

## Australian ENGO views on CCS

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P2009/808  
1<sup>st</sup> May, 2009

Prepared for the Carbon Storage Taskforce





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## EXECUTIVE SUMMARY

This report summarises the results of a one day workshop held with five environmental non-governmental organisations (ENGO's) of Australia. In total six representatives participated in the workshop. Currently, the Carbon Storage Taskforce – Community Working Group has a remit to examine potential community concerns about carbon capture and storage issues and make recommendations on potential approaches for addressing them. As part of their stakeholder mapping exercise, the Community Working Group identified the ENGO's as a key influential stakeholder group.

The main aims for this research project included:

- To bring together the range of influential ENGO's to Sydney for a one day workshop to openly discuss their issues and concerns about CCS.
- To record the key concerns and identify where potential blockages may occur within this stakeholder group by analysing qualitative and quantitative data arising from the workshop.
- Identify key reference individuals for the organisations and how they impact on their current perspective of CCS.
- Continue the dialogue with this group of stakeholders by collecting information from international research projects which may help to inform individual positions on CCS with the latest research findings.

An external facilitator was engaged to facilitate the process. Participants were asked to complete an inventory at the beginning and the end of the workshop to allow the researchers to quantify the ENGO issues and concerns. The items used in the inventory were adapted from the Wright et al. CO<sub>2</sub> Capture Project (CCP2) 2007 report *Public perceptions to carbon dioxide capture and storage: Prioritised assessment of issues and concerns*. In the report, Wright et al. identified a number of potential issues in relation to deployment of CCS which were applied to the current study.

The entire day's discussions were recorded and transcribed verbatim. The resulting transcripts produced a corpus of 38,054 words. The transcripts were then content analysed to identify common themes and key issues and concerns.

Based on the analysis of both the qualitative and quantitative data a number of key issues and concerns arose. These included:

- The urgency of the problem of climate change;
- A preference for a portfolio approach;
- Privileging of CCS interests and the “silver bullet syndrome”;
- Technological concerns and the absence of trustworthy information;
- Whether other stakeholders including the lay public appreciated the scale of infrastructure required for CCS;

- The importance of communication, and that for now there was seen to be an absence of accurate and easily accessible information available to individuals.

Drawing on the ideas that arose as a result of the work a number of recommendations arose for consideration by the Carbon Storage Taskforce. These included:

1. There is a need to raise the sense of urgency around combating climate change at all levels of society.
2. All key stakeholders need to actively promote the need for a portfolio approach to mitigate climate change and avoid picking winners. That is, not playing off CCS against renewable energy forms or privileging one solution over others. Ideally ENGO's would like to see a common message that is understood and supported by government, industry and the general public.
3. There is a need to engage all stakeholders with a vested interest in low emission energy technologies to ensure they also promote and understand the portfolio approach.
4. Any solution for greenhouse gas mitigation should include energy efficiency measures. ENGO's felt that the Australian Government – at all levels – has a responsibility to promote and raise awareness of energy efficiency measures available to the average householder and industry.
5. A shorter, more compact version of CSIRO's Energy Futures Forum would be helpful to inform Australia, and the delegation to Copenhagen. The forum could aim to clarify the life cycle analysis of all low emission technologies, identify the true costs of each technology and their realistic deployment date.
6. Longer term forecasting, beyond the 2020 deadline for CCS deployment is also necessary to show the range of stakeholders that this is part of an ongoing commitment to address climate change.
7. Need increased communication about CCS that is easy to understand, accessible and in the right format so that individuals will want to read and learn more about the technology.

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## 1. INTRODUCTION

The Carbon Storage Taskforce - Community Working Group has a remit to examine potential community concerns about carbon capture and storage issues and make recommendations on potential approaches for addressing them. As part of their stakeholder mapping exercise, the Community Working Group identified Environmental Non-Government Organisations (ENGO's) as a key influential stakeholder group.

Although some of the ENGO's and their international affiliations openly express their opposition to CCS, many of these viewpoints are not well documented at the local level. It was felt that understanding the issues and concerns of such an influential group would help the Carbon Storage Taskforce to ascertain the key sticking points as well as identify what further information and research may be required by the various groups and therefore inform a wider communication strategy.

This research project has several aims which include:

- To bring together the range of influential ENGO's to Sydney for a one day workshop to openly discuss their issues and concerns about CCS.
- To record the key concerns and identify where potential blockages may occur within this stakeholder group by analysing qualitative and quantitative data arising from the workshop.
- Identify key reference individuals for the organisations and how they impact on their current perspective of CCS.
- Continue the dialogue with this group of stakeholders by collecting information from international research projects which may help to inform individual positions on CCS with the latest research findings.

## 2. METHODOLOGY

Key ENGO's from Australia were identified and invitations were sent to their leading representatives. The majority of the NGOs have a dedicated representative working on energy and climate change. Five of these organisations were able to send a participant to the workshop, with one organisation sending two representatives. Unfortunately four of the invited organisations were unable to attend - mainly due to resource issues.

### 2.1 Workshop process

The main purpose of the workshop was to facilitate a critical evaluation of CCS technology with a range of Australian NGO representatives. Participants were asked to complete an inventory at the beginning and the end of the workshop to allow the researchers to quantify the ENGO issues and concerns. A copy of the inventory can be found at Appendix A. The items used in the inventory were adapted from the CO2 Capture Project (CCP2) 2007 report *Public perceptions to carbon dioxide capture and storage: Prioritised assessment of issues and concerns*. In this report, Wright et al. identified a number of potential issues in relation to deployment of CCS. The entire day's discussions were recorded and transcribed verbatim. The resulting transcripts produced a corpus of 38,054 words. The transcripts were then content analysed to identify common themes and key issues and concerns. The detailed process for the day is reflected in Table 1 below. The objectives for the day stated that at the conclusion of the workshop, ENGO's would be able to state with some clarity:

- Any issues and concerns groups have in common in relation to CCS technology
- Any issues and concerns that are specific to your agency in relation to CCS technology
- Your critical evaluation of CCS technology
- Voice key messages for the consideration of the Carbon Storage Taskforce and its constituents
- Create an avenue for ongoing dialogue around energy technologies and carbon mitigation strategies that can inform non-government, government and industry policies and research priorities

