Final report: Citizens' panels on the role of future fuels in a low-carbon future energy mix in Australia

February 2023

Project number: 2.1-07

Project title: Deliberative engagement processes on the role of future fuels in a low-carbon future energy mix in Australia

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IMPORTANT DISCLAIMER

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Milestone Report Number	2.4
Description	This report provides the findings of five deliberative processes conducted across Greater Melbourne, Illawarra/ Wollongong and South Australia in 2021 and Western Australia and national young persons from across Australia in 2022. It shows how governments and industry can use the results and gain traction towards Australia's energy transition.
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Project start/completion date	August 2020/November 2022
IP Status	**Open** – available publicly to all parties outside the CRC
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Summary

This report provides a summary of five citizens' panels held in February/March 2021 and April/May 2022 funded by the Future Fuels Cooperative Research Centre. The project objectives were to i) identify and document what Australians see as the opportunities, challenges and considerations in relation to the implementation of future fuels in the future energy mix; ii) collectively devise principles that can guide Australia's path to a low carbon future and iii) track participants' journey (pre- and post- panel) and evaluate the citizens' panel process based on participants' experience. Pre- and post- surveys along with transcriptions of recordings from each of the deliberative sessions informed the research outcomes.

Each citizens' panel brought together a sample of members of the public from Greater Melbourne, Illawarra/Wollongong, and South Australia in 2021 and Western Australia and a national young persons panel comprised of 18-29 year olds, in 2022. Participants from each panel met twice a week over a period of three weeks to learn about climate change, Australia's current energy system, future low carbon energy possibilities including future fuels, and then discuss and deliberate on the role they see for future fuels in Australia's future energy mix. All panels were conducted online, due to the continued uncertainty surrounding COVID-19 restrictions and to maintain consistency with the earlier 2021 panel processes conducted online.

Our findings show:

The citizens' panels provided insights into the factors the Australian public prioritise when considering the transition to low-carbon futures, with or without future fuels. Benefits, challenges and considerations were identified when the participants considered transition in energy systems in relation to the implementation of future fuels in the future energy mix:

Opportunities for future fuels: participants perceived that future fuels would be a new technology to reduce carbon in the energy sector and produce cleaner sources of energy, thereby addressing climate change concerns. A future fuels economy was seen as a way to create employment and offer a chance for workers to migrate across from fossil fuels. Future fuels was seen as an option to keep Australia's energy system resilient by offering diversity and choice in the system.

Challenges for future fuels: participants perceived a lack of strong leadership and acknowledged uncertainty about the impacts and expected benefits of introducing future fuels at the household level. They identified the importance of public education campaigns about renewable energy, future fuels and any necessary changes at the household level. They were concerned about social justice and how the costs and burdens of implementation would be ameliorated, particularly for vulnerable people in the community. They also questioned how waste and redundancy triggered by the transition would be managed.

What should be considered in the implementation of future fuels: participants relayed a desire for strong political and government leadership on climate change issues. They sought greater clarity on how cost, economic and financial implications would be addressed in the transition to low-carbon energy future, particularly at the household level. Participants are seeking more information and public education campaigns about decarbonising the energy system. They relayed a desire for integrated planning and assessment of a range of technology options. Equity in affordability, reliability and access remains an important consideration.

Principles: Each panel collectively developed a set of principles to guide energy transition reflecting values that are important to them. By comparing the five sets of principles, many commonalities have been identified suggesting that despite regional (and age) differences, Australians share many of the same values when it comes to energy systems.

The following amalgamated statement reflects commonly held values and in the Australian public's own words, describes a clear path to follow for both government and industry stakeholders.

Well-funded research into technology and innovation should underpin the formation of coordinated policies that guide industry and the public in their decisions that provide economic benefits but not at the expense of the environment. Clean, safe, reliable, affordable energy should be accessible and available to all Australians at all times.

Quantitatively evaluating the citizens' panel process based on participants' experience: The quantitative results show that the citizens' panel process was effective in enhancing participants' understanding of future fuels. Enhanced understanding led to greater support for future fuels.

Recommendations:

This report has elicited and documented what the Australian public values about the energy system today and what they would like protected or changed in the future. Organisations, irrespective of whether from government or industry, can use the findings of this report to assess whether their own value propositions align with the views of the public.

Where organisations are able to demonstrate their contribution towards the values and aspirations discussed in this report, it is more likely that social acceptance will follow. Communication strategies should therefore clearly articulate values alignment and demonstrate how these values translate into action.

The aggregated themes in the final report can be used as criteria for developing more 'wholesome' policies and processes. Wholesome is a term deliberately coined here to describe policy and processes that are 'holistic' in the sense of considering the 'whole system' but that go further to promote shared values in the creation of social, economic, environmental and political conditions in which individuals and communities can flourish. In other words, wholesome policies and processes consider the whole and promote community wellbeing. Wholesome approaches are particularly needed during a period of significant change and disruption such as the energy transition.

Where organisations find that their approach is not well aligned with the values reported here, then this report can be starting point for reforming organisational value propositions and communication strategies.

Where organisations find that the communities they seek to understand or work with are not represented here, this report is a chance to discover how deliberative engagement processes can be of value in getting to know communities and learning how best to work with them.

Future work

For many, future fuels were seen as having a valuable role in the future energy system as they were seen to provide choice to consumers and maintain diversity and resilience in the energy system. Understanding the importance to consumers of maintaining choice and diversity in the system is an area for further research. Continued dialogue and ongoing deliberative engagement with communities can continue to enhance awareness, education and support for future fuels in a meaningful way.

Designing factual and neutral information material for general public consumption was identified as an area of need.

1. Introduction

The project RP2.1-07 - *Deliberative engagement processes on the role of future fuels in the future low-carbon energy mix in Australia,* has been investigating public attitudes towards future fuels and their associated production processes and use. Through a deliberative engagement process, three citizens' panels were held in February and March, 2021. These brought together members of the public from Greater Melbourne, the Illawarra/ Wollongong region, and the state of South Australia. Similarly, two additional panels were conducted in April/May 2022 to determine the views of the public from Western Australia and the perceptions of young persons between the ages of 18 – 29 years from across the nation (NYP panel).

The project objectives were to i) identify and document what Australians see as the opportunities, challenges and considerations in relation to the implementation of future fuels in the future energy mix; ii) collectively devise principles that can guide Australia's path to a low carbon future and iii) track participants' journey (pre- and post-panel) and evaluate the citizens' panel process based on participants' experience.

The aim of this report is to summarise the findings from the 2021 (Ashworth et al., 2021) and 2022 citizens' panels (coming soon: (Kambo, Arratia-Solar, et al., 2022)). Chapter 2 provides an overview of the method to familiarise the reader with aspects of deliberative processes and the citizens' panel approach that was deployed. Chapter 3 highlights the similarities and differences observed in the citizens' panels comparing Greater Melbourne, Illawarra/ Wollongong, South Australia, Western Australia and NYP. Chapters 4, 5 and 6 highlight the key learnings from a deliberative engagement process perspective and how the process can be used in future respectively. Chapter 7 suggests ways in which government and industry stakeholders can apply the findings that have emerged from the exercise.

2. Overview of the method

To understand Australians' perception towards the matters of interest (cited in project objectives in Chapter 1), deliberative approaches were chosen to engage with selected panel participants. Deliberative engagement processes are recognised as being effective when it comes to implementing energy technologies, new science and technological innovations and associated policies (Batel & Devine-Wright, 2015; Batel et al., 2013; MacArthur, 2016).

Key aspects of the research method are extracted from an earlier report (Ashworth et al., 2021) to succinctly describe the overall process as follows:

2.1. DELIBERATIVE PROCESSES AND CITIZENS' PANELS

Deliberative engagement processes provide a much richer understanding when compared with other conventional modes of obtaining public opinion. The 2021 and 2022 exercises were purposefully designed to add to the knowledge base emerging from two previous surveys on levels of awareness and baseline support for hydrogen in Australia (Lambert & Ashworth, 2018; Martin et al., 2021). Deliberative research, is based on the notion of deliberation, where deliberation has been defined as *mutual communication that involves weighing and reflecting on preferences, values and interests regarding matters of common concern* (Dryzek, 2002; Mansbridge, 2015). Specifically, a form of citizens' panel was used involving groups of people selected to be representative of the wider public. The process was conducted over a three-week period, allowing for multiple short surveys to be issued at points before, during and after the panel discussions – allowing the research team to evaluate how participants process information presented to them; and how participants' perceptions change over time.

