
Public understanding of CCS in Australia and worldwide

OUTLINE

- Statistics from Europe/China research
- Recent Australian study
- Update on Australian CCS projects



SPECIAL EUROBAROMETER 364 (2011)

Germany, United Kingdom, Italy, Spain, the Netherlands, Poland, Finland, France, Greece, the Czech Republic, Bulgaria and Romania (n=13091)

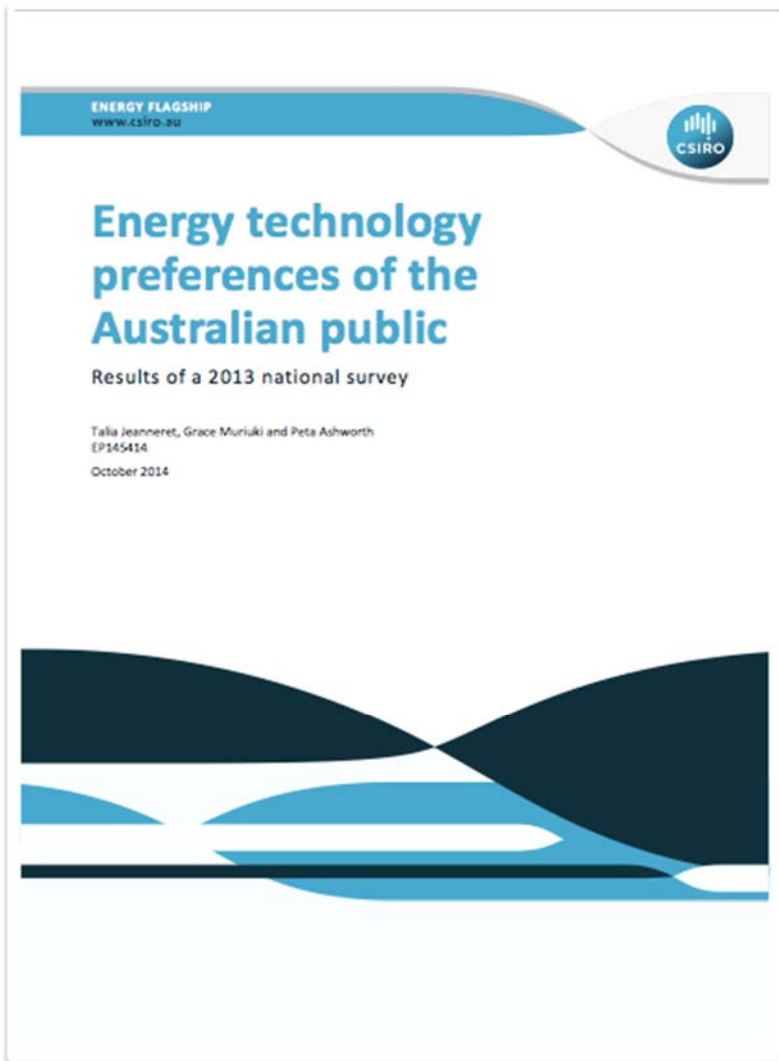
- 10% said they had heard of CCS and knew what it was
- 20% had heard of it but did not really know what it was
- 52% of respondents in the Netherlands said they had heard of CCS and knew what it was, over five times the average
- Germany (13%), Finland (12%) and the UK (11%) awareness and understanding of what was meant by CCS
- 47% agree that CCS could help the combat climate change. But only 23% said that they do not agree with this
- 38% felt that they ‘would not benefit’ from CCS technology if it was used in their region whilst 23% thought that they ‘would benefit’



ACROSS OTHER COUNTRIES

Netherlands	Canada	Scotland	France	China
111	80	99	1076	2410
2011	2011	2011	2007	2014
Workshop	Workshop	Workshop	Survey	Survey
84%	61%	36%	34% (on CO ₂ storage)	32%
Ashworth et al. 2013	Ashworth et al. 2013	Ashworth et al. 2013	Ha-Duong 2009	UK-China CCUS 2014

ACKNOWLEDGEMENT



The team at CSIRO:

- Grace Muriuki
- Talia Jeanneret
- Paul Graham
- Thomas Brinsmead
- Jenny Hayward

Funding from the CSIRO's
Energy Flagship

RATIONALE

- Conducted energy technology surveys for some time (since 2005)
- Continual finding Australians prefer renewable energy
- Generally have been reluctant to pay more
- Previous experience with interactive tools for climate data in tourism has been well received
- What would be the impact of an interactive tool on price and GHG data



EXPLORATION

- [Link to My Power](#)

Step one FAQ

Move the sliders or type in a percentage to change your energy mix. The sliders are set at Australia's current energy mix. To go back to this at any time click [default](#).