Table 1: NGO Workshop Process

Session	Start	Time
Welcome and Introduction	9.30	15 mins
Round Table introductions	9:45	15 mins
Questionnaire #1 Your initial evaluation of CCS technology	10:00	30 mins
Present aggregated pre-workshop prioritised lists of concerns	10.30	15 mins
<b>MORNING TEA</b>	10.45	15 mins
Round Table Interactive Discussion – share your concerns with others at the table	11.00	60 mins

Session	Start	Time
and develop a list of common concerns based on pre-workshop and questionnaire responses, your organisation's position and your discussions to date.		
Interactive discussion with Barry Hooper and John Bradshaw	12.00	30 mins
<b>LUNCH</b>	12.30	30 mins
Reactions and points of clarification – in plenary	1.00	30 mins
Round Table Deliberation - share your concerns and reactions to the interactive discussions with others at the table and develop a list of common concerns and concerns specific to your organisation	1:30	60 mins
<b>AFTERNOON TEA</b>	2.30	15 mins
Voicing key messages	2.45	30 mins
Where to from here!	3.15	25 mins
Questionnaire #2 – Rate your concerns in relation to CCS Technology and voice additional concerns and key messages	3:40	20 mins
<b>FINISH</b>	4:00	

### 3. ISSUES AND CONCERNS

#### 3.1 Pre-workshop issues and concerns

Prior to the workshop, individual ENGO's were asked to send through their top five issues in relation to CCS, in order of priority. This was to enable the researchers some understanding of the similarities and differences between groups prior to commencement of the workshop. Unfortunately, only two groups sent in their issues prior to the workshop and both of these are listed below:

##### **Participant One**

1. A policy framework in Australia that stimulates private sector investment in R, D & D and commercialisation of CCS.
2. More R, D & D into non-fossil fuel CCS to provide information to policy makers on the viability of CCS to provide negative emissions by 2050.

##### **Participant Two**

1. We support pollution prevention over pollution control
2. We do not believe CCS can deliver emissions reductions in time to tackle climate change
3. Focussing on CCS diverts resources and energy from other, more mature, zero-emission technologies.
4. The promise of 'CCS ready' is being used as a justification to build more coal power stations, which will make the transition away from coal even harder.
5. CCS creates unnecessary legacy and liability issues.

To overcome the lack of initial responses, once introductions were made on the day, the above list of issues and concerns was circulated to participants. The participants were then asked again to record their issues and concerns. These are listed below, in the order that they were presented by each of the individuals.

##### **Participant Three**

1. Lack of transparency/independence re: research i.e. will negative/bad results be made public
2. Communication by media and politicians and public service. Overestimation of capacity, potential, timing, "greenwash" marketing.
3. CCS not carbon neutral or carbon positive – need to see life cycle analysis of technology.

### Participant Four

1. Probably not for this workshop however, I am concerned that CCS will be used to drive a wedge between NGO's
2. We need to discuss jobs. The jobs argument has been the single most effective tool in blunting our climate change advocacy. There is potential with CCS to respond to this.

### Participant Five

1. My prime concern is that the "CCS" promise will be used to justify little action in what must be a portfolio of solutions pursued concurrently.
2. Public/private partnerships must speedily "prove" or "disprove" the scalability potential by building large demonstration plants within the next five years – if there is sufficient will.

Examining these in more detail along with the discussion, it is apparent that across the group of ENGO's present there is a wide range of views. Some of the ENGO's are more supportive of the technology because they feel that CCS offers large potential for greenhouse gas mitigation. Therefore they deem it essential to demonstrate CCS at large scale as soon as possible to legitimise or discount its potential. ENGO's not supportive clearly expressed the view that investment in this technology was a diversion from other more proven and/or emerging technologies. There was also some concern expressed at the transparency of support for various technologies. This extended to some mistrust about accurate communication of research results, the actual time to market for CCS, and the future potential of this technology.

## 3.2 Inventory responses

Participants were asked to complete an inventory at the beginning and the end of the workshop to allow the researchers to quantify the ENGO issues and concerns. A copy of the inventory can be found at Appendix A. The items used in the inventory were adapted from the Wright et al. CO2 Capture Project (CCP2) 2007 report *Public perceptions to carbon dioxide capture and storage: Prioritised assessment of issues and concerns*. In the report, Wright et al. identified a number of potential issues in relation to deployment of CCS which were applied to the current study.

To explore the ENGO concerns, participants were asked to complete their level of concern for a range of items by **circling** the number that most closely resembled their level of concern with CCS; where 1= low concern and 7 = high concern. Table 2 below shows the mean responses to the issues. The first column shows the mean scores for all six participants. However, because two of the participants did not complete the final questionnaire the earlier scores have been removed and then the four remaining responses averaged to show a comparison between the responses completed at the beginning and the end of the workshop.

Analysis of the mean responses at the beginning of the workshop for all respondents show that the highest concern (6.33) was *whether the scale of the infrastructure required for CCS was well understood*. This was similar for the mean of the four respondents (6.25) which reduced to 5.5 by the end of the workshop.

The next highest concerns were whether *CCS was being oversold as a silver bullet to the detriment of renewable energy deployment* (6.00) and *that CCS is not yet ready for large scale deployment* (5.83). Comparing the responses of the four respondents, originally they were slightly less concerned (5.75) than the average of the total group in relation to the silver bullet concern, however by the end of the workshop their level of concern had increased to a mean response of 6.5. While in the second question, the four respondents had a higher mean concern of 6. This increased to an average of 6.25 by the end of the workshop.

The next highest concerns for all were rated the same (5.50) and focused on information. The three concerns included *whether information about CCS is readily available for all stakeholders; whether information about CCS is of an appropriate quality, style and language for all stakeholders; and whether there has been enough communication about CCS to the range of stakeholders*. These concerns were lessened by the process of the workshop for the four respondents that also completed the final questionnaire.