2.2. PROJECT GOVERNANCE AND PANEL DESIGN

An Industry Steering Committee (ISC) and Independent Advisory Panel (IAP) provided insight and feedback from start to finish to ascertain key aspects of the panel design. The ISC provided input on industry needs and suggestions of best geographic locations to focus on, while the IAP provided strategic support and advice. This included reviewing the *Briefing Guide* content sent to participants in advance of the panels, choice of expert presenters, scenario selection, and deliberation activities. All were subject to discussion and vetted for accuracy and bias by the IAP. The IAP and ISC continued to offer support in promoting the process, outcomes and overall findings and recommendations to relevant institutions and organisations.

A ***Citizens' Panel*** is an opportunity for a representative group of people to come together to discuss a specific issue. Participants are selected to statistically represent (demographically and attitudinally) the members of a wider population. These people meet together over an extended period of time to learn about an important issue, discuss it with other fellow citizens and come up with recommendations or present a collective view on a topic.

A **large group process** usually involves workshop-style collaboration, consisting of a mix of large group plenary sessions featuring expert presentations followed by questions, and small group breakout sessions where participants discuss the topics amongst themselves with the help of a facilitator. The workshop also features a series of questionnaires to capture participants' experience.

Deliberative workshops developed out of focus group method as a more in-depth alternative that provides participants with an opportunity to learn about and discuss an issue so that they reach an informed position. Deliberative workshops are dialogue events where the focus is on having informed discussion on a specific topic. A defining feature of those type of workshops is that all group discussions are supported by facilitators. Facilitators' main role is to support participants to communicate and interact in productive and respectful way. Deliberative workshops allow the organisation conducting the event to have a greater understanding of reasons and explanations behind an opinion or how people's views change as they are given new information.

Figure 1: Screenshot from 2021 citizens' panel

Figure 1 is a screenshot from the 2021 citizens' panel. Figure 2 briefly describes the learning topics and deliberation exercises that participants were immersed in over the three-week period.

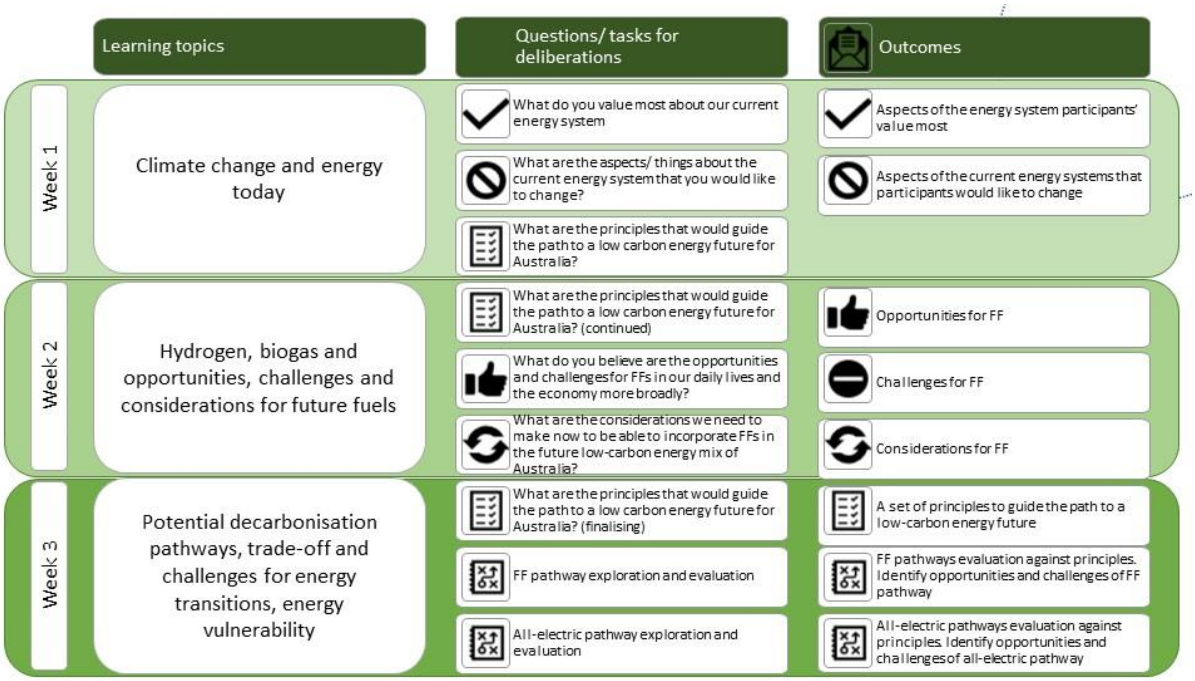

Figure 2: Citizens' panels process – deliberations and qualitative outcomes. Source: Ashworth et al. (2021)

Figure 3 briefly describes the reasons why the five different citizens' panels were selected. Greater Melbourne was an urban area of interest with high dependence on fossil fuels. Illawarra/ Wollongong is emerging as a renewable energy region. South Australia as a state has a higher penetration of renewable energy. In 2022, the 18-30 year old group was a demographic of interest as they displayed a high attrition rate in 2021. Western Australia was selected since it has a high dependence on fossil fuels and its electricity system is separate to the National Energy Market with its own regulatory arrangements.

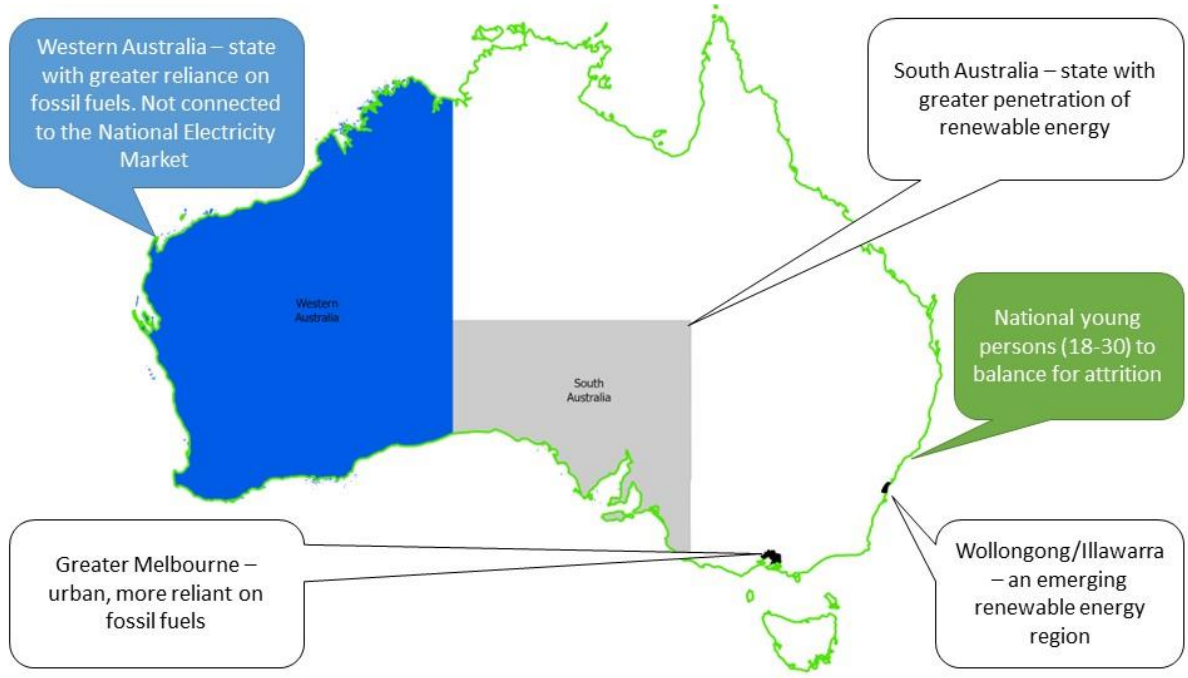

Figure 3: Strategic selection of five citizens' panels

2.3. DATA ANALYSES

To understand the similarities and differences across the citizens' panels (Chapter 3), themes reported in two interim reports (one each on the 2021 and 2022 citizens' panels) were compared for each deliberation task. Closely related themes (as reported previously, (see Ashworth et al., 2021) and (Kambo, Arratia-Solar, et al., 2022 coming soon)) were aggregated to summarise the key points of discussion.

A ' √ ' was placed against the theme if it appeared in a specific panel's discussions. If there was a fine nuance to the theme (as per the detailed reporting in previous report), a '+' was added to the relevant cell and subtext around the nuance was added. This way the themes of importance were summarised and visually accentuated in tabular format. Fine nuances differentiating each citizens' panel were visually reinforced. Since a description of each theme (in its disaggregated, discrete form), frequency at which it appears, distribution across each citizens' panel and salience for the participants, are described in lengthy detail in each of the previously published interim reports, we have not repeated these discussions in this final report.

