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Geothermal Technology in Australia: Investigating Social Acceptance

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ABSTRACT

Even though the geothermal industry has recently undergone innovative growth and capacity building in all aspects, across wider society there appears to be little knowledge or understanding of geothermal technology and its implications. Focusing on the societal acceptance of geothermal, this paper presents the results of using a participatory action research (PAR) methodology to engage diverse groups within the Australian public. A key finding of the facilitated group process, is that the majority of public have little knowledge or understanding of geothermal technology but are supportive of the technology's development and use as a clean energy source. The support for geothermal appeared to be stable even though various concerns were raised with the use of this technology (including water usage and seismic activity instigated by geothermal drilling). The results demonstrate the effectiveness of using an engagement process to explore public understanding of energy technologies in the context of climate change. Furthermore, the paper suggests a way forward for governments and industry to allocate resources for greatest impact when communicating about geothermal technology.

1. INTRODUCTION

As several professions attempt to develop various innovative technologies to address the issue of climate change, the geothermal industry aims to significantly contribute to clean electricity generation in Australia through the use of their hot rock approach. In the last few years, the concept of geothermal energy has dramatically improved in its development, capabilities and application through the reforming of traditional thought and approaches. The geothermal industry in Australia will attempt to use heat from deep under various unique regions across the country, in order to contribute up to 20 percent of Australia's electricity capacity. Even though the geothermal industry has recently undergone innovative growth and capacity building in all aspects, across wider society there appears to be little knowledge or understanding of geothermal technology and its implications. Therefore, communicating about this technology is essential to its societal acceptance - future development and uptake.

When thinking about why society is an essential consideration, it is important to understand that the worlds of technology, society and governance are intertwined - changes in one affect the others. The way these worlds interact, significantly influences the rate of change and the acceptance of the technology. It is therefore, important to have an understanding of all three worlds and how they interact (see Figure 1).

A key issue for whether a technology is accepted by society is how the technology and the risks associated with it are perceived. If society perceives the risks to be too great it can delay, or stop the adoption of new technologies. Having an understanding of stakeholder positions can help address issues and concerns stakeholders may have. This knowledge can be used to inform the development of the technology and potentially improve the outcomes and relevance to society. Building relationships and engaging with stakeholders early, is also shown to be beneficial.

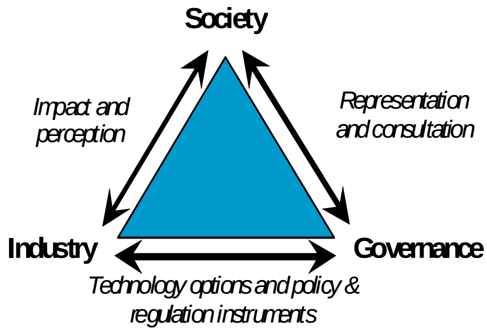

Figure 1: Connection between society, industry and governance.

2. LITERATURE

For almost 15 years, studies from the developed world have shown that people view climate change as a serious problem (e.g. Bazerman, 2006; Pacala, and Socolow, 2004; Soper, 2008). In Australia, 75% of citizens believe that climate change is a major problem and support government action to introduce energy efficiency, clean electricity generation and motor vehicle emissions reductions (Sunblad, Biel and Garling, 2007).

However, in most of the world climate change is rated as a lesser priority compared to other issues, of seemingly more personal relevance. The Lowry Institute poll of 2007 found that Australians rated tackling climate change after improving education and health as the most important goals for the country. In some parts of the world, climate change still ranks below other, more tangible, environmental risks, such as nuclear power and radioactive waste, industrial pollution and ozone depletion (Lorenzoni and Pidgeon, 2006).