Many of the concerns were reduced over the workshop day, however closer examination shows that for the four respondents who completed both surveys, some concerns increased as a result of the workshop. These included *the adequacy of regulatory framework, both in Australia and in developing countries*, which rose from 4.25 to 5 and 5 to 5.25 respectively. The other issue that increased slightly was *whether CCS can reduce the large amounts of GHG emissions required quickly enough*. The predominant concerns suggest a need for increased information and communication about CCS to ensure it is better understood. Particularly in relation to the scale of infrastructure required and how it fits in the portfolio of options to mitigate greenhouse gas emissions.

Table 2 Aggregated responses of issues and concerns

	<i>I would rate my level of concern over:</i>	<b>T1(All)</b>	<b>T1</b>	<b>T2</b>
1	Whether there is enough storage capacity for CCS.	4.33	3.75	2.25
2	Whether the scale of infrastructure required for CCS is well understood.	6.33	6.25	5.5
3	The increased costs for deploying CCS.	4.33	4.75	4.25
4	The risk that CCS will cause harm to other humans.	3.67	2.5	1.75
5	The risk that CCS will kill humans.	2.17	1.75	1*
6	The safety of coal miners with the continued use of coal.	3.17	2.5	2.25
7	The risk that CCS will cause harm to ecosystems.	3*	2.33*	2.5
8	That CCS will acidify drinking water.	2.83	2	1.75
9	What happens to CCS if there is an earthquake?	3.67	2.25	2
10	Whether storing CCS will cause an earthquake.	1.83	1.5	1.25
11	Safety concerns where CO2 pipelines are sited.	3	2	2
12	Siting of pipelines in built up areas.	3	2.5	2
13	Whether CCS will have a positive impact on property values.	1.83	2.25	2
14	Whether CCS will have a negative impact on property values.	2.17	2.75	2.75
15	Existing land rights, once CCS projects are allocated to specific companies	3.17	3	2.75
16	The rights of land owners in CCS projects.	3.67	3.5	2.75

ISSUES AND CONCERNS

	<i>I would rate my level of concern over:</i>	<b>T1(All)</b>	<b>T1</b>	<b>T2</b>
17	Potential competing land use issues	4	4	2.5
18	Long term liability issues	4.17	3.75	4
19	The energy intensity of CCS process having a negative impact on addressing climate change	3.67	4	3.25
20	The true energy penalty for CCS not being taken into account when assessing the viability of the technology	5	5	4.25
21	The adequacy of regulatory frameworks for CCS in the developed world to address risks	4.83	4.25	5
22	The adequacy of regulatory frameworks for CCS in the developing world to address risks	5.33	5	5.25
23	The adequacy of regulatory frameworks for CCS in Australia to address risks	5	4.5	4.75
24	Whether information about CCS is readily available for all stakeholders	5.5	5.5	4.75
25	Whether information about CCS is of an appropriate quality, style and language for all stakeholders	5.5	5.25	5
26	Whether there has been enough communication about CCS to the range of stakeholders	5.5	5.5	5
27	Whether CCS can reduce the large amounts of GHG emissions required quickly enough	5.33	5.25	5.5
28	Whether other low emission technologies can reduce large amounts of GHG emissions more quickly than CCS?	3.83	4.25	4.5
29	Insufficient support to make CCS happen	4.17	5	5
30	CCS being oversold as a silver bullet to the detriment of renewable energy deployment	6	5.75	6.5
31	Using CCS for enhanced oil recovery to extend the life of the oil market	3.17	3	2.25
32	Using CCS to extend the life of coal	3.33	3.25	3
33	The potential of using CCS with biomass for negative CO2 reductions	4	4.25	3.75
34	Storing CO2 on shore	3.83	2.75	2
35	Storing CO2 off shore in geologic formations under the ocean floor	3.67	2.25	2.25
36	That CCS is seen as a long term sustainable strategy rather than a bridging strategy	5.17	4.5	5
37	That CCS is not yet ready for large scale deployment?	5.83	6	6.25
38	That renewable technologies are not ready for large scale deployment	4	3.5	3.25
39	That renewable is not yet reliable enough to provide base load energy supply	3.83	3.25	3

\* Denotes one missing response

### 3.3 Highest organisational concerns

After rating each of the questions, participants were also asked to identify the top ten (10) issues that caused their organisation most concern, where 1 was highest concern and 10 was lowest concern. The responses to these questions were quite varied. Not all participants chose to complete ten of the priorities. One ranked only their top six (6) concerns, while another only completed nine (9) in total. Examining the responses to this ranking exercise to identify patterns in the responses, confirmed that there are a number of items about which most ENGO's are not collectively concerned. These included questions 4, 5, 10 to 17 inclusive, 20, 28, 34 and 38.

There was little commonality in the items they were concerned about. The list of questions that received a ranking can be found in Appendix B. The questions that received the highest concern, that is were ranked one (1), by five of the participants included:

- Whether the scale of infrastructure required for CCS is well understood (n=2);
- Whether CCS can reduce the large amounts of GHG emissions required quickly enough;
- Insufficient support to make CCS happen; and
- CCS being oversold as a silver bullet to the detriment of renewable energy deployment.

Second highest ranked concerns included:

- The increased costs for deploying CCS;
- CCS being oversold as a silver bullet to the detriment of renewable energy deployment (n=2);
- Using CCS for enhanced oil recovery to extend the life of the oil market; and
- That CCS is not yet ready for large scale deployment

#### 3.3.1 Justifications for listing concerns

Participants were asked to explain why they ranked the questions as they did. Once again the responses are varied but to illustrate the points made, the qualitative responses have been copied verbatim below.

- “Question 29, Support for CCS is not just about RD&D. Need policy frameworks to drive deployment - carbon pricing insufficient to overcome investment barriers. Need to know whether CCS works or not quickly. Question 3, Cost is not a concern as it is relative to other low emission technology. Some other low emission technology will be as or more expensive. Question 7, Ecosystems would be a concern if developments were in sensitive areas. Besides direct impacts this would erode public support for technology. Issues around liability and leakage are not a concern only if the appropriate regulatory frameworks are not in place. Information questions – the issue is that CCS is largely promoted by proponents. More independent and trusted sources needed.”
- “CCS has potential to play an important early role in reducing emissions - however the scale at which it is needed is not yet been proven to work. The costs may prove to be much higher than expected.”