Similarly, the principles from each citizens' panel were compared and collated across common themes (as reported in the policy workshops report). Lastly, to bring home the salience of certain issues raised by the public, some quotes have been inserted across this report.

3. Similarities and differences across the panels

In the first deliberative exercise, participants were asked what they valued about the current energy system. Participant responses are summarized in Table 1, while Table 2 outlines the aspects of the current energy system that participants would like to change. Similarly, Table 3, Table 4 and Table 5 outline the opportunities, challenges and considerations to incorporate future fuels in Australia's low carbon energy mix, based on participants' views. Some illustrative quotes that reflected important themes emerging from the citizens' panels include:

"Ease and reliability is taken for granted" (Greater Melbourne)

"Being able to use alternative energy generation in the home and certain applications - e.g. solar powered pool heater" (Illawarra/ Wollongong)

"Affordability, for people with low income or students. Finding the balance between being environmentally friendly and being affordable" (South Australia)

"There is an element of privilege and expectation in our energy supply" (Western Australia)

"I value energy that does not produce emissions" (NYP)

It is interesting to see how participants' discussion around values (Table 1), changes they would like to see (Table 2), opportunities (Table 3), challenges (Table 4) and considerations (Table 5) for future fuels in daily life and the economy more broadly, flow into the principles discussed in Chapter 4. In a sense each of the activities reported here in Chapter 3, helped the participants to synthesise the principles and concretise their expectations into a discrete set of statements conveying the finalised principle. Each principle is an explicit statement that describes items of specific interest to the participants, and constructs meaning around, what social licence is, in the context of the renewable energy sector. From the perspective of renewable gas players/entities, efforts towards meeting the ideals set out in these principles, will go far in securing a place of favour with the broader public, and therefore we urge the reader to pay special heed to the tables that follow:

Table 1: What participants value about our current energy system

Aggregated themes	Greater Melbourne	Illawarra/ Wollongong	South Australia	Western Australia	National young persons
A reliable energy system where 24X7 supply is taken for granted and is considered a basic necessity to support desired lifestyle	✓	✓	✓	✓	✓
Diversity of energy sources and providers is valuable as having choice is important.	✓	✓	+ Quality of providers is important	+ Seeking more choice in sustainable and renewable energy	+ Seeking more transparent and competitive energy + Seeking more options for renters
Affordability and price. Accessibility and availability	✓	✓	+ more options to store solar energy	+ better services for regional and remote areas	+ Seeking better environmental management to reduce impact on climate + Seeking support to be able to afford renewables
Utilisation of smart technologies to monitor energy usage and smart appliances to save energy	✓			✓	✓
Safety		✓	✓		✓
Flexible arrangements with providers; technology for getting off the grid; government rebates; discounts and incentives	✓			✓	✓
Economic benefit from exporting energy; local jobs	✓	✓		✓	✓
Visual amenity					✓
Early warning systems (that transparently communicate and explain changes and upgrades in advance)				✓	

Table 2: What participants would like to change about our current energy system

Aggregated themes	Greater Melbourne	Illawarra/ Wollongong	South Australia	Western Australia	National young persons
Changes to allow for more renewable, cleaner and sustainable sources of energy	+ technologies for domestic use and export	✓		+ Build diversity in the energy system	+ Build diversity in the energy system
Changes related to tariffs, cost and rebates	+ Solar panel tariff, billing and alternate providers	+ Mechanisms to increase affordability	✓	+ Seeking more government support + More innovative payment plans	+ Seeking more corporate responsibility from industry
Changes that require government action and interventions	+ Changes around government regulation on energy prices (gas prices and affordability)	✓	+ Changes related to policy	+ Clear mandate from government	+ More pressure on developers to include solar
Research and investment in new technologies	+ Technological advances and exploration of new/alternative technologies	+ Research and funding mechanisms for new/alternative technologies	✓	+ Changes in transport fuel sources	+ a greater focus on reliable infrastructure for renewable energy transport
Education and information provision around energy savings and the various energy sources out there	+ energy use behaviour at individual and community level	✓	+ simple information	+ Build capacity to understand issues at stake + Embrace conscientious lifestyle choices	+ Build capacity to understand issues at stake + Embrace conscientious lifestyle choices
How companies operate	+ transparency of energy companies	✓	+ Competition between energy suppliers	+ Honest and transparent reporting	+ Honest and transparent reporting
Economic benefit from exporting energy	✓	✓		+ Look out for people losing jobs in the Coal industry + Reduce export of emissions	✓
Greater focus on the environment				✓	✓
Decentralisation and location of infrastructure			✓	+ Improve visual amenity	+ Improve visual amenity + Improve system stability
Cater to renters' needs					✓

Table 3: Opportunities for future fuels in daily life and the economy

Aggregated themes	Greater Melbourne	Illawarra/ Wollongong	South Australia	Western Australia	National young persons
Cleaner sources of energy and benefits to the environment and public health	✓	+ Social benefits	✓	+ Better, smarter than fossil fuels + Creates optimism	+ Better, smarter than fossil fuels + Creates optimism
The process of transitioning to a low-carbon future	+ Role of government		✓	+ With more choice in energy	✓
Employment and workforce upskilling	+ Skills transfer	+ Training and transition to new employment	✓		+ New jobs
Production and usage of fuels/energy		✓			
Export		+ Economic benefits	✓	+ Economic benefits	+ Economic benefits
Greening the transport sector		✓	✓		
Education		+ Community involvement	✓	✓	
Serious approach to waste				✓	+ Good use of available resources
Safety				✓	
International collaborations				✓	
Reduce energy costs					✓
Application at household level					✓
System to implement from the start					✓
Innovation					✓

Table 4: Challenges for future fuels in daily life and the economy

Aggregated themes	Greater Melbourne	Illawarra/ Wollongong	South Australia	Western Australia	National young persons
Infrastructure	+ Technology		✓	✓	+ Good use of available resources
Cost of establishing a future fuels industry	✓	✓	+ Financial implications	✓	+ Financial risk and uncertainty
Challenges around public perceptions of future fuels	✓	+ Uptake of future fuels	+ Education, engagement and public opinion	+ Changing mindsets + Understanding + Education	+ Changing mindsets + Acceptance + Public education
Involving people/ stakeholders				✓	✓
Affordability, reliability, and safety	+ Security of supply (7)	+ Access to available technology	✓	✓	+ Accessibility
Employment	✓	+ Workforce training	+ Workforce training	+ New skills needed	
The nature of future fuels and their generation process		✓	+ Implementation of Technology, Transport, Export and Waste of future fuels		
Loss of fossil fuel revenue		✓			+ Loss of jobs
Uncertainty about household impacts/benefits				✓	+ Other uncertainties
Lack of political will/ care	✓			✓	✓
Lack of trust in government				✓	
Energy privatised				✓	
Fragmentation of governance	+ policy			✓	+ Complex governance/ responsibility

Table 5: Considerations to incorporate future fuels in Australia's low carbon energy mix

Aggregated themes	Greater Melbourne	Illawarra/ Wollongong	South Australia	Western Australia	National young persons
Considerations around governance and political leadership	✓	✓	+ Policy, political will & government regulations	+ Strong leadership is needed	+ Strong leadership is needed
Cost, economic and financial implications	✓	✓	+ Economic considerations	✓	+ Scales of economy
Providing information and education around future fuels and the move from fossil fuels	✓	+ Public opinion	+ Public perceptions, education and consultations	+ Public education campaigns	+ Public education campaigns
Transitioning to a low-carbon energy future	The implications of different technologies	+ Planning	✓	+ Understanding the need for integrated planning	+ Weigh up technologies
Considerations around affordability, availability and reliability	✓	+ Equitable transition	+ Equity	+ Social equity	+ Equity and access
Transition to new employment and upskilling workforce	✓	+ Workforce training	+ Workforce training		
Location of infrastructure	✓		✓		
Environmentally conscientious choices			✓		✓
Urgent action is needed				✓	✓
Safety			✓	+ Uncertainty	
Strong feelings (positive and/ or negative) need to be validated				✓	✓
Impacts at consumer end					✓

4. Principles to guide a pathway to a low-carbon energy future for Australia

Over the course of the deliberation, each panel was tasked to develop principles that should guide the path to a low carbon energy future for Australia. These principles (Table 6) explicitly state the values and considerations that the participants hold dear. Therefore, heed must be paid to the principles devised here, as they summate the overall expectations that the participants hold against the overall transition, how it ought to play out, and how key stakeholders such as industry and government representatives, ought to operate and function. Heeding these expectations and having a plan as to how they must be managed through communication and engagement exercises, augers well for any player who wishes to come across as sincere, honest and aligned with the public's views.