Coal 0 10 20 30 40 50 60 70 80 90 %

Gas 0 10 20 30 40 50 60 70 80 90 %

CCS Carbon Capture Storage 0 10 20 30 40 50 60 70 80 90 %

Renewables 0 10 20 30 40 50 60 70 80 90 %

Nuclear 0 10 20 30 40 50 60 70 80 90 %

Step two

See the outcome of your decisions on your electricity bill and national carbon emissions, today and into the future.

Electricity bill

15% increase to your bill

NOW | 2050

National carbon emissions

21% increase to national carbon emissions

NOW | 2050

Step three

Now help us with a quick survey. CSIRO wants to hear from you!

Before proceeding, please tick to agree to share the information in this survey with CSIRO

I agree to share my information.

Why did you choose this energy mix (above)?

Enter your answer

ID code:

What is your gender? male female

Which year were you born?

What is the highest level of education you have completed?



EXPERIMENTAL DESIGN

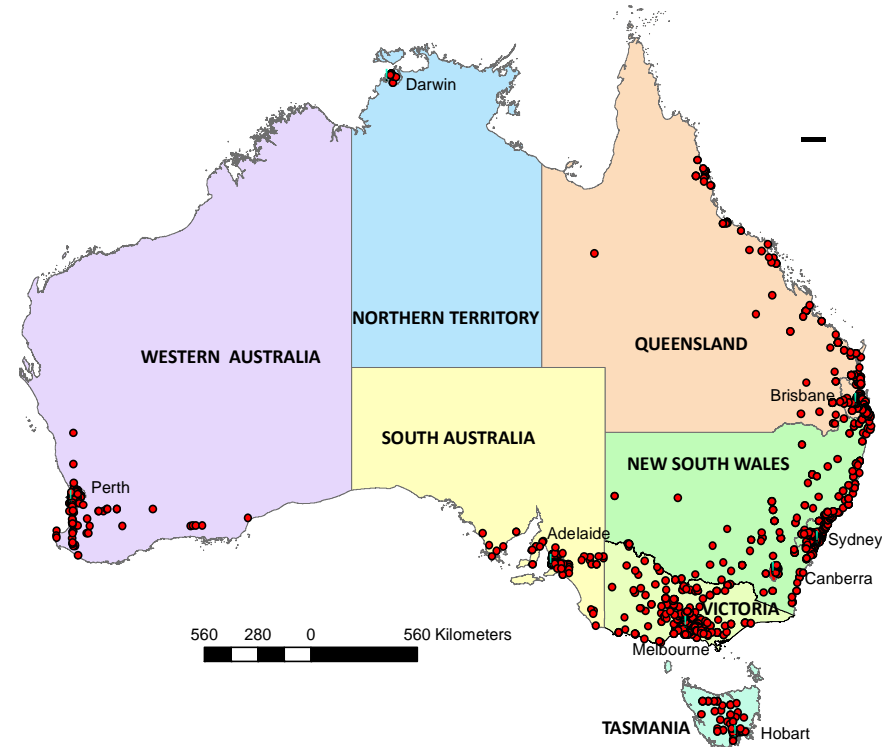
TREATMENT	DESCRIPTION
Control	<ul style="list-style-type: none">• No energy source and related technologies information provided• Repeat of funding priority ranking included only the top five energy sources and related technologies
Condition One (‘MyPower’)	<ul style="list-style-type: none">• Description of energy sources and related technologies provided• Directed to engage with ‘MyPower’ online tool• Attitudes sought after interaction with online tool• Repeat of funding priority ranking included all twelve energy sources and related technologies
Condition Two (Information table)	<ul style="list-style-type: none">• Description of energy sources and related technologies provided• Information on cost and emissions of energy sources and related technologies presented in a table• Attitudes sought with consideration given to cost and emissions information• Repeat of funding priority ranking included all twelve energy sources and related technologies