Investigations have also shown that most people still have a fairly limited understanding of the causes of climate change and they typically do not have an accurate picture of what and how human behavior is responsible (Monbiot, 2007). Misunderstandings are evident even in countries with relatively strong environmental values. This trend is also true for the level of knowledge and understanding of energy technologies, especially geothermal and carbon capture and storage (CCS; Ashworth, Carr-Cornish, Boughen and Thambimuthu, 2008). While there have been some recent improvements in the knowledge base, people continue to confuse the greenhouse effect with ozone depletion and a majority probably still do not appreciate that burning fossil fuels is the main anthropogenic contributor to global warming or that global warming is a result of increasing CO_2 emissions (Pichert and Katsikopoulos, 2008).

Communication about the environment and energy technologies shapes public opinion, changes policy and affects our world and quality of life. Communication is at the core of the environmental crisis, as decisions must be made about the kind of world in which we want to live and the kind of world we want to leave for our children. Our demand for consumables is outstripping our understanding of its consequences and communication about energy technology solutions is fraught with uncertainty. Often, a group of technical “elite” make decisions for all others (Deshler, 1991). This has fed into a public sense of false security that one particular technology can “fix” any environmental crisis that occurs. The reality is that environmental crises are not easily fixed and difficult choices must be made which somehow incorporate collective values about acceptable ranges of solutions (Renn, Webler and Wiedemann, 1995).

There has been some attempt to better understand how to bring issues of environmental risk and potential technological solutions to public dialogue. Risk communication is a field that developed when risk managers, psychologists, sociologists and others explored ways to involve the public in environmental decision-making. Risk communication has been defined as the interactive process of information and opinion exchange among individuals, groups and government institutions, involving multiple messages about the nature of risk. The term refers to other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management (Committee on Risk Perception and Communication, 1989).

Risk communication at its best is not easy. Weber and Word (2001) point out that even “compelling scientific information very often runs aground almost as soon as it is launched into the choppy waters of public discourse” (p. 488). This is in part; say Renn, Webler and Kastenholz (1996) because risk perception is about a multitude of elements that shape the individual and social experience of risk.

> *Rather than evaluating risk with a single yardstick, most people use different mental tools when estimating and evaluating risk sources or activities. Risk perception and evaluation are both complex phenomena that are shaped by attitudes, social values and cultural traditions (Renn, Webler and Kastenholz (1996: 178).*

Researchers and practitioners (including Sandman, 1986; Fischoff, 1995; Covello, 1989) have contributed to a body of knowledge that supports the idea that both risk perception and scientific risk assessment are elements of a risk communication dialogue that must be part of any informed decision-making process. Krimsky and Plough (1988) suggest that the scientific aspects of risk are embedded in a complex socio-political tapestry in which there are not only different voices but different perceptions of the problem and possible solutions. Deshler (1991) argues that

> *Environmental conflicts are value-laden, and political. Solutions to environmental problems call for individual, organizational, governmental and international understanding and action. Different solutions reflect different social goals. ‘Hard research’ solutions and degrees of tolerable risk turn out to be political. The capacity of scientists and technological elites to communicate with those who are most likely to benefit and suffer from technological applications is also central to environmental education (p. 401).*

Risk communicators argue that interaction is central to a meaningful process of communicating risks. It is an act of both informing and being informed. As Scherer and Juanillo (1989a) describes it, it is about participating in shaping new ways of looking at issues under discussion. In this interactive process, all participants are risk communicators. Unlike the traditional approach where officials inform the public about what they (the experts) think they need to know, the risk communication process is an exchange that works towards mutual understanding and learning. In his dissertation exploring an agency response to wildland fire messages, Eric Toman’s (2005) findings suggest interactive formats were more effective than methods consisting of a one-way flow of information. Toman (2005) found that participants in interactive activities were more likely to experience knowledge and attitude change. The challenge is to move away from traditional communication to this more egalitarian mode. Scientific and technical information are necessary for the process, however, the question has been whether they should fairly remain as the sole basis on which decisions or actions are made.