Table 6 shows that participants from each of the citizens' panels, placed a heavy emphasis on education, research and innovation. A great amount of faith is placed on the role of research in ascertaining the efficacy of renewable technology options. Participants conveyed a strong belief in Australia's research capability and communicated their expectation that Australia should become a world leader in renewable energy innovation. A plea for positive, engaging and comprehensive public education campaigns was made so that the public can understand the environmental risks and impacts of current fossil fuel energy sources and simultaneously understand the benefits of renewable energy technologies that are being considered for Australia's energy mix.

Secondly, as already documented (Chapter 3) all participants placed a great amount of emphasis on costs, affordability and access. Combined, the participants devised the second highest number of principles around equitable and affordable energy services. Whilst overall supportive of renewable energy, participants expect that costs should not become a barrier, nor should the energy sector sacrifice the habitability of the earth for future generations.

The third highest number of principles fell under the category of 'transparency'. There appears to be a general mistrust of industry and the sentiment that arose in the panel discussions is that reporting from industry often appears disguised and deficient. Information about current energy supply chains and operations is hard to obtain and at present the participants cannot see how industry will be held accountable and remain compliant towards reducing carbon footprints and preserving the environment for the future. The call is made to government to adopt evidence-based public policies that 'keep providers honest and transparent'. A call is also made to establish an ethically driven independent committee/authority that ensure industries report how they are meeting their emissions reductions targets and are remaining compliant with the necessary policies and regulations.

With respect to policy, the participants want to see an overarching long-term emissions reduction plan with net-zero targets firmly in place. They want to see a policy that can survive the change of governments. They want to see strong leadership and collaboration across all levels of government such that a net zero carbon emissions future can be actualised, alongside overall environmental gains.

Table 6: The citizens' principles – arranged in order of themes

Aggregated theme	Citizens' principles	Location/ Cohort
Education, research and innovation	Government and private support for education and research with a purpose to encourage innovative and progressive technology with an objective to produce financially viable renewable sources of safe, environmentally friendly and reliable energy.	Greater Melbourne
	The Government should seek to transition our society by providing multicultural, reliable and transparent information/education to improve understanding that will lead to positive change.	Illawarra/ Wollongong
	Transition to net-zero carbon emission and future energy usage in general requires early investment in ground-breaking scientific research and innovation - including more directional research into non-renewable and low-carbon energy. That research should be future focused, drive sustainable power, ensure new technology is safe for all Australians and the environment and inform industries and Government decision processes.	Illawarra/ Wollongong

Aggregated theme	Citizens' principles	Location/ Cohort
	Develop community and public education for Australians to understand energy production, usage and disposal to increase overall efficiency/efficacy in the transition to cleaner energy while reducing waste/misuse	South Australia
	Access to updated information and simple reports produced by energy providers, which show the method of generation, will support people to make informed choices and to become aware of the long-term impact of various different technologies.	South Australia
	Create a positive, engaging, and comprehensive education campaign for renewable energy. This should also include up to date information on the risks of current energy sources and their effects.	NYP
	Australia should be investing in their own research into renewable technologies, while also encouraging and incentivising the private sector to join and collaborate. This will ensure that Australia becomes a world leader in renewable energy innovation.	NYP
	Government and industry work together in producing accurate research and planning. Develop a national, public, up-to-date database of research findings to help inform decision-makers and policy.	Western Australia
	Developing education programs for all Australians through consultation with diverse populations to ensure that all current and future generations will benefit and gain the new knowledge and skills required to move to cleaner energy and decarbonisation of the economy.	Western Australia
Equitable and affordable energy services	Energy is an essential service. Big companies and government should act in the public interest, so that energy services are equitable. Energy providers should put human and environmental impacts alongside profit.	Greater Melbourne
	Equitable and sustainable community-based decisions surrounding energy consumption, production and employment for current and future generations.	Illawarra/ Wollongong
	Green energy should be economically viable for producers and consumers of any economic status and residential location.	Illawarra/ Wollongong
	The transition to a low-carbon future should not negatively affect the reliability and affordability of Australia's energy supply of Australia.	South Australia
	Produce the required combined renewable energy using the technologies available today and the emerging technologies, in a reliable and affordable price structure, to meet the agreed climate change deadline.	Western Australia
	Energy is a basic human right for current and future generations. Future renewable energy must be universal, equitable, available to all where costs are not a barrier regardless of location, wealth or ability. Energy for all without sacrificing the habitability of the earth for future generations.	Western Australia
Transparency	(Energy) companies need to be transparent with their supply chains and dealings.	Illawarra/ Wollongong
	Public policy should be adjusted to keep electricity providers honest and transparent seeking to meet clean energy usage targets as well as assisting and incentivising consumers and businesses to move towards renewable energy to achieve a carbon neutral home and businesses by 2050. This should be done by exploring alternative options including emerging technologies.	South Australia
	Establish an independent Government authority to use scientific evidence and provide evidence-based solutions to consult transparently with the community to make final decisions to reduce our carbon footprint and preserve our environment for the future.	South Australia
	Form an independent ethics committee to ensure transparency, manage access to incentives, and public education to provide equal access for all.	NYP

Aggregated theme	Citizens' principles	Location/ Cohort
	Accountability and transparency for industry to adopt future fuels to achieve zero emissions. Accountability of measurements needs to be monitored by an independent body. Targets need to be reported, compliance is rewarded and non-compliance is penalised.	Western Australia
Net-zero	Australia should participate in global efforts to reduce CO2 emissions. It should prioritise the development of renewable energy, introduce targets to approach zero net carbon emissions and a code of conduct informing Australians about all energy choices.	Greater Melbourne
	Successfully achieve net-zero by 2050 without needing to radically change infrastructure, with clear rules and guidelines to build sustainable future living.	Illawarra/ Wollongong
	Government should develop a long-term policy to reach a carbon emission target, like net-zero. The target should be overseen by a government body, like an independent commission, to withstand through government changes	NYP
	Collaboration at all levels of government to provide strong leadership to drive changes and behaviours towards a net zero carbon emissions future.	Western Australia
Safe for all	The new energy technologies should be safe to produce, consume, and dispose of in comparison to the current technology.	Greater Melbourne
	Build sustainable energy supply chains by recycling and considering product life-cycle with lowest possible environmental contamination.	Illawarra/ Wollongong
	Future fuel sources should have safety as the highest priority.	Illawarra/ Wollongong
Reliable energy	Every person has the right to safe, reliable, and affordable energy supplies that are supported by fair tariffs and rebates. Therefore, all Australians should have reliable, guaranteed energy when they need it and at a price they can afford.	Greater Melbourne
	Governments, in consultation with the corporate sector should create policies that support private infrastructures to ensure ongoing reliability while not compromising on quality.	Illawarra/ Wollongong
	Government must hold energy providers accountable for meeting transition milestones. Milestones that have been achieved need to be maintained relative to increasing demand.	NYP
Switch to variety of new and renewable energy options	All technologies considered should be incentivised and education should be provided in order to shift general public perspective and understanding. The transition to new technologies should be based upon proven effectiveness/value.	NYP
	Australia should be leading investments in and utilising a diverse range of new technologies in order to create a highly efficient energy system which minimises potential energy losses which would result from use of a single or limited technologies.	NYP
Inclusion through consultation	Government should develop a long-term policy to reach a carbon emission target, like net-zero. The target should be overseen by a government body, like an independent commission, to withstand through government changes	NYP
	The Australian Government should ensure that decision making is unified to meet "climate change" goals through consultation with young people, environmental groups, Land-owners and Traditional Owners.	NYP
Fair incentives for renewables	Governments' decisions should be apolitical and instil fair incentives for moving towards renewables and penalties for non-compliance. They should allow free enterprise to develop alternative energies at a cost-effective rate for the consumer, through tax incentives.	Greater Melbourne
	Governments should ensure the transition to renewables is affordable through a range of incentives for consumers, as well as disincentives for industries using fossil fuels. This will secure equal access for all.	NYP