ENERGY INFORMATION

Energy Sources and related technology	Levelised cost of energy (cents per kilowatt hour)	Typical lifecycle CO ₂ emissions (grams of carbon dioxide per kilowatt hour)
Wind*	ranges from 9 to 17	ranges from 8 to 20
Nuclear	ranges from 10 to 12	ranges from 8 to 45
Coal	ranges from 14 to 22	ranges from 877 to 1130
Gas	ranges from 12 to 27	ranges from 422 to 548
Gas or coal (CCS)	ranges from 11 to 25	ranges from 65 to 396
Geothermal*	ranges from 15 to 23	ranges from 20 to 57
Solar* (concentrating solar/solar-thermal)	ranges from 18 to 25	ranges from 14 to 32
Solar* (photovoltaic)	ranges from 12 to 23	ranges from 29 to 80
Biomass*	ranges from 12 to 14	ranges from 18 to 75
Wave/tidal*	ranges from 21 to 23	ranges from 6 to 9

TOTAL SAMPLE

- In total 2986
 - Control n=483
 - C1 n= 1250
 - C2 n=1253
- Age and gender reasonably consistent across groups
- Males 48.1%/Females 51.9%
- Slight over representation in 65 – 69 years



Legend

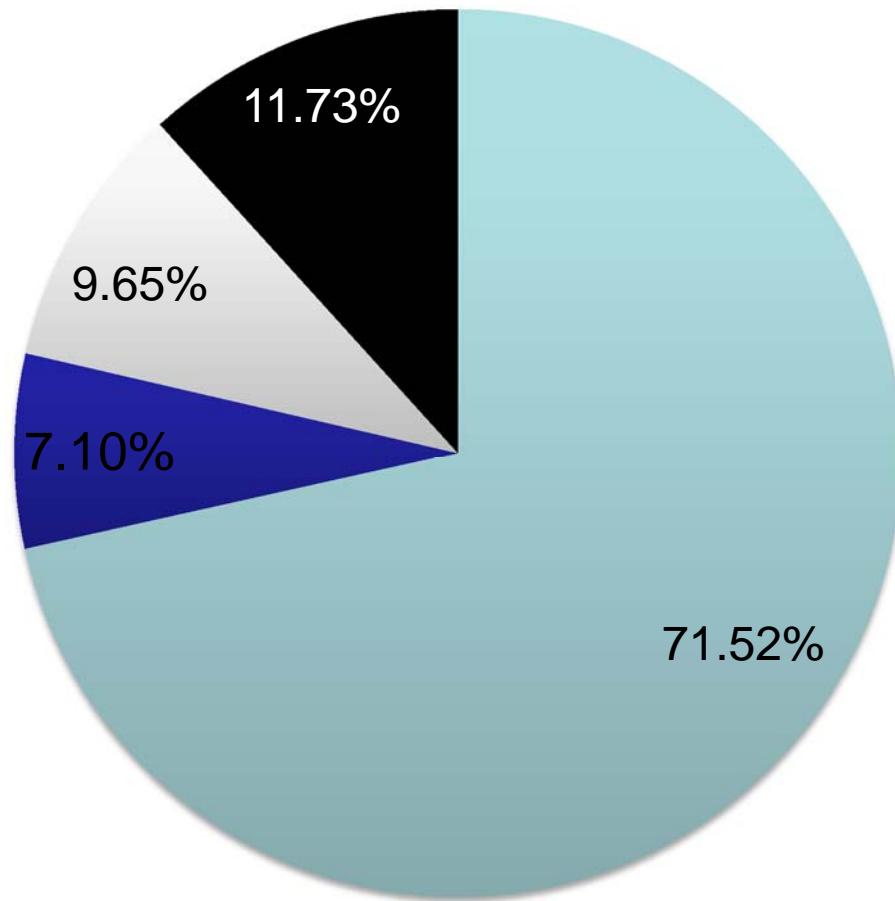
- ! Capital cities
- Respondent postcodes