Slovic (1985) and others who support the value of risk communication argue

> *It appears that people understand some things quite well, although their path to knowledge may be quite different from that of the technical experts … given an atmosphere of trust in which both experts and lay persons recognize that each group may have something to contribute to the discussion, exchange of information and deepening of perspectives may well be possible (p. 170)*

Covello (1989) warns not to underestimate the ability of the public to assimilate technical information. He believes that if you give people a reason to learn, i.e. a stake in the decision, they can do so.

Many authors speak of an ethical or moral imperative to engage people in risk communication dialogue. Robert Cox (2007) says that environmental communication has an “ethical duty; an obligation to enhance the ability of society to respond appropriately to environmental signals relevant to the well-being of both human communities and natural biological system” (p. 6).

Renn, Webler and Kastenholz (1996) talk about communication being a “two-way” process, but suggest that means that both public perception and technical concerns are heard and incorporated. They argue that an ideal communication program envisions a receiver who processes all available information to form a well-balanced judgment based on facts, arguments of other players and his/her own interests and values. For these authors, successful communication requires three essential elements:

1. *communication strategies are carefully structured and prepared – factual information, interpretation of facts, opinions about expected outcomes, and evaluation of these outcomes are treated separately and communicated in a different format;*

2. *communication strategies are organized in a dialogue forum – audience has a chance to voice concerns, participate in conveying their perspectives; and*
3. *providing an opportunity to comprehend the level of risk in relation to the task or problem, this is the first step in creating or sustaining trust (p. 179).*

Along similar lines, Scherer and Juanillo (1989b) reflects that the underlying principle behind an interactive communication process is the right of all concerned to be involved in issues that directly affect individual and community well-being. This process enables all concerned to: a) obtain information, b) gain insights into issues, c) make their respective positions known, and d) arrive at well-informed decisions and courses of action that impact on individual and community lifestyles as well as on policies, programs and regulations. Implicit in the process is an assumption that differing viewpoints concerning risk will empower people to arrive at reasonable judgments and well-grounded actions towards reducing the probable occurrence of risk in their own lives (Scherer and Juanillo, 1989b).

3. METHODOLOGY

Dialogue is a fundamental aspect of effective environmental risk communication. Dialogue is more than a conversation or an exchange of ideas, but a communication that is based on reflective listening and responsiveness to competing and complementary perspectives. To foster such a process, we developed an engaging workshop, aimed at providing the general public with an opportunity to have an informative dialogue between themselves and a low emission technology scientist.

3.1 Recruitment

To date five facilitated group workshops have been conducted, one specifically targeted at the 18 - 25 age group (n=29) and the others in Brisbane (n=60), Melbourne (n=47), Perth (n=62) and Adelaide (n=131). Participants for each workshop were identified from a direct marketing list of over 2.1 million Australians. Within this list a random sample was drawn from the individuals that were within a 200 km radius of each city's central business district and 18 years or older. Invitations were emailed to these individuals and in the case of the Adelaide workshop, a newspaper advertisement was implemented in the recruiting process.

3.2 Process

A "lead facilitator" was recruited to oversee the day's functioning to ensure it ran smoothly and kept to time. Additional facilitators were organized to "host" each table of participants (6 - 8 people per table). These table facilitators were considered an essential component for enhancing each small group's functioning by encouraging introductions, the discussions and attending to group process. Facilitators were provided with a list of prompt questions for all of the sessions and briefed on expectations prior to the workshop. On the day, workshop participants were assigned to different tables based on their age and gender to allow them to be exposed to a variety of views. At the beginning of each workshop, time was allowed for the "lead facilitator" to set the context of the workshop and the focus for the day. After this participants, who were seated at round tables to maximize interaction, were allowed time for introductions within each of their small groups, led by their table facilitator. Prior to any information being presented participants then completed a questionnaire to assess demographic features, along with reactions to the technologies, including their support, priorities for public funding, self-rated knowledge. After this, table facilitators led small group discussions within their group around participants' awareness of climate change and energy technologies.