Aggregated theme	Citizens' principles	Location/ Cohort
Energy security for Australian users	There should be an obligation to provide energy to the citizens of Australia first before exporting to other countries. The energy transition throughout the years needs to have system redundancies to ensure energy security.	Greater Melbourne
	Resources and new technologies relating to renewable energy that originate from Australia should be owned by Australians instead of capitalising on them through overseas ownership. Therefore, Australia should be operating and building infrastructures that are within Australia's operation capabilities.	South Australia
Energy efficient built environment	Government needs to facilitate the transition to low carbon options and renewable infrastructure. This should be achieved through incentivising low cost, energy efficient building design elements, as well as empowering consumers to be conscious of their energy usage by the installation of usage metres on buildings.	NYP
	Legislate and incentivise to ensure that every aspect of the life cycle of the built environment and industry, from design, construction, and operation reduces energy footprint and increases energy efficiency.	Western Australia
Collaboration	The implementation of new low-carbon energy technologies should be based on scientific research, education, and supported by government and industry funding.	Greater Melbourne
	The Government should seek out community views on how Australia should transition to reduce its carbon footprint.	Illawarra/ Wollongong
Transport	Create financial incentives for low carbon transport options and disincentivize polluting transport activities while ensuring equitable accessibility for electric vehicles and public transport.	Western Australia
Sustainable planning	Planning and development play a central role to ensure sustainability and minimal impact on communities, people, livelihoods and the environment. This could be achieved by selecting infrastructure which reduces the impact of urbanisation.	South Australia
Supply chain considerations	Support local supply chains where viable or necessary (for critical equipment) to reduce risks, whilst making reusable products and maximising value.	Western Australia
Low carbon leadership	Australia must be a global leader in implementing a low carbon economy and be future focused.	Western Australia
Environment and renewables	Future fuels and energy usage should be prioritised along with environmental concerns. The creation of sustainable renewable resources should be underpinned by legislation.	Illawarra/ Wollongong
	All energy decisions (extraction, supply, manufacture and distribution) should prioritise balanced sustainability and focus on decarbonisation of the planet; with minimal negative environmental impact. Future designs should respect Traditional Owners, their rights, habitat and utilisation.	Western Australia

Given that the wordsmithing of the principles was initiated in a small group and finalised in the plenary sessions, it was important to capture the main sentiment, objects and subjects within each statement. The aim of the wordsmithing exercise was to reflect key resolutions of the participants debate and their levels of collective agreement with the 'finalised' principle. A limited amount of time added to the challenge, and therefore grammatical perfection was never a goal. Once participants had voted in their preferences for the principles, apart from minor spelling fixes, the principles are reported back in Table 6 in the form rendered by the participants since it is a priority to preserve the integrity of the process, over and above grammatical and syntactical perfection.

5. Responses to the two alternate pathways

Across the five citizens' panels (in week three) participants were presented with two potential decarbonisation pathways that included a future fuels scenario (where gas is replaced by hydrogen) and an all-electric scenario (where all gas is replaced by electricity). We asked participants to assess each of these pathways, against the principles they had devised earlier. Participants were first asked the question: *Keeping in mind the pros and cons*

discussed earlier, can a future fuels pathway meet your principles? Then they were asked the same question with respect to the all-electric pathway. Possible answers were yes, no, partially or not applicable.

To compare the five citizens' panels, for the sake of this report, we have selected principles from one theme 'education, research and innovation' reported above in Table 6 (since this category, once populated with principles devised by the citizens' turned out to have the largest count of items). Next, we see how many yes votes that principle received against the future fuel scenario and all-electric scenario (Table 7). A comprehensive discussion on this activity is available in the interim reports previously published (see Ashworth et al., 2021; Kambo, Arratia-Solar, et al., 2022 coming soon). However, through this exercise, although the selection is very narrow, we are able to see how the two scenarios fare if forced to face off against each other, one principle at a time.

Table 7 shows that for each selected principle, Greater Melbourne, NYP and Western Australia, gave a much higher percentage of yes votes against the future fuel scenario than the all-electric scenario. However, in case of Greater Melbourne and NYP, the principle in questions (marked with * in Table 6), also received the highest percentage of votes for the all-electric scenario. This shows that the selected principles in each case, is of high value to each set of participants. It also reinforces the point that in the participants' view, irrespective of the scenario under consideration, Australia's energy transition should be research-led, innovation focussed and grounded on a sound and rigorous evidence base. Policy and education campaigns should follow but these need to be based on what the evidence is saying. Environmentally friendly, clean energy is welcome (at an affordable price), and the actions of industry should be bound by what policy says. Policy, in turn, should be bound by what evidence says.

In a sense this provides validation for the scientific community and the work they undertake where the focus is on environmental conservation via cleaner energy generation and production. It also provides a clear sign that governments should embrace and engage with the knowledge held within Australia's research and academic cohort to provide the necessary evidence base. There is a strong desire amongst the public for the government to hold industry to account and ensure they comply with minimising environmental impacts from energy production.

If the gas sector is to survive and secure its place in Australia's energy transition, it must show due deference to this desire of the public and demonstrate that they value the direction given to them by research, innovation and evidence, leaning strongly towards behaviours of environmental care and consideration. This link between industry, government and research, where environmental consideration is a strong focus, has to be expressed in clear terms for any gas entities who wish to prosper in the coming years.

Interestingly, it is hard to see whether Illawarra/ Wollongong and South Australia, favour any scenario based on Table 7 alone. Therefore, we examined the themes and votes against the top-ranking principles, in the case of Illawarra/Wollongong and South Australia (Table 8). From Table 8, again it is hard to tell, whether these participants valued any one scenario over the other. However once again it can be seen that, irrespective of the scenario in consideration, the one thing the two panels valued deeply is honesty and transparency. There are two principles here, clearly placing responsibility on government to hold energy industry to account. An explicit need is stated – that much needs to be done to keep energy and utility companies open, honest and transparent. However, this brings into question the concept of a social licence to operate which relies heavily on companies acting in good faith and working beyond compliance in their operations.

There is a strong opportunity here for the gas sector, if they are up to this challenge of being open, honest and transparent. Can the gas sector of the future, over-throw a long and closely held legacy of holding things in? In our policy workshops report (Kambo, Witt, et al., 2022), we have shown how industry appears to continue to struggle with a requirement of honesty and transparency. If entities within the gas sector can overcome their inhibitions in this regard, the prospect of survival becomes bright and certain, at least in terms of public acceptance. It will be important for the gas sector to demonstrate values of environmental consideration, public welfare, and that open, transparent, honest and continuing dialogue is sincerely valued. All of which will help to ensure a social licence to operate is maintained.

Table 7: Comparing the response to future fuels and all-electric scenarios

Theme	Citizens' principles	Principle devised by	How the future fuels pathway meets the principle (percentage of yes votes)	How the all-electric pathway meets the principle (percentage of yes votes)
Education, research and innovation	Government and private support for education and research with a purpose to encourage innovative and progressive technology with an objective to produce financially viable renewable sources of safe, environmentally friendly and reliable energy*.	Greater Melbourne	94 (placed 1st out of 8)*	89 (placed 1st out of 8)*
	Transition to net-zero carbon emission and future energy usage in general requires early investment in ground-breaking scientific research and innovation - including more directional research into non-renewable and low-carbon energy. That research should be future focused, drive sustainable power, ensure new technology is safe for all Australians and the environment and inform industries and Government decision processes.	Illawarra/ Wollongong	76 (placed 6th out of 11)	76 (placed 8th out of 11)
	Develop community and public education for Australians to understand energy production, usage and disposal to increase overall efficiency/efficacy in the transition to cleaner energy while reducing waste/misuse	South Australia	73 (placed 4th out of 7)	73 (placed 4th out of 7)
	Australia should be investing in their own research into renewable technologies, while also encouraging and incentivising the private sector to join and collaborate. This will ensure that Australia becomes a world leader in renewable energy innovation*.	NYP	82 (placed 1st out of 10)*	66 (placed 1st out of 10)*
	Government and industry work together in producing accurate research and planning. Develop a national, public, up-to-date database of research findings to help inform decision-makers and policy.	Western Australia	94 (placed 1st out 11)	75 (placed 8th out 11)

Table 8: Comparing the top ranked principles for Illawarra/Wollongong and South Australia

Theme	Citizens' principles	Principle devised by	How the future fuels pathway meets the principle (percentage of yes votes)	How the all-electric pathway meets the principle (percentage of yes votes)
Safe for all	Build sustainable energy supply chains by recycling and considering product life-cycle with lowest possible environmental contamination.	Illawarra/ Wollongong	97	88
Transparency	(Energy) companies need to be transparent with their supply chains and dealings.	Illawarra/ Wollongong	100	100
Equitable and affordable energy services	The transition to a low-carbon future should not negatively affect the reliability and affordability of Australia's energy supply of Australia.	South Australia	89	89
Transparency	Public policy should be adjusted to keep electricity providers honest and transparent seeking to meet clean energy usage targets as well as assisting and incentivising consumers and businesses to move towards renewable energy to achieve a carbon neutral homes and businesses by 2050. This should be done by exploring alternative options including emerging technologies.	South Australia	81	91

6. Key quantitative results

Supplementing the qualitative results in this section we provide a summary of some of the key quantitative results based on analysis of data collected through surveys issued to participants before and after the panels.