- “CCS has been poorly explained to the general community. There has been no discussion in the media about CCS that seems to be reaching beyond the policy makers. I have yet to see a simple sheet explaining the pros and cons and no discussion on what it will mean to communities.”
- “CCS is less mature than renewable energy and every site will be unique. Given we need global emission reductions by 2015 it is very hard to see how CCS can deliver it in time. The fact we are having a CCS workshop instead of solar or wind workshop, shows that CCS is being considered as a primary solution, CCS is diverting attention away from more mature solutions. It is somewhat naive to think that if CCS is commercialised, industry and governments will phase it out around 2050, given the substantial investment.”
- “Really it is a combination of above, CCS being used as a silver bullet without adequate understanding of the risks, rather than promoting/allowing investment in other forms of renewables. Above doesn't capture intergenerational equity issues, i.e. pushing problem onto future generation (e.g. if infrastructure fails).”

One participant chose not to individually rank each question, instead clustered their responses into three areas, specifying that each area was equally important. The cluster groupings and related questions are listed below.

- Timing/impact issues – the technical feasibility/independence of the research outcomes/transparency
  - (6) The safety of coal miners with the continued use of coal.
  - (26) Whether there has been enough communication about CCS to the range of stakeholders.
  - (19) The energy intensity of CCS process having a negative impact on addressing climate change.
  - (20) The true energy penalty for CCS not being taken into account when assessing the viability of the technology.
- Implementation/management issues – should it be technically feasible – do we have the legal, regulatory, fiscal and social constructs to manage the technology.
  - (18) Long term liability issues.
  - (23) The adequacy of regulatory frameworks for CCS in Australia to address risks.
  - (24) Whether information about CCS is readily available for all stakeholders.
- Concern that focus on CCS will be at the detriment of a focus on NOW solutions. That other portfolio options that can be implemented now and in the near future e.g. under 15 years will be stalled/ignored/not funded in the meantime, placing the planet at a higher risk.
  - (36) That CCS is seen as a long term sustainable strategy rather than a bridging strategy.
  - (28) Whether other low emission technologies can reduce large amounts of GHG emissions more quickly than CCS?.
  - (30) CCS being oversold as a silver bullet to the detriment of renewable energy deployment.
  - (3) The increased costs for deploying CCS.

### 3.4 Priority ranking of energy sources and related technologies

Participants were asked to rank the following energy sources and related technologies in the priority order that they would use to allocate public funds toward their continued deployment, development and implementation. Rankings were from one (1) highest priority through to (11) lowest priority so in the table a low score indicates a higher priority. Unfortunately two of the participants did not rank all of their preferences and so the mean scores are of only four respondents. Mean results for the four are provided in Table 3 below.

Table 3 Preferred energy sources

Energy source/technology	Mean
Solar	1.5
Wind	2
Geothermal (Hot rocks)	4
Wave/Tidal	4
Carbon capture and storage	4.5
Biofuels	6.25
Natural Gas	6.75
Hydro electric	7
Coal	9.25
Oil	9.75
Nuclear	11

The preferred technology was solar closely followed by wind which corresponds with how the general public usually respond to the question. It is consistent with the idea that across Australia and the world, there is a strong preference for renewable energy sources. Nuclear was the least preferred technology for all participants. Almost all of the participants made note of the fact that energy efficiency was not included in the list. One recording that:

*The energy efficiency (demand reduction) technologies, behaviour changes and incentives need to be pursued just as hard as the supply side solutions!*

Two participants chose not to complete all of the rankings. Their responses included:

*I think the funding for R &D should be based on the maturity of existing technology and availability of resources, and of investment opportunities (i.e. manufacturing for export).*

*Energy efficiency should be the number one especially in buildings (design/operation), materials and appliances.*

## 4. KEY THEMES

The following section details the main issues that arose from the discussions through out the day. The entire day’s discussions were recorded and transcribed verbatim. The resulting transcripts produced a corpus of 38,054 words. The transcripts were then content analysed to identify common themes and key issues and concerns. Four key themes were identified and these are summarised below and then expanded on in the following pages.

1. Urgency of the problem;
2. A preference for a portfolio approach;
3. Privileging of CCS interests and the “silver bullet syndrome”; and
4. Technological concerns and the absence of trustworthy information.

### 4.1 Urgency of the problem

Fundamentally, all participants agreed that the need to mitigate climate change is an urgent one. This is best reflected in the quotes below.

*There’s a desperate need to turn a corner very, very, very fast... to turn the corner really fast; almost everything we can possibly have to work really becomes important.*

*The more we look at this stuff, we’ve got to move fast.*

*There’s no reason for delay, or not putting really strong effort into things that we know exist now.*

Additionally, participants noted that while their positions on various technologies may differ in some respects, they share an overriding sense of urgency.

*CCS or not CCS is not really the argument, the point is we’ve got to transform. I think maybe what’s happening is we’re getting a little caught up in the policy details.*

*There are some subtle differences among NGOs as to the numbers and particular dates that are minor in a relative sense, but we’re all really clear that it is urgent.*

As a result, participants saw existing policy as essentially tinkering with the *status quo*, and therefore inadequate. Instead, they advocated using science as the starting point to guide policy:

*But I think we all recognise we’re in a climate of urgency and we can’t continue with business-as-usual, and there may be a political reality at the moment in*

*there established, but does that mean we can't look at ways in which OK, what does the science tell us what we need to do; how can we technically get there and use that as a starting point? Rather than starting off and saying, "Right, what's affordable? Yes, OK, how can we manage this with least destruction to the status quo?"*

While participants were united in perceiving a sense of urgency, envisioning a post-emergency future that recognised the magnitude of the transition required, presents an enormous challenge. This includes understanding exactly the path required to achieve greenhouse gas mitigation, the costs involved and technical challenges associated with it. Inevitably, participants presumed, such a transformation will entail some losers. They felt this applies particularly to companies that exclusively mine coal, rather than those companies who have chosen to diversify.