On completion of this discussion an international expert in the field of climate change and energy technologies presented part one of the information session on climate change and energy. The information presented by the expert was developed using an advisory group of representatives of diverse stakeholder groups. The diversity of the group, with a range of opinions about the technological solutions for climate mitigation, ensured the material presented was objective and not biased to any one solution. After a time for questions and morning tea, the expert presented part two which focused on the portfolio of options for climate change mitigation. For each of the technologies the identified benefits and barriers were presented to the group. Risk communication literature suggests that participants need this information when making their personal assessments of the technologies (Toman, 2005).

After lunch, approximately an hour and a half was allowed for small group deliberation on the information presented. Participants were asked to share their reactions to the information, their concerns and preferences for energy options and also to identify what further information they felt was needed. It was felt this process would create the necessary conditions for cognitive dissonance. Each group was given the opportunity to seek further information from the expert by raising a question flag to show they needed more information. This one-on-one opportunity provided further opportunity for individuals to reflect on what they had heard and have their assumptions challenged by the expert.

During an extended afternoon break, facilitators convened and fed back the main findings from individual tables. The lead facilitator coordinated this information into a number of key messages which were then shared with the large group for clarification and endorsement in the final session. Once key messages were agreed, time was spent reflecting on the learning that had taken place over the day. Then to close participants were asked to complete another questionnaire so that any shifts in support, priorities for public funding and self-rated knowledge were captured.

3.3 Data Collection and Analysis

A mix of quantitative and qualitative methods was used to collect the data at all five workshops. As mentioned earlier, questionnaires at the beginning and end of the process were used to measure the social acceptance of the technologies and to identify the impacts of the process. Specifically three types of measures were collected that indicated social acceptance: 1) support for the technologies, 2) priority ranking of public funding, and 3) self-rated knowledge of the technologies.

In each instance responses to eleven technologies were assessed: biofuels, carbon dioxide capture and storage, coal, geothermal, hydro-electricity, natural gas, nuclear, oil, solar, wave/tidal and wind. Support for the technologies, was measured by capturing attitudes toward the technologies. Participants were asked "How strongly do you support the use of the following?" Responses were recorded on a seven-point Likert scale of 1-strongly disagree, 4-unsure and 7-strongly agree. Self-rated knowledge was measured by asking "How would you rate your knowledge of the following?" on a seven-point Likert scale of 1-no knowledge, 4-moderate knowledge and 7-high knowledge. Priority for public funding was measured by asking participants to rank technologies according to how they think public funding for development and implementation should be prioritized. Participants' recorded their highest priority as 1 through to 11 for their lowest priority.

In this paper we report on the quantitative measures of social acceptance, which included participants' support, funding priorities and self-rated knowledge. These responses are reported as mean scores. T-tests were used to identify if there were significant ($p<.05$) changes in support and knowledge ratings because of the workshop. As the major emphasis of this research was to promote dialogue and engagement through a facilitated group process, qualitative data was important, particularly for exploring the participants' responses in-depth. Key statements made by the participants are reported to demonstrate issues and concerns about geothermal technology

4. RESULTS AND DISCUSSION

4.1 Support for Geothermal

Presented in Table 1 are the mean levels of support reported by workshop participants before and then after the workshops. Respondent's reported to agree with use of geothermal technology and this agreement was consistently reported across the five workshops. Furthermore Adelaide participants reported the strongest support and significant increases in support, which may be linked to the demonstration project occurring in their state and compared to the other workshops there were more participants at the Adelaide workshop. Overall these responses indicate the public are supportive of geothermal as an energy technology even when compared to other energy technologies, with only solar and wind consistently attracting more support.

Table 1: Mean ratings of support for energy technologies. Support was measured as (1) strongly disagree, (4) unsure, (7) strongly agree. Paired t-tests ($p<0.05$) were used to identify significant changes between before and after mean ratings and significantly different ratings are marked in bold.