6.1. LEVELS OF SUPPORT FOR HYDROGEN

Figure 4 depicts the change in mean support for all five cohorts before and after the panels. The question was *Overall, how do you feel about hydrogen as a possible solution for energy and environmental challenges?* Answers ranged from v*ery unsupportive (1) to very supportive (7).* The mean support for hydrogen increased across all five panels after the panels. Comparatively, across cohorts, mean values for support for hydrogen were highest in South Australia.

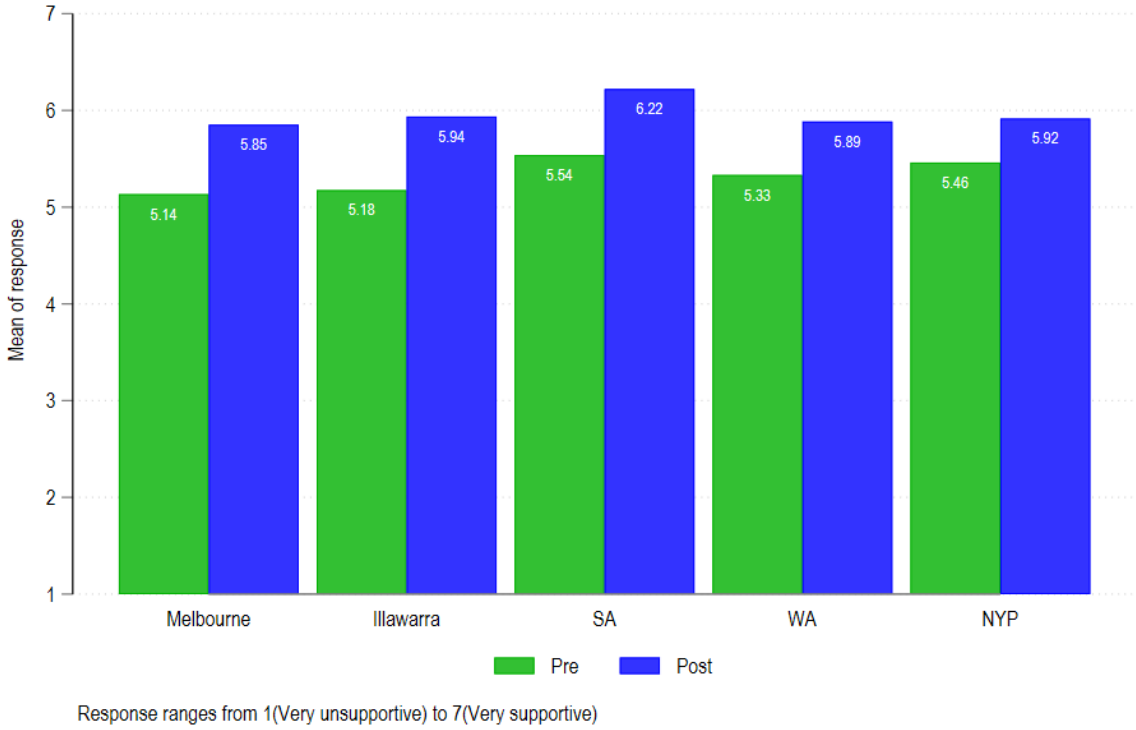

Figure 4 Mean support for hydrogen as a future fuel of Australia by cohort before and after the citizens' panel

In conjunction with mean support, Figure 5 shows the percentage of participants and their levels of support for the above stated question. Again, South Australia along with Western Australia had the greatest percentage of participants selecting the 'very supportive' option at the end of the panels (Figure 5).

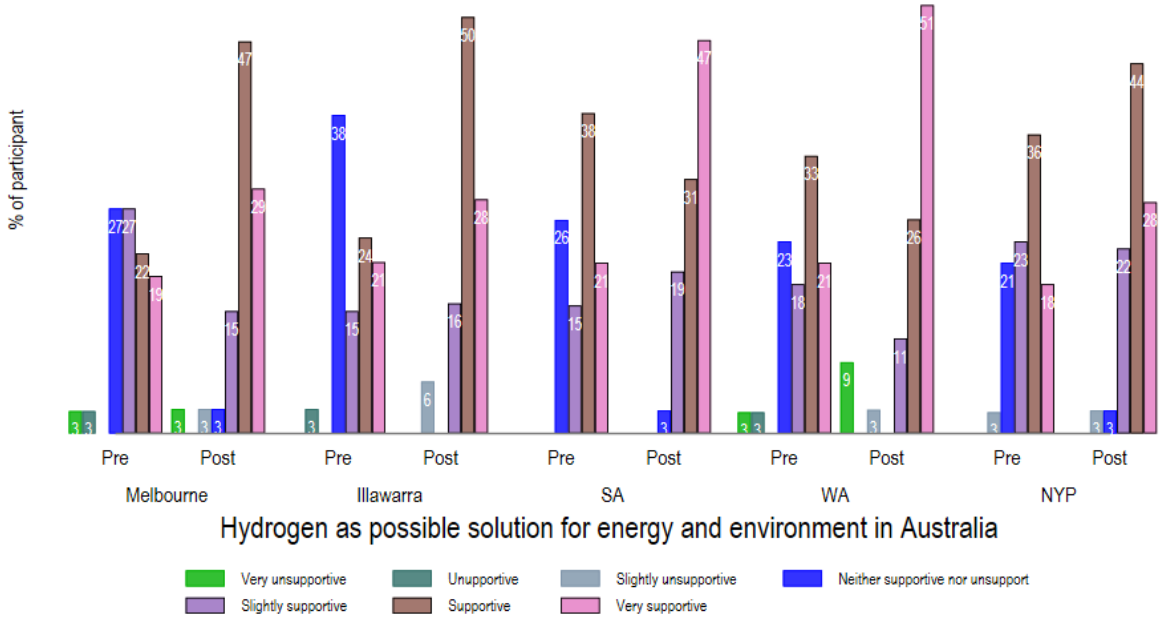

Figure 5 Hydrogen as a possible solution for energy and environment in Australia

6.2. CHANGE IN SELF-RATED KNOWLEDGE

Participants were asked to rate their knowledge about the various hydrogen applications. Participants were given a series of statements and asked to respond whether they had: *never heard of it (0), heard of it (1) or heard of it and can describe it to a friend (2).*

Table 9 shows that there was a significant change in how participants rated their knowledge before and after the panels. This is an expected result and validates that the information and panel deliberative processes helped them to grow their knowledge and awareness of hydrogen and its applications.

Table 9: Change in self rated knowledge before and after the citizens' panel for all cohorts

Variables	Pre		Post		Mean Difference
	N	Mean	N	Mean	
How hydrogen is produced	188	0.803	173	1.520	-0.717***
The use of hydrogen fuel cells in vehicles	187	0.770	170	1.376	-0.606***
The use of hydrogen fuel cells in homes	186	0.409	172	1.308	-0.900***
Hydrogen as an energy storage medium for electricity	187	0.524	172	1.302	-0.778***
Hydrogen refuelling stations	187	0.481	172	1.267	-0.786***
Burning hydrogen as a replacement for natural gas	187	0.578	172	1.419	-0.841***

6.3. SOCIAL LICENCE CONSIDERATIONS FOR AUSTRALIA TO TRANSITION

Gaining a social licence to operate is influenced by an individual's trust in the ability of government and industry to manage the associated risks and to act in the best interests of the community (Moffat & Zhang, 2014). To test this with participants, we included the question: *If a hydrogen economy was to be developed in Australia, to what extent do you agree or disagree, that the following groups would act in the best interest of the consumer?* Responses were on a Likert scale of 1 = strongly disagree through to 7 = strongly agree. Table 10 shows the spread of responses. Consistent with other trust surveys, the CSIRO received the highest score, with trust increasing by the end of the deliberations. It is worth noting that a CSIRO presenter provided the information on hydrogen for a large part of week 2 presentations in both 2021 and 2022. Environmental NGOs also scored highly as did local and state governments and universities. However, fuel/ gas supply companies scored the lowest slightly below electricity generation companies. Table 10 is consistent with the qualitative results reported in the previous sections (Table 7).

These results suggest that continued dialogue and engagement around the topic of hydrogen and biogas industry, is best led by research and environmental organisations, rather than fuel/gas companies or other electricity generation companies. Based on the qualitative analysis, participants still maintain a belief that electricity generation and fuel/gas companies actions are governed by economic interests (as would be expected), however sometimes to the detriment of the natural environment and local communities. If companies wish to improve their image with the public, their commitment to environmental gain and social benefit needs to be demonstrated in an honest, open and transparent way.