*One of the problems is that we don't actually have a vision of what the zero carbon Australia or global economy might look like.*

*One almost has to recognise that nothing moves unless you want to move the whole model of business as usual... So, it is a fundamental industrial revolution.*

*But if you actually look at the enormity of the task in, whether it be wind power or all the different solar powers, the industrial change is so fundamental... It means that investment bankers are out of this game and even venture capitalists are out of this game, the payback time is too long. You're looking at a really fundamental physical and financial change; just the enormity of scale that people are only just beginning to grasp.*

*What I would see is that certain assets are going to get knocked off wherever they are before other ones, and it may well turn out to be (and I haven't done a calculation or even tried to) that Hunter Valley power stations stay longer. But there is a structural adjustment between the States that is facilitated by the Commonwealth, and something in Western Australia shuts down, or something in Victoria shuts down.*

In response to this perceived urgency, participants articulated the merits of a portfolio approach, warning of the dangers of favouring one particular technology.

## **4.2 Preference for a portfolio approach**

Participants perceived that progress to mitigate greenhouse gas emissions was being hampered by the tendency of various groups to favour their own particular interests at the expense of other potential solutions. It was felt that most low emission energy industries tend to see themselves as competing against each other, rather than cooperating in efforts towards a global solution to climate change. Participants, therefore, advocated a portfolio approach.

*Different political groups/industry groups assume that their solution is best, and all fight amongst each other for available R&D dollars.*

*That's equally happening within the renewables industry individually, technologies fighting for each other, as well as between the renewables as a whole against fossil fuels, instead of everybody saying we're going to need everything that we can throw at things.*

In practice, the implication of a portfolio approach is that no predefined preferred energy options would be advocated. Rather, the problem would be approached from a more impartial standpoint, and the various proponents would be more open-minded and objective about the contribution that other technologies can offer. The idea of finding common ground from which to work was advocated by almost all of the participants within the workshop, however, they recognised that this is not an easy goal to achieve.

*You'd need to assess the resource availability in a country and identify the resources here that we think have got the best practicability that suit our unique environment.*

*It's when the wind people are saying we need more solar and the coal people are saying we need more renewables,... that's when you know you're getting there.*

*You get things sorted by getting the two sides together and no, you don't need to agree, and yes, there will be arguments, but if you can find some sort of common ground to start with, then you can advance.*

Nevertheless, some technologies are seen as better positioned for rapid deployment than others. According to participants, however, the open-mindedness needed to deploy renewable technologies appears to be hampered by institutionalised power imbalances.

### **4.3 Privileging of CCS interests and the 'silver bullet syndrome'**

Consistent with their advocacy of a portfolio approach, participants were concerned that the high profile of CCS might be adversely affecting other efforts towards climate change mitigation, in particular investment in renewables. The view was that CCS enjoys a privileged position in certain circles' discussions on climate change solutions – a situation seen as counterproductive for some participants, when they felt other industries appear to be more progressive. Participants thus perceived an unequal power relationship between CCS interests and those of other technologies. In essence, they considered that CCS interests enjoy a disproportionate level of attention and public funds.

This point was emphasised through the observation that Department of Resources, Energy and Tourism appear to have a disproportionate number of their staff working in the coal and CCS space when compared to other technologies. However, some participants described this current state of play as more of an encumbrance, based on the amount Australia has currently invested in coal and its export. These participants hypothesised that in twenty years the organisation might be vastly different with many more individuals working in solar thermal, geothermal and other new and emerging technologies. Linked to this was the discussion that currently all renewable technologies are often lumped together and not identified as a single technology. The

ENGO group felt it was important to recognise each of them separately and focus discussions on each of their merits or drawbacks. It was felt that this would help in communicating the problem.

*I'm concerned that there's a focus on CCS that will take away from other things that could be done right now, and whether it takes away financially or takes away R&D effort.*

*If you add up all the other financial benefits that are applied to an existing industry, as opposed to some of the new industries, there is a big financial imbalance.*

*I'm not too sure if the Government is getting very balanced advice at the moment... The very fact that CO2CRC has such a high profile and has obviously confided in Government about this one particular technology, and we don't have equivalent types of research bodies for the other technologies... I think that indicates very strongly that the Government is pursuing a particular path.*

A key manifestation of this perceived power imbalance is that some of the NGO's felt that the public receives biased messages. These sentiments highlight the role of communication in constructing people's attitudes towards energy futures:

*But there seems to be a general communication thing, say, from politicians again, who say, "We've got heaps of storage because we can just pump all the CO<sub>2</sub> into all the depleted oil wells".*

*The community is not given the choice; they're only seeing one option. They're being sold that coal must go on regardless, whether it's CCS or anything, and that there is no life outside of coal... we must continue business as usual.*

*But if Joe Public out there thinks that base load power is what I need to keep my lights on, and I know that power stations are up there in Newcastle and I have heard about CCS that's going to solve it for us great, I don't have to worry.*

Participants' sensed that NGOs, in response, have struggled to influence people's attitudes to an equivalent extent and that this problem is exacerbated where people have a predisposition towards climate-change scepticism. CCS, in this context, was seen by some participants as part of the problem, not part of the solution. Indeed, some comments suggest a view that coal mining companies have, either explicitly or implicitly, a vested interest in hindering efforts at developing solutions

*Coal miners are using this time to stop everything in its tracks, and so that nothing gets done... CCS is being used as part of the bait to slow things down.*

*At the moment, CCS comes across as a protection of an industry, rather than as a viable climate change technology.*

*One of our primary concerns with CCS... is it that they use it as a justification to continue to build coal-fired plants.*

More generally, meaningful action on climate change is seen as hampered by a privileging of economic concerns. Consistent with the question of using either science or the *status quo* as the policy starting-point, participants distinguished between redesigning business practices to achieve an agreed emissions goal, versus inserting new technologies into unchanged parameters. In this context, participants critiqued the tendency towards depending on CCS as a ‘silver bullet’ solution to climate change, rather than viewing it as a transitional technology. Their concern is that this tendency exacerbates the marginalisation of other potential measures. For example, some participants acknowledged that ‘renewables’ are commonly considered as one entity, rather than diverse industries. This was particularly seen as a problem for emerging renewable technologies, such as geothermal, solar thermal and tidal power. Each of these were felt to be worthy of additional funding as emerging technologies. The disproportionate attention afforded to CCS also takes away from emphasis on mitigation opportunities available through energy efficiency. However, with a one size fits all approach to renewable energy technologies there was a concern that some were being overlooked, particularly in response to CCS funding.