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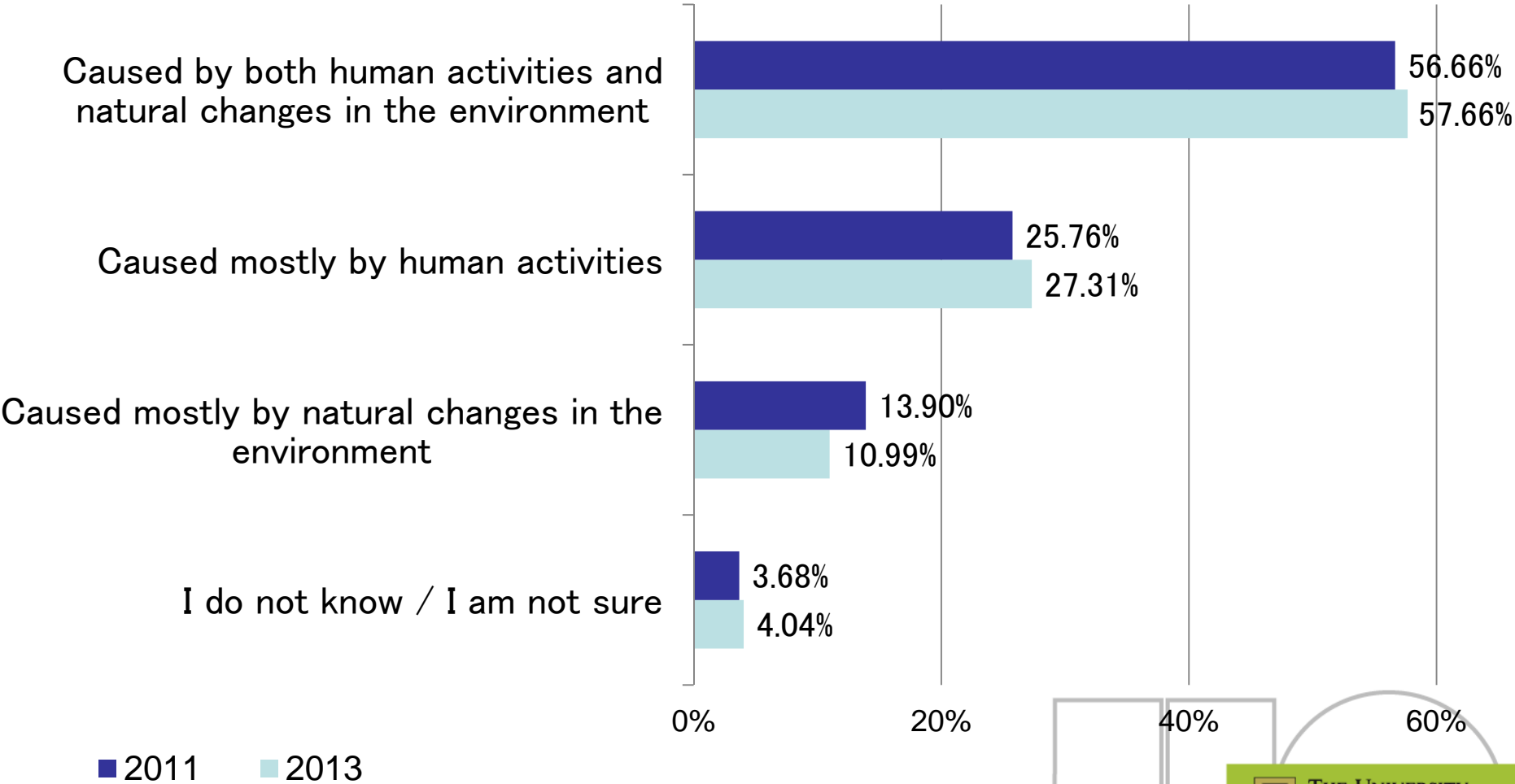
BELIEF IN CLIMATE CHANGE



- Yes, it is already happening
- It will start happening within the next 30 years
- No it is not happening and won't
- I do not know / I am not sure