	Feb, 2008 Youth		Mar, 2008 Brisbane		Jun, 2008 Melbourne		Nov, 2008 Perth		Feb, 2009 Adelaide	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Biofuels	**4.2**	**4.7**	4.9	5.0	**4.4**	**4.9**	**4.6**	**5.1**	**4.9**	**5.2**
CCS	4.0	4.1	4.1	4.4	**4.2**	**5.0**	4.4	4.6	**4.7**	**5.6**
Coal	2.3	2.3	2.9	3.2	3.3	3.8	3.2	3.5	**3.2**	**3.7**
Geothermal	5.5	5.7	5.4	5.5	5.1	5.1	5.3	5.0	**5.7**	**6.1**
Hydro	**5.1**	**4.3**	5.3	5.2	5.0	5.3	**5.8**	**5.1**	**5.5**	**5.2**
Nat. Gas	4.3	4.5	4.8	4.8	5.0	5.0	4.7	4.6	5.1	5.1
Nuclear	2.7	2.4	2.9	2.9	**3.1**	**3.8**	**4.2**	**4.6**	3.8	3.9
Oil	2.6	2.4	3.3	3.2	3.4	3.4	3.3	3.5	**3.2**	**3.6**
Solar	6.7	6.6	6.5	6.6	6.6	6.7	6.7	6.8	6.7	6.6
Wave/tidal	5.7	5.6	5.8	5.7	5.3	5.6	6.0	5.9	**5.8**	**4.2**
Wind	6.1	6.2	6.2	6.3	6.1	6.3	6.4	6.4	6.3	6.5

4.2 Priority Ranking of Public Funding for Geothermal

Presented in Table 2 are the results of asking participants to rank technologies according to how they think public funding for development and implementation should be prioritized. Solar and wind were consistently ranked as a high funding priorities whereas technologies such oil, nuclear and coal without CCS were ranked as low funding priorities. Funding for geothermal was typically a high priority, following funding for solar, wind and wave/tidal. There was a small difference between workshops in the way geothermal was prioritized. Participants in the Youth, Brisbane and Adelaide workshops prioritized geothermal slightly higher than participants in the Melbourne and Perth workshops. Overall, the results indicate there is public support for using public funds in the development and implementation of geothermal.

Table 2: Mean ranking of public funding priority for development and implementation. Technologies were ranked using (1) to indicate the highest priority through to (11) to indicate the lowest priority.

	Feb, 2008 Youth		Mar, 2008 Brisbane		Jun, 2008 Melbourne		Nov, 2008 Perth		Feb, 2009 Adelaide	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Solar	1.7	1.8	2.1	1.9	1.9	2.1	3.0	2.1	2.1	2.5
Wind	2.9	2.4	3.1	3.3	2.6	2.7	2.5	2.8	3.1	3.6
Wave/Tidal	4.3	4.6	4.3	4.7	4.4	5.3	4.4	4.1	5.2	6.8
Geothermal	4.2	4.0	4.9	5.2	6.1	6.7	5.5	6.1	4.8	3.8
Nat. Gas	6.6	6.2	6.5	6.0	5.6	6.1	6.6	6.4	5.8	6.0
Hydro	5.6	5.9	5.2	5.3	5.5	5.6	5.1	6.5	5.7	6.3
Biofuels	5.8	5.9	6.2	5.5	7.0	6.4	7.2	6.7	6.7	6.7
CCS	6.5	6.2	6.7	7.0	7.1	5.7	6.9	7.2	6.5	4.3
Coal	9.6	9.6	8.8	8.7	8.6	8.4	9.0	8.6	8.7	8.4
Nuclear	8.7	9.4	8.8	9.1	8.5	8.2	6.9	6.6	7.7	8.3
Oil	9.9	9.8	9.2	9.1	8.8	8.8	9.2	8.9	9.1	9.0

4.3 Self-Rated Knowledge of Geothermal

Before and then after the workshops participants were asked to rate their knowledge of a range of technologies, these ratings are presented in Table 3. Participants reported to be most informed about Solar, whereas lower levels of knowledge were reported for geothermal, along with other technologies such as CCS, nuclear and wave/tidal. Geothermal, CCS, nuclear and wave/tidal are currently not used for electricity generation in Australia and this could explain why participants were less familiar with them.