*Renewables are always been lumped together as one thing when in essence, they are different technologies and they have different applications, different needs, different things. So, lumping renewables collectively is not helping.*

*We would say that CCS lobbying is winning, and that there’s been far more investment in both human capacity and in financial resources going towards CCS with a sort of silver bullet solution, and that that’s not being spread amongst a range of other technology.*

*The bigger risk is the idea that the silver bullet is just around the corner, don’t worry.... Anything that stops us pursuing wave, wind, solar, energy efficiency, the agricultural side of things; anything that stops us putting efforts into those, that to me is the danger. It’s the slowing down of the portfolio effect that is a real, real danger... Silver bullet is the most dangerous thing of the lot.*

*The most important thing to try for is energy efficiency. It obviates a need to put in new plant, whether that be wind, solar or coal, but going for energy efficiency.*

Ultimately, however, participants argued that industry itself needs to act now, and to accept the message of urgency from climate scientists. Such action, of course, implies a need to overcome wider industry resistance. Perhaps because CCS interests are seen as privileged, participants were also concerned that information on CCS and climate change needs to be trustworthy, particularly when making claims about technological issues.

#### **4.4 Technological concerns and the absence of trustworthy information**

Much discussion centred on the question of the technological feasibility of CCS. Perhaps most significantly, participants appeared frustrated at the lack of reliable, credible information regarding CCS, and about climate change more broadly. Therefore, trust emerged as a significant issue. With some sensing that information is being deliberately omitted. Some raised the point that to date there appears to be no CCS ready power plant which is the root cause of

the problem and hence why they are critical of the technology. In order to achieve this reliable, credible information, cooperation was again felt to be critical.

*The science has become so contested in the public domain over the last few years - people don't trust scientists, which is a shame.*

*We need an agency which people can trust to communicate broadly, not just on CCS, but on energy technologies broadly, and that's lacking at the moment.*

*We see these stories that CCS is more economical, but I think there's a lot of detail left lacking, and the community hasn't had a chance to fully analyse what these plans are.*

*I think there's still the need for independent verification and reliability of information... I think all the technologies in essence need to share how they've come up with and what are the risks and management issues and the costs of all the technologies to cross-verify everybody's else's to help the policy decision.*

On a more practical level, there was considerable uncertainty regarding the storage capacity and efficacy of geological structures. In other words, is there enough storage capacity, and can we rely upon it for a considerable length of time? Given the need to consider the possibility that a storage structure may fail, a key question is long-term liability. Participants were unsure how to manage this, but argued that proponents must assume a meaningful share of this liability. One participant, however, was more concerned about transportation than storage. Concerns regarding capture were less substantial than those regarding storage. Nevertheless, one participant pointed out that CCS should not be seen as ever likely to capture 100% of emissions.

*What's the actual, realistic storage potential?*

*My basic point is there is potentially no realistic storage potential offshore or onshore at a commercial stance in New South Wales.*

*There is the argument that in the future... there may be a failure of the storage of (CCS) technology.*

*I believe it's the wrong approach...to say that the Commonwealth, or the Government, will take on liability knowing that upfront. Because if the liability, or the risk, sits with the person doing the injection, they're going to do it properly because they know they've got an issue at the end of the day...*

*CCS only really addresses part of the problem around combusting coal and power stations and the associated mining as well. It's going to be X percentage theoretically captured; we still don't know exactly what that's going to be.*

Nevertheless, participants are not categorically opposed to CCS. Indeed, they suggested possible roles for CCS beyond those associated with coal-fired power stations. These might include removing CO<sub>2</sub> from the atmosphere, and applying CCS to biomass:



*CCS might play two roles. It might play an early role, but it might play a late 2050s to 2100 role. And that is trying to suck CO<sub>2</sub> out of the atmosphere. It may well be that we get into geo-engineering.*

Given the perceived urgency, participants were concerned that CCS might not be available at the scale required in the timeframe available. The implication is that CCS alone is seen as failing to address the urgency of climate change. For some, therefore, it becomes difficult to accept CCS as part of the solution:

*For a scientist to say this is possible/feasible, it gets misrepresented in both the media and by politicians...I think it's a lack of understanding of the time frame it takes to get through the whole R&D demonstration plan, to commercialisation, to actually replacing what we're currently using... People need to have a more realistic understanding of how long all these things take.*

*CCS is not going to be deployable or useful really at scale for at least decades, and in the meantime we've got to throw everything we can at the other things, but it's going to take time. We can't just switch it on like that.*

*So the prospects of reducing the carbon intensity of our electricity mix before 2050, realistically. I would say that is probably fairly small to 2050 because of the time it takes to develop power stations, to either retrofit or resign old ones and bring in new ones.*

## 4.5 Other concerns

Slightly different to the main themes outlined above, were other issues which arose during the discussion that are worth noting. As an extension to the trusted source, the group were keen to see a more transparent and detailed life cycle analysis of each of the technologies. It was suggested that such an approach would provide the true costs of each individual technology – particularly if the analysis was done by an institution that had no vested interest.

Similarly, participants felt it would be helpful to have longer range forecasts around the expected share of low emission technologies looking forward. For example, to date there has been much discussion around twenty CCS projects by 2020. However, participants queried what was expected to happen after that if these targets were met – how the world would allocate CCS targets into the future. Although it was acknowledged there are a range of models showing forecast mixes of technologies, most felt the sources were not independent and able to be trusted. In other words there was a need for a detailed plan about CCS and the associated economics that relate to its deployment.

There was also a suggestion that the CSIRO, as an independent research organisation, could undertake to complete and publish the findings of such research. Additionally, there was a request that CSIRO might consider conducting a smaller version of their Energy Futures Forum they ran in 2006. The idea was to conduct this over the next six months to help inform the Australian delegation to Copenhagen in December, 2009.