Table 10: Extent of agreement that each group would act in the best interests of the consumer

	Pre		Post		
	N	Mean	N	Mean	Difference
CSIRO	186	5.747	173	5.983	-0.235*
Environmental NGO	186	5.645	172	5.547	0.099
Local Government	187	4.749	171	4.76	-0.012
State Government	184	4.69	172	4.674	0.016
Universities	186	4.731	172	4.674	0.057
Federal Government	186	4.349	173	4.422	-0.073
Car/appliance manufacturers	185	4.227	172	4.18	0.047
Media	186	4.253	172	4.081	0.171
Electricity generation companies	185	3.886	173	3.665	0.222
Fuel/gas supply companies	184	3.554	172	3.43	0.124

6.4. WEEKLY EVALUATION – EXTENT TO WHICH PARTICIPANTS CHANGED OR BROADENED THEIR VIEW

In addition to the pre- and post- surveys, weekly evaluation surveys were given to participants to complete at the end of each week. One question that was asked was: *After listening to the presentations and talking to other members of your community, to what extent did you find you changed or broadened your views about low-carbon energy transitions and the possible pathways as a result of this week's workshops?* Participants had the choice to respond: *not at all (1); to a small extent (2); to a moderate extent (3); to a fairly great extent (4); and to a great extent (5)*

Figure 6 shows the mean response to this question. As mean value grew between week 1 to week 3 across the five panels, it is safe to assume that the panels were effective in broadening participants' views over time.

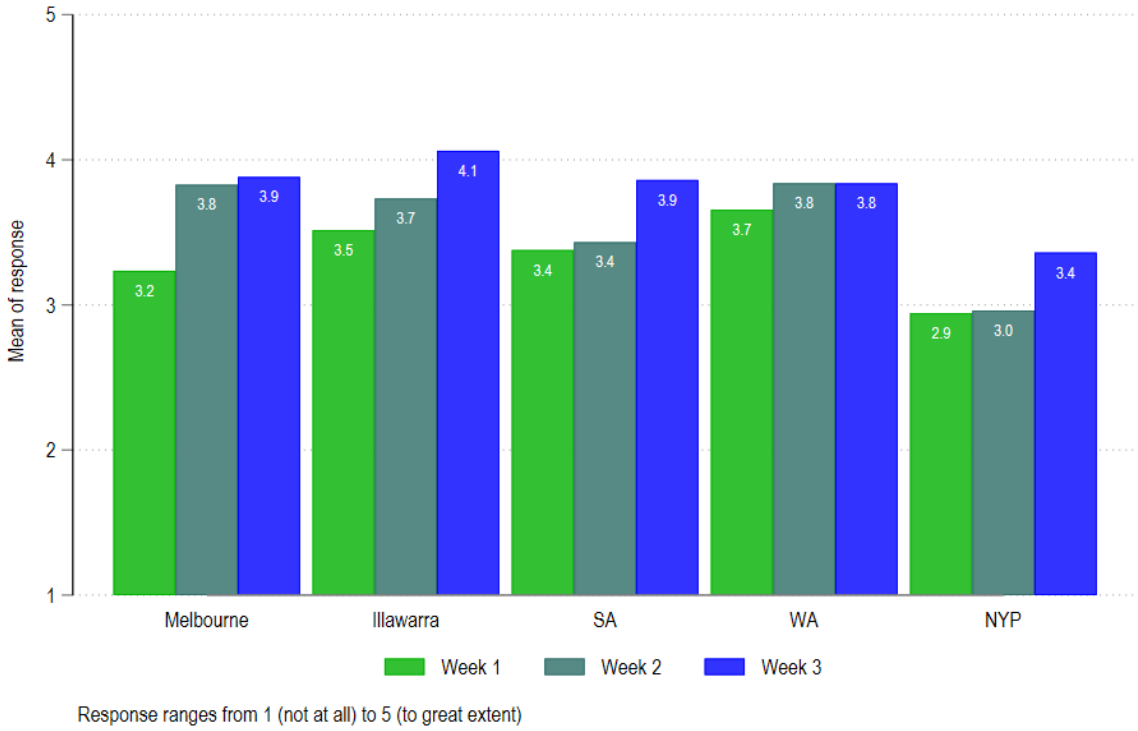

Figure 6: Mean responses to the question: To what extent did you broaden or change your view?

Next, we asked participants: *How did you enjoy your overall experience with this research project?* (*1 = not at all to 5 = to a great extent*). These responses were used to calculate the perceived panel effectiveness. To do this we first calculated a mean response. This was then expressed as a percentage. Figure 7 shows the overall panel effectiveness (in percentages) based on responses from across the five regions. This analysis shows the participants' enjoyment with the overall experience over the course of the three weeks hovered around the 80% mark. It appears that participants were more positive in their assessment of week 1 and slightly less so in week 3 – with Illawarra/Wollongong being the exception in this case. This might be partially due to the excitement of the process at the start and people being less forthright in the beginning, whereas more deliberation and tougher discussions ensued during the following weeks.

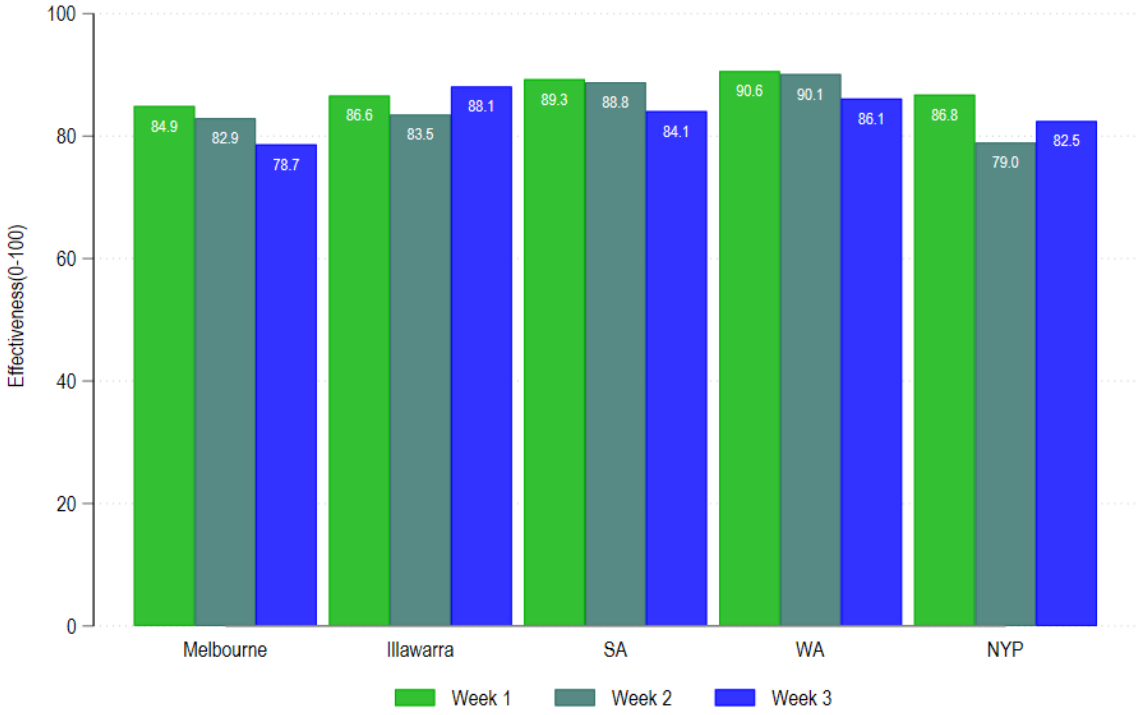

Figure 7: Overall panel effectiveness by percentage

7. Conclusions, Implications and Recommendations for industry

From Chapter 6, based on the principles stated in Table 6, Table 7, and Table 8, the public sees that responsibility for Australia's energy transition is divided between the research sector, government, industry and the public (Figure 8). Figure 8 visually depicts the collective view of how participants from across the five citizens' panels, unite to place expectations on the three sectors and themselves. Secondly, Figure 8 shows how the participants believe that responsibilities and information ought to flow through from the research sector to government, industry and the wider public.