BELIEF IN CAUSES OF CLIMATE CHANGE



Step one

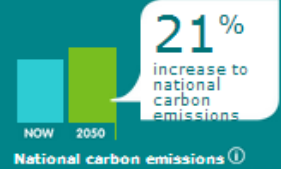
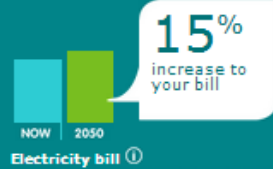
[FAQ](#)

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I agree to share my information. ^①

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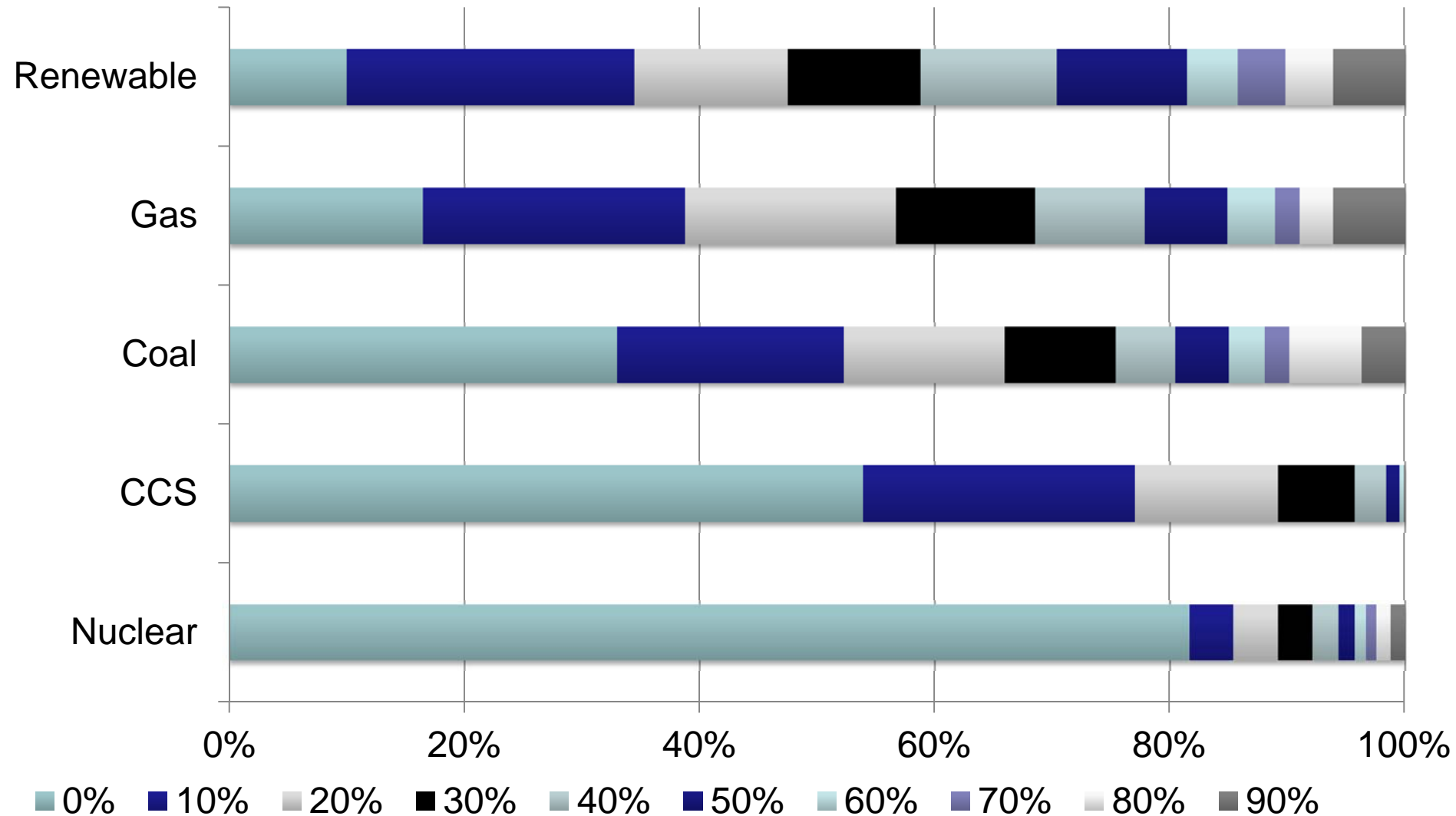