## 5. CONCLUSION AND CLOSING COMMENTS

Overall there was a mix of genuine support for CCS as well as some strongly opposed to the technology. The main arguments in support of CCS included the need to “throw everything” at the problem of greenhouse gas mitigation and CCS is seen as one potential option for mitigating large amounts of CO<sub>2</sub>. Secondly, it was considered by those supportive of CCS as a necessary part of the transition to a lower carbon economy. And thirdly, because Australia is currently so heavily invested in coal, through its exports and energy generation, it was considered a logical economic choice for some as well.

Conversely the arguments presented against CCS were firstly about whether the gas can be stored safely. Secondly, that the technology might fail and if it did there were likely to be consequences for future generations. And as an obvious extension to this failure, large amounts of CO<sub>2</sub> might be forced back into the atmosphere.

In summarising the discussion the following table highlights the major concerns of the ENGO's that attended the workshop. The differences show where some individual organisations had more strongly opposing opinions and therefore each are not necessarily representative of the whole group.

Table 4 Summary of issues and differences arising from the discussion

Top Issue	Differences
No excuse for delay. Systemic issues at Federal Government level that meant there wasn't a level playing field. Increasing energy use needs to stop. Need an agency people can trust – CSIRO. Need a breakdown of the true life cycle analysis and costs of each technology. Silver bullet – distraction from all the options.	Viewed morally – intergenerational equity. Less inclined to see variations on business as usual and move away from coal as primary source. Presenting alternative options to government and community is challenging. E.g. In Qld coal most go on no alternative – business as usual. Public money into CCS technology and balanced to renewable CCS may have a part to play.

There are a number of closing comments that were made on individual NGO responses at the close of the day. These focus on direct feedback on the workshop process as well as messages to government. Each of the comments has been copied verbatim below.

*John and Barry good experts. Honest. A key ingredient.*

*We need government, industry and NGO and broader civil society to have a shared vision of a sustainable future.*

*I am inclined to think that the opposition of other NGOs to CCS is more from a sense of there being an unfair emphasis on this as a solution at government and corporate level. Should other renewable resources start to receive a similar level of consideration - CCS would gather more support. John and Barry were excellent.*

*Added a 12th energy source as ranked no 1, energy efficiency/megawatt. My answers in ranking (777) means no public funding for coal, industry, nuclear and hydro. Industries mature enough, enough profits long term in that expenditure in these areas should be incorporated into standard business development/future planning risk mitigation practices. Public \$ should assist in moving forward to varying degrees, less mature industries.*

*Q38, base load is not a technical term, it actual misleads. The point is about dispatchable vs. non dispatchable power. Having the CO2CRC and the GGSS was useful however, this discussion revolved around policy frameworks and entrenched power. The contribution of these organisations reinforced that politicians are likely cherry picking the best of CCS, without addressing their shortfalls*

Given the nature of the workshop it is not realistic to make recommendations on behalf of the ENGO groups. However the following recommendations have been drawn from the key messages and quantitative measures and should assist the Carbon Storage Taskforce in their efforts to identify a way forward in progressing carbon storage in Australia. These include, in no order of priority.

1. There is a need to raise the sense of urgency around combating climate change at all levels of society.
2. All key stakeholders need to actively promote the need for a portfolio approach to mitigate climate change and avoid picking winners. That is, not playing off CCS against renewable energy forms or privileging one solution over others. Ideally ENGO's would like to see a common message that is understood and supported by government, industry and the general public.
3. There is a need to engage all stakeholders with a vested interest in low emission energy technologies to ensure they also promote and understand the portfolio approach.
4. Any solution for greenhouse gas mitigation should include energy efficiency measures. ENGO's felt that the Australian Government – at all levels – has a responsibility to promote and raise awareness of energy efficiency measures available to the average householder and industry.
5. A shorter, more compact version of CSIRO's Energy Futures Forum would be helpful to inform Australia, and the delegation to Copenhagen. The forum could aim to clarify the life cycle analysis of all low emission technologies, identify the true costs of each technology and their realistic deployment date.
6. Longer term forecasting, beyond the 2020 deadline for CCS deployment is also necessary to show the range of stakeholders that this is part of an ongoing commitment to address climate change.
7. Need increased communication about CCS that is easy to understand, accessible and in the right format so that individuals will want to read and learn more about the technology.

## APPENDIX A – CCS ISSUE AND CONCERNS WORKSHOP INVENTORY

### DEMOGRAPHICS

Please complete the following by circling one number for each answer or writing the appropriate answer in the space.

Q1 I am a) Male b) Female

Q2 My age is between:

a) 18 - 25 b) 26 - 35 c) 36 - 45 d) 46- 55 e) 56 - 65 f) 66 - 75 g) 76 <

Q3 My postcode is: \_\_\_\_\_

Q4 The name of my organisation is (optional): \_\_\_\_\_

### QUESTION 5: EXPLORING YOUR CONCERNS OVER ISSUES RELATING TO CCS

In the CO<sub>2</sub> Capture Project (CCP2) 2007 report *Public perceptions to carbon dioxide capture and storage: Prioritised assessment of issues and concerns*, Wright et al. identified a number of potential issues in relation to deployment of CCS. To explore your concerns, please complete the following by circling the number that most closely resembles your level of concern with CCS on each of the identified issues, where 1= low concern and 7 = high concern.