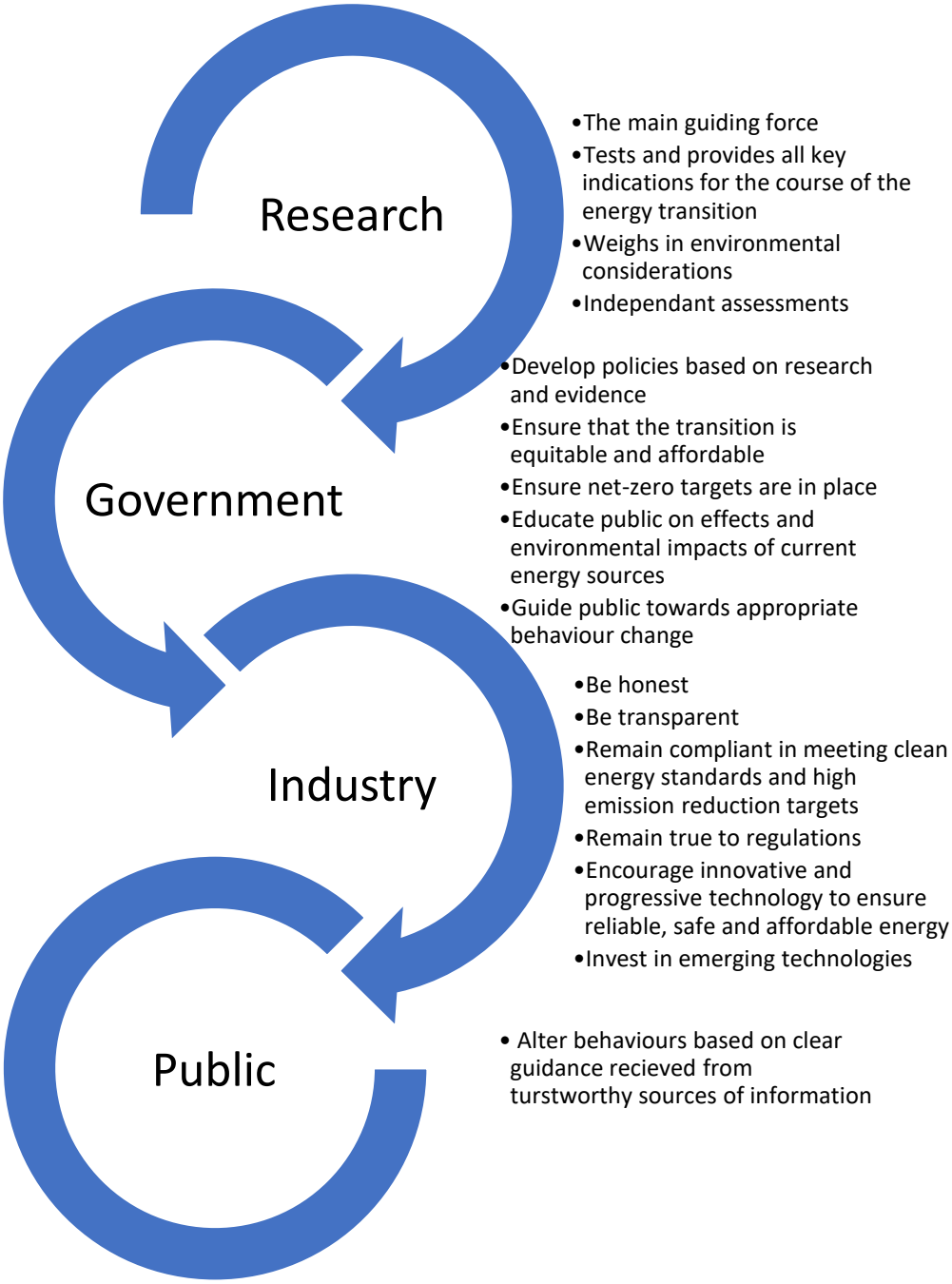

Figure 8: How responsibility for Australia's energy transition may flow from the research sector, through to government, industry and the public

Key quantitative results depicted in Chapter 6 show that the public consider the government to be a more trustworthy entity than electricity and gas/fuel companies. CSIRO, Australia's peak scientific research body is considered the most trustworthy of all. Based on a synthesis of Chapters 3, 4, 5 and 6, it becomes evident that the public places central responsibility for validating the science on the research sector and expects government to take the lead from the evidence-based results to decide their policies and to ensure their decisions are not seen as creating more divisive politics. There was a strong feeling that energy governance requires a bi-partisan approach to solutions.

Collaboration not competition amongst the research sector, government, industry and public, is a key working hypothesis – a non-negotiable expectation set up by the participants. However, from Figure 8 and Chapter 6 it is evident, there is a clear hierarchy of trustworthy entities. It will be important to ensure that communication about hydrogen is led by the more trusted entities with appropriate support from government and industry. Upon analysis, a key message, in relation to the energy transition, is synthesised as follows:

Well-funded research into technology and innovation should underpin the formation of coordinated policies that guide industry and the public in their decisions that provide economic benefits but not at the expense of the environment. Clean, safe, reliable, affordable energy should be accessible and available to all Australians at all times

7.1. WHAT DID WE LEARN FROM THE DELIBERATIVE ENGAGEMENT PROCESSES?

Apart from elucidating a clear message from participants of the five citizens' panel, the true value of the project is contained in the vast amount of data that has been collected over the course of the project. The three reports published so far, have only touched the tip of the iceberg, there is more information that will be produced in ensuing journal articles and additional in-depth analyses. However, from the point of view of the gas sector, government and the FFCRC, there are some key learnings to highlight that impact social licence to operate considerations.

7.1.1. How can government use the data towards developing policies and framing regulations?

The synthesis above depicts the key message emerging from the participants across the five citizens' panels. If the government, takes its lead from this message and uses it as a guideline towards developing policies, there is a good chance that the end product will contain features that resonate well with the general public. For further clarity, the aggregated themes listed in Tables 1, 2, 3, 4, 5 and 6, can all become criteria against which governments can assess the policies they are developing.

When it comes to communicating their work on policy to the public, governments would do well to demonstrate how each of these criteria have been addressed within their respective policies. A special effort should be made to use the criteria not only for the sake of constructing a 'communication' rhetoric, but also actualising environmental gains, keeping energy clean, safe, reliable, affordable, accessible and available 24X7, all at the same time.

Holistic, integrated strategic and scenario planning may well be undertaken to demonstrate how the aggregated themes in Tables 1-6 can be addressed. In the view of the participants, environmental gains and social benefit need to be weighed in alongside techno-economic criteria (For example, embedded into scenarios where techno-economic modelling has already begun like Net Zero Australia (2022)). Communities will ask to see environmental gains alongside emission reductions to assess the overall social/ community benefit of any local projects that emerge down the track. Unless techno-economic modelling is tempered with socio-environmental considerations, the true path for net-zero emissions in Australia cannot be wholly charted.

7.1.2. How might industry use the data towards continuing their operations?

Similarly, the gas sector (referring to every entity and organisation – whether public or private within the sector; whether a producer, generator, transporter, distributor, wholesaler or retailer), will also do well to revisit and

revise their own value propositions and operating principles to see how well theirs resonate with the criteria listed in Tables 1-6. If the gas sector can communicate to the public and demonstrate through words and actions, how their own operations align with the criteria devised by the participants. there is a strong chance that the gas sector will secure a place for itself within the hearts of the wider public.

However, the onus of demonstrating how each organisation within the gas sector meets the above-listed criteria (aggregated themes in Tables 1-6), is the whole sole responsibility of each organisation itself. Again, rhetoric alone will not cut it – actions have to follow on if integrity is to be demonstrated (specially to the very discerning youth of the nation). Moreover, the gas sector is reminded that:

> *"The specific issues of community acceptance and council development approval is likely to remain a challenge to the sector as it develops and deserves careful attention by project developers. A co-ordinated and thorough industry-wide approach would be more efficient and avoid the risk of long-term damage to community acceptance of hydrogen projects in the event that an individual developer does not handle it well." (BOC, 2022, p. 4)*

Therefore, from an industry perspective the work of community engagement teams, who are on the ground to elicit social acceptance, their work is cut-out and remains difficult. However, staff working in this capacity, will have much reassurance, when they are going out to engage, **IF** the organisations that they work with can demonstrate how their activities resonate and address the needs of the public. Particularly, with respect to the aggregate themes listed in Tables 1-6.

7.2. NEXT STEPS AND FUTURE WORK

This report is the final deliverable of this deliberative engagement project. However, it follows on from the conclusions, implications and recommendations cited above, that the national survey on public perceptions towards hydrogen would be useful starting point in tracking the sentiments of the public to see whether any broad-scale changes have occurred in perceptions since 2018, when the first (Lambert & Ashworth, 2018) and second national hydrogen surveys were conducted (Martin et al., 2021). Since FFCRC has established its standing in this space, it makes sense for the FFCRC to take the responsibility to deliver the third hydrogen survey to allow for greater comparison. In many ways the FFCRC embodies the kind of collaboration that the public are seeking, amongst industry, government and research institutions. It makes sense to capitalise on the image that FFCRC has so far established for itself and continue to foster growth and dialogue in the coming years.

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