After the workshops there was an average increase in knowledge of all energy technologies, with the mean ratings of the participant groups increasing from low ratings to moderate ratings. This increase in self-rated knowledge demonstrates that the workshop process, including the provision of information and the facilitation of deliberation effectively increased public familiarity with technologies – including the emerging geothermal technology.

Table 3: Mean ratings of self-rated knowledge of energy technologies. Self-rated knowledge was measured as (1) no knowledge, (4) moderate knowledge, (7) high knowledge. Paired t-tests ($p<0.05$) were used to identify significant changes between before and after mean ratings and significantly different ratings are marked in bold.

	Feb, 2008 Youth		Mar, 2008 Brisbane		Jun, 2008 Melbourne		Nov, 2008 Perth		Feb, 2009 Adelaide	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Biofuels	**4.1**	**5.0**	**4.2**	**4.9**	**3.3**	**4.7**	**3.6**	**4.7**	**3.8**	**5.0**
CCS	**3.0**	**4.9**	**3.2**	**4.4**	**2.6**	**5.1**	**2.8**	**4.8**	**2.9**	**5.1**
Coal	**4.4**	**5.5**	**4.3**	**5.0**	**4.1**	**5.5**	**4.2**	**5.0**	**4.4**	**5.4**
Geothermal	**3.3**	**4.9**	**3.5**	**4.6**	**3.1**	**4.9**	**3.3**	**4.7**	**3.7**	**5.3**
Hydro	**3.9**	**4.7**	**4.2**	**4.9**	**4.1**	**5.1**	**4.2**	**4.9**	**4.3**	**5.1**
Nat. Gas	**3.8**	**5.1**	**4.1**	**4.8**	**3.9**	**5.4**	**4.2**	**5.0**	**4.4**	**5.2**
Nuclear	**3.9**	**4.9**	**3.8**	**4.5**	**3.6**	**4.8**	**3.7**	**4.7**	**4.1**	**4.8**
Oil	**4.2**	**4.9**	**4.2**	**4.8**	**4.2**	**5.3**	**4.2**	**4.8**	**4.4**	**5.0**
Solar	**4.7**	**5.7**	**4.8**	**5.3**	**4.5**	**5.6**	**4.7**	**5.5**	**4.9**	**5.7**
Wave/tidal	**3.2**	**4.1**	**3.6**	**4.4**	**3.4**	**4.7**	**3.6**	**4.7**	**3.6**	**4.8**
Wind	**3.8**	**5.2**	**4.2**	**5.1**	**4.2**	**5.3**	**4.3**	**5.2**	**4.5**	**5.4**

4.4 Qualitative Responses to Geothermal Technology

During the deliberation sessions of the workshop, the issues and concerns surrounding geothermal technology were elaborated on in more detail. Water usage and seismic activity instigated by geothermal drilling were two key concerns raised with the use of geothermal as an energy source in Australia. These concerns are reflected the following sample of comments made by participants.