I would rate my level of concern over:		Low concern						High Concern
1	Whether there is enough storage capacity for CCS.	1	2	3	4	5	6	7
2	Whether the scale of infrastructure required for CCS is well understood.	1	2	3	4	5	6	7
3	The increased costs for deploying CCS.	1	2	3	4	5	6	7
4	The risk that CCS will cause harm to other humans.	1	2	3	4	5	6	7
5	The risk that CCS will kill humans.	1	2	3	4	5	6	7

6	The safety of coal miners with the continued use of coal.	1	2	3	4	5	6	7
7	The risk that CCS will cause harm to ecosystems.	1	2	3	4	5	6	7
8	That CCS will acidify drinking water.	1	2	3	4	5	6	7
9	What happens to CCS if there is an earthquake?	1	2	3	4	5	6	7
10	Whether storing CCS will cause an earthquake.	1	2	3	4	5	6	7
11	Safety concerns where CO2 pipelines are sited.	1	2	3	4	5	6	7
12	Siting of pipelines in built up areas.	1	2	3	4	5	6	7
13	Whether CCS will have a positive impact on property values.	1	2	3	4	5	6	7
14	Whether CCS will have a negative impact on property values.	1	2	3	4	5	6	7
15	Existing land rights, once CCS projects are allocated to specific companies	1	2	3	4	5	6	7
16	The rights of land owners in CCS projects.	1	2	3	4	5	6	7
17	Potential competing land use issues	1	2	3	4	5	6	7
18	Long term liability issues	1	2	3	4	5	6	7
19	The energy intensity of CCS process having a negative impact on addressing climate change	1	2	3	4	5	6	7
20	The true energy penalty for CCS not being taken into account when assessing the viability of the technology	1	2	3	4	5	6	7
21	The adequacy of regulatory frameworks for CCS in the developed world to address risks	1	2	3	4	5	6	7
22	The adequacy of regulatory frameworks for CCS in the developing world to address risks	1	2	3	4	5	6	7
23	The adequacy of regulatory frameworks for CCS in Australia to address risks	1	2	3	4	5	6	7
24	Whether information about CCS is readily available for all stakeholders	1	2	3	4	5	6	7
25	Whether information about CCS is of an appropriate quality, style and language for all stakeholders	1	2	3	4	5	6	7
26	Whether there has been enough communication about CCS to the range of stakeholders	1	2	3	4	5	6	7
27	Whether CCS can reduce the large amounts of GHG emissions required quickly enough	1	2	3	4	5	6	7

28	Whether other low emission technologies can reduce large amounts of GHG emissions more quickly than CCS?	1	2	3	4	5	6	7
29	Insufficient support to make CCS happen	1	2	3	4	5	6	7
30	CCS being oversold as a silver bullet to the detriment of renewable energy deployment	1	2	3	4	5	6	7
31	Using CCS for enhanced oil recovery to extend the life of the oil market	1	2	3	4	5	6	7
32	Using CCS to extend the life of coal	1	2	3	4	5	6	7
33	The potential of using CCS with biomass for negative CO2 reductions	1	2	3	4	5	6	7
34	Storing CO2 on shore	1	2	3	4	5	6	7
35	Storing CO2 off shore in geologic formations under the ocean floor	1	2	3	4	5	6	7
36	That CCS is seen as a long term sustainable strategy rather than a bridging strategy	1	2	3	4	5	6	7
37	That CCS is not yet ready for large scale deployment?	1	2	3	4	5	6	7
38	That renewable technologies are not ready for large scale deployment	1	2	3	4	5	6	7
39	That renewable is not yet reliable enough to provide base load energy supply	1	2	3	4	5	6	7

### QUESTION 6: RANKING YOUR HIGHEST CONCERNS OF ISSUES WITH CCS

Examine your answers to Question 5 above. Please rank in order of priority the ten (10) issues - **using the question number** - that cause you or your organisation the most concern, where 1 = highest concern and 10 = lower concern.

Ranking	Question No.
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



**QUESTION 9: PRIORITY RANKING OF ENERGY SOURCES AND RELATED TECHNOLOGIES**

Please complete the following by *ranking* the following energy sources and related technologies in the priority order that you would use to allocate public funds toward their continued deployment, development and implementation. Your priority order should be written next to the energy sources below. Please follow the order of 1 (one) for the highest priority, through to 11 (eleven) for the lowest priority.

Note you should use each number between 1 and 11 only once.

Energy sources and related technologies	Funding Priority Order
Wind	
Carbon Capture and Storage (CCS)	
Nuclear	
Hydro-electric	
Coal	
Natural Gas	
Geothermal (hot rocks)	
Solar	
Biofuels	
Oil	
Wave/tidal	

PLEASE FEEL FREE TO RECORD OTHER COMMENTS IN THE SPACE BELOW

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**Reference**

Wright, I., et al., *Public Perception of Carbon Dioxide Capture and Storage: Prioritised Assessment of Issues and Concerns.*, in *IEA Working Party on Fossil Fuels, ZETS Phase 2: Communication Strategy*. 2007, CO2 Capture Project, CCP2. : London: DTI. .



## APPENDIX B – RANKINGS OF HIGHEST CONCERNS

	I would rate my level of concern over:	1	2	3	4	5	6	7	8	9	10
1	Whether there is enough storage capacity for CCS.									9	
2	Whether the scale of infrastructure required for CCS is well understood.	1,1			4	5		7			
3	The increased costs for deploying CCS.		2								
6	The safety of coal miners with the continued use of coal.								8		
7	The risk that CCS will cause harm to ecosystems.									9	
8	That CCS will acidify drinking water.										10
9	What happens to CCS if there is an earthquake?				4						
18	Long term liability issues						6				
19	The energy intensity of CCS process having a negative impact on addressing climate change										10
21	The adequacy of regulatory frameworks for CCS in the developed world to address risks								8		
22	The adequacy of regulatory frameworks for CCS in the developing world to address risks					5				9	
23	The adequacy of regulatory frameworks for CCS in Australia to address risks										10
24	Whether information about CCS is readily available for all stakeholders					5					
25	Whether information about CCS is of an appropriate quality, style and language for all stakeholders					5				9	
26	Whether there has been enough communication about CCS to the range of stakeholders				4		6,6				
27	Whether CCS can reduce the large amounts of GHG emissions required quickly enough	1		3							
29	Insufficient support to make CCS happen	1					6		8		
30	CCS being oversold as a silver bullet to the detriment of renewable energy deployment	1	2,2		4						
31	Using CCS for enhanced oil recovery to extend the life of the oil market		2								
32	Using CCS to extend the life of coal			3							
33	The potential of using CCS with biomass for negative CO2 reductions			3							
35	Storing CO2 off shore in geologic formations under the ocean floor					5		7			

36	That CCS is seen as a long term sustainable strategy rather than a bridging strategy	3,3	6
37	That CCS is not yet ready for large scale deployment?	2	4 7 8
39	That renewable is not yet reliable enough to provide base load energy supply		7





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