such as the development of CO₂ resistant cements for use in well sealing and tools for detecting and measuring CO₂ from within storage reservoirs.²⁸
- 8.27 Chevron emphasised that projects such as the Gorgon Project have the potential to demonstrate Australia's position as a leading nation in the implementation of this technology as a greenhouse gas emission tool.²⁹ Chevron also highlighted its commitment to making the data from its monitoring activities publicly available.
- 8.28 Chevron noted the importance of Australia's involvement with international fora such as the CSLF and AP6 which will ultimately assist in the transfer of CCS technologies to developing countries.³⁰
- 8.29 Anglo Coal also believes that Australia has made a good start in establishing a leadership position in CCS stating that:
- Australian industry will have a solid platform from which to capture new market applications arising from R&D and deployment, as well as to continuing derived value for a nation from our coal resources and markets.³¹
- 8.30 Anglo Coal noted that one of the key requirements for the widespread deployment of CCS technologies is a supportive skills base. As outlined above, this base has been somewhat eroded in recent years due to the offer of more attractive remuneration in the oil and gas sector and more generally in the booming resources sector.³²

26 CSIRO, *Submission No. 10*, p. 8.

27 CSIRO, *Submission No. 10*, p. 8.

28 CSIRO, *Submission No. 10*, p. 8.

29 Chevron Australia, *Submission No. 12*, p. 3.

30 Chevron Australia, *Submission No. 12*, p. 3 & 15; Australian Government, *Submission No. 41*, pp. 32-33.

31 Anglo Coal, *Submission No. 24*, p. 26.

32 Anglo Coal, *Submission No. 24*, p. 26.

- 8.31 On the other hand, Greenpeace argues that market opportunities are being lost by Australia's continued lack of support for renewable energy options stating:

Focusing on how to position industry to capture possible market applications of CCS is therefore betting on the wrong horse. By putting the majority of resources and capacities towards the development of geosequestration technology, Australia is setting the seal on its dependence on coal as the primary energy resource.³³

- 8.32 The spin-off according to BP Australia is that the successful development and demonstration of CCS will provide global marketing opportunities and this will in turn help reduce the costs and increase its market competitiveness.³⁴

Maintaining our international competitiveness

- 8.33 Central to the goal of achieving clean energy is the desire to maintain Australia's international competitiveness that is currently underpinned by its access to cheap energy. In the absence of any market incentives, the current cost of CCS would erode this competitiveness and put a number of industries at risk.

- 8.34 According to many submissions, a market driven carbon trading system would provide the necessary incentive in a technology-neutral manner. However, in order to maintain our competitiveness, many would argue that Australia should be part of a global emissions trading scheme.

- 8.35 The ACA stated in its submission that:

Seeking to reduce greenhouse gases by establishing an Australian or other sub-regional carbon price in the current environment will simply act as a blunt and largely ineffective instrument of change and a tax impost. Moreover, in the absence of suitable step-change technologies, costs imposed in one zone will merely drive activity to a different zone that does not have the same restrictions.³⁵

33 Greenpeace Australia Pacific, *Submission No. 15*, p. 23.

34 BP Australia, *Submission No. 43*, p. 14.

35 Australian Coal Association and Minerals Council of Australia, *Submission No. 40*, p. 6.

8.36 These issues were the subject of consideration by the Prime Minister's Task Group on Emissions Trading which reported on 31 May 2007 (see Chapter 6 for further discussion). In its Issues Paper, the Task Group re-iterated the position of the Australian Government's Energy White Paper, in which it identified emissions trading as a potentially least-cost approach to reducing emissions subject to an effective global approach being in prospect.³⁶

8.37 The Task Group said:

Emissions trading is a more flexible market-based policy tool than imposing a carbon tax on industry. It requires emitters to hold permits that provide the right to emit a certain amount of greenhouse gases and allows them to buy and sell permits in an open market. Such a system works because only enough permits are allocated to ensure total emissions are curtailed over time, and industry uses the open market to discover the lowest cost ways of reducing emissions. A tradeable permit market creates an explicit carbon signal which allows business greater certainty in taking long term investment decisions and allows for the development of financial instruments to manage risk.³⁷

Conclusions

8.38 Australia can be rightly proud of the skill base it has built up over the years in a range of earth science and engineering disciplines. Fortunately, the skills set for CCS is not new, the challenge faced being one of applying these current skills to a new problem in order to realise the full commercialisation and economic viability of CCS.

8.39 However, the strong skill base in Australia has been under threat in recent years due to two key factors.

8.40 Firstly, the resources boom has placed a great deal of pressure on the recruitment of science and engineering personnel to fill jobs in the mining sector. This sector has been able to attract highly qualified people from important research areas by being able to offer far more attractive remuneration packages. This transfer of personnel is likely to continue in the near future as the industry continues to grow.

36 Task Group on Emissions Trading, *Issues Paper*, February 2007, p. 4.

37 Task Group on Emissions Trading, *Issues Paper*, February 2007, p. 4.

- 8.41 The second issue is a more generic problem and that is to do with a general lack of students undertaking undergraduate engineering and science courses.
- 8.42 The skills base in CCS technology will continue to be developed through CSIRO, CRC programs and Geoscience Australia provided they are given the appropriate levels of funding to attract and retain qualified people.
- 8.43 While most stakeholders have accepted the need for a price to be placed on carbon emissions, some have argued that the establishment of an emissions trading scheme should not be rushed.³⁸ Rather priority should be given to developing and demonstrating CCS technology so that industry will be in a better position to make decisions about future low-emission investments. At present the biggest impediment to the commercial uptake of CCS is its cost and this will only be reduced if sufficient time, money and effort is spent on further research, development, demonstration and deployment.
- 8.44 If this can be achieved, then notwithstanding the fact that this technology will primarily help address our greenhouse gas emissions and related climate change issues, other market opportunities may arise as the rest of the world also seeks ways to deal with its emissions. There is the potential that Australia's position as leaders in the development of these technologies may result in the capitalisation of major export and market prospects from this industry.

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Chair

13 August 2007

38 For example see, The Australian Coal Association and the Minerals Council of Australia, *Submission No. 40*, p. 13; Mr M. O'Neil, *Transcript 21 November 2007*, p. 8.