Water usage:

> *"I am really concerned about the amount of water required for geothermal. If we already have a water problem aren't they just making things worse but needing so much water for making the energy?"*
>
> *"Water is scarce as it is, how is this approach going to deal with a lack of water while still supplying us with electricity?"*
>
> *"Geothermal, if effective, would be more cost effective than clean coal but I do worry about the amount of water it uses"*
>
> *"The next generation would have to deal with the side effects of geothermal and clean coal technologies. Such as in the case of geothermal and the possibility that the CO^2 could emit from underground and the vast amount of demand on the water supply to make it all happen"*
>
> *"Townships would need to be relocated for geothermal to ensure that there are plenty of hot rocks and water for operation and the effect it would have on industry, compared to clean coal"*

Seismic activity instigated by geothermal drilling:

> *"Geothermal is only appropriate for some areas because of the risk of earthquakes either due to drilling or natural"*
>
> *"Geothermal is seen as better as it isn't treating a symptom by covering up a problem, it is actually a solution in that it produces little or no emissions but it is also a threat when looking at the possibility of seismic results due to drilling"*
>
> *"Wasn't there two large mistakes made overseas by geothermal drillers. Didn't they cause an earthquake? That really scares me to think that we are still creating destructive harm to the earth in search of energy"*

Additional information was sought by participants about energy technologies, actually participants were most interested in being providing with more information about geothermal and CCS. In particular, the youth workshop participants requested a follow-up session that specifically included expert presentations and dialogue opportunities with representatives from these industries. For example:

> *"Not many people are aware of geothermal, unlike that of clean coal which has been discussed. I for one would really like more information and if possible to talk to someone from the industry itself"*
>
> *"Not enough information out there to decide if one is socially superior to the other"*

4.5 A Way Forward: Building Upon Our Learning

Successful risk communication does not happen by chance. It takes planning, effort and continuous attention to what is working and what is not working. The most successful strategies are those that solicit, incorporate and address stakeholder concerns in a respectful and supportive environment. Strategies must also provide a mechanism to explore the contextual underpinnings of the risk issue, in terms of social, cultural, political and scientific factors.

Results from the workshop highlight that successful risk communication is possible through a deliberative and purposeful process. This process includes a systematic approach to identifying and inviting people to participate, while considering factors that affect participation. Risk communication is maintained by creating and nurturing structured forums for dialogue by acknowledging the varying perspectives of the people who participate and the contextual settings of environmental risks. The results of effective dialogue, as demonstrated in this study can range from increased public familiarity and increased understanding of the support for implementation and public funding.

5. CONCLUSIONS

Various reports warn us that failure to act will actually cost substantially more than prevention (e.g. IPCC, 2007). Most of the solutions contemplated are focused on ways to allocate a given level of carbon emissions rather than on sharply reducing the extraction and consumption of fossil fuels. The geothermal industry is working hard to address the issue of meeting Australia's renewable energy targets but will this effort be in vain if there is little to no level of public support in the development and use of this technology? In developing new technology a key line of research is not only whether a technology is accepted by society but how the technology and risks associated with it are perceived. Having an understanding of stakeholder positions can help address issues and concerns stakeholders may have and this knowledge can be used to inform the development of the technology and potentially improve the outcomes and relevance to society.

This research identified that the public are supportive of the use of geothermal technology and there is support for using public funds in the development and implementation of geothermal technology. An increase in self-rated knowledge of geothermal technology demonstrates that the workshop process, including the provision of information and the facilitation of deliberation, effectively increased public familiarity with technologies - including the emerging geothermal technology. Additionally, participants' expressed some concern about geothermal technology, particularly regarding the use of water and the potential to create seismic activity due to drilling practices. Participants also called for further information about the technology, specifically from the industry itself.

A deliberative process, as reported on in this paper, provides a credible setting for the public to provide valuable information to policy makers, researchers and industry. Furthermore participants were enthusiastic contributors knowing their responses would be delivered to the highest levels of government and the geothermal industry within Australia. If government, researchers and industry are truly committed to the successful implementation of low emission technologies, including geothermal there is a need to make a concerted effort to begin the dialogue process. The process trialed in this research offers one possible method, which can access large numbers of stakeholders in a non-resource intensive way that provides rich insights into the societal acceptance of the technologies being proposed.

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