FREQ. OF ENERGY SOURCE SELECTION (N=813)

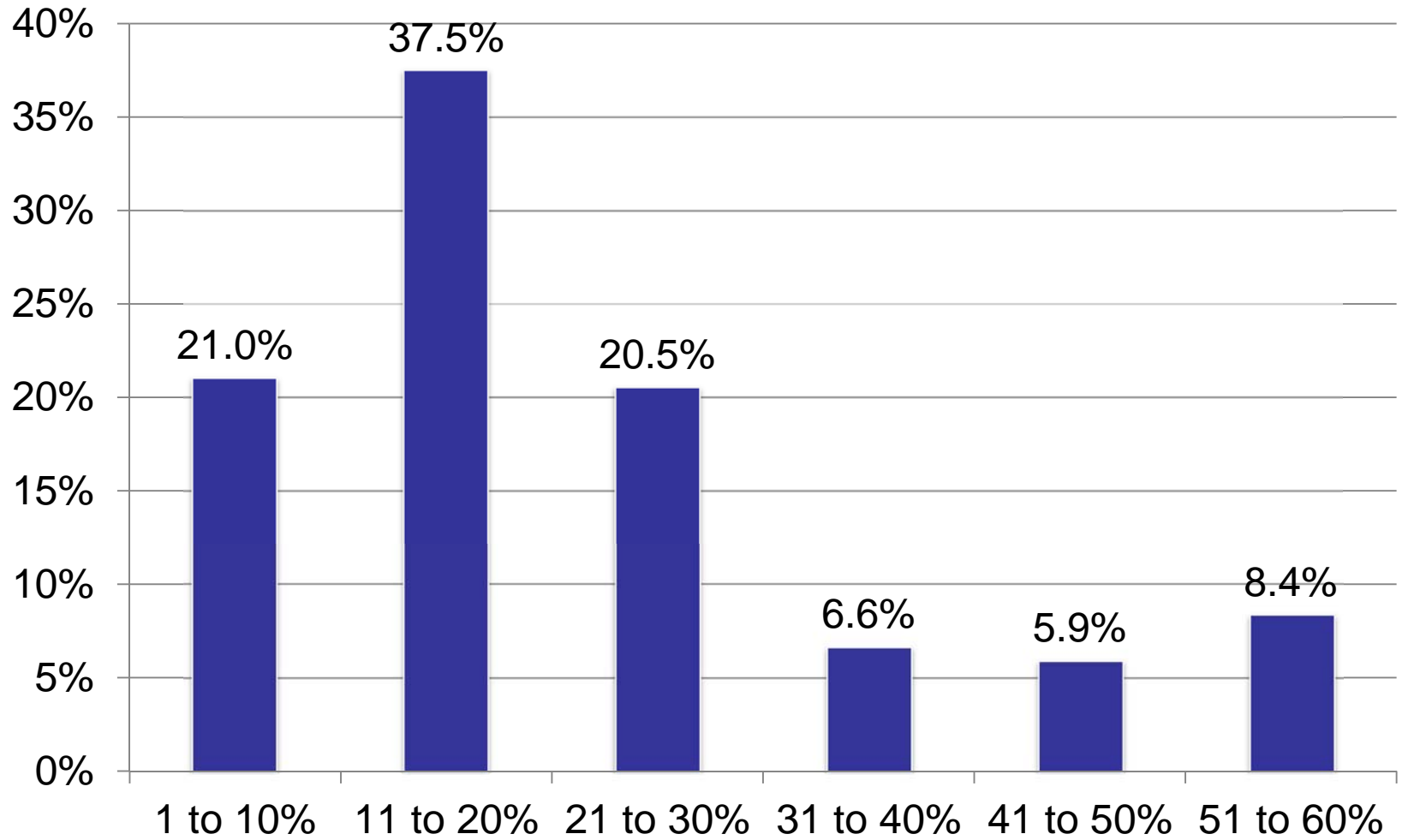
Energy source/technology	N	%
Renewables	732	90.04
Gas	679	83.52
Coal	545	67.04
CCS	375	46.13
Nuclear	169	18.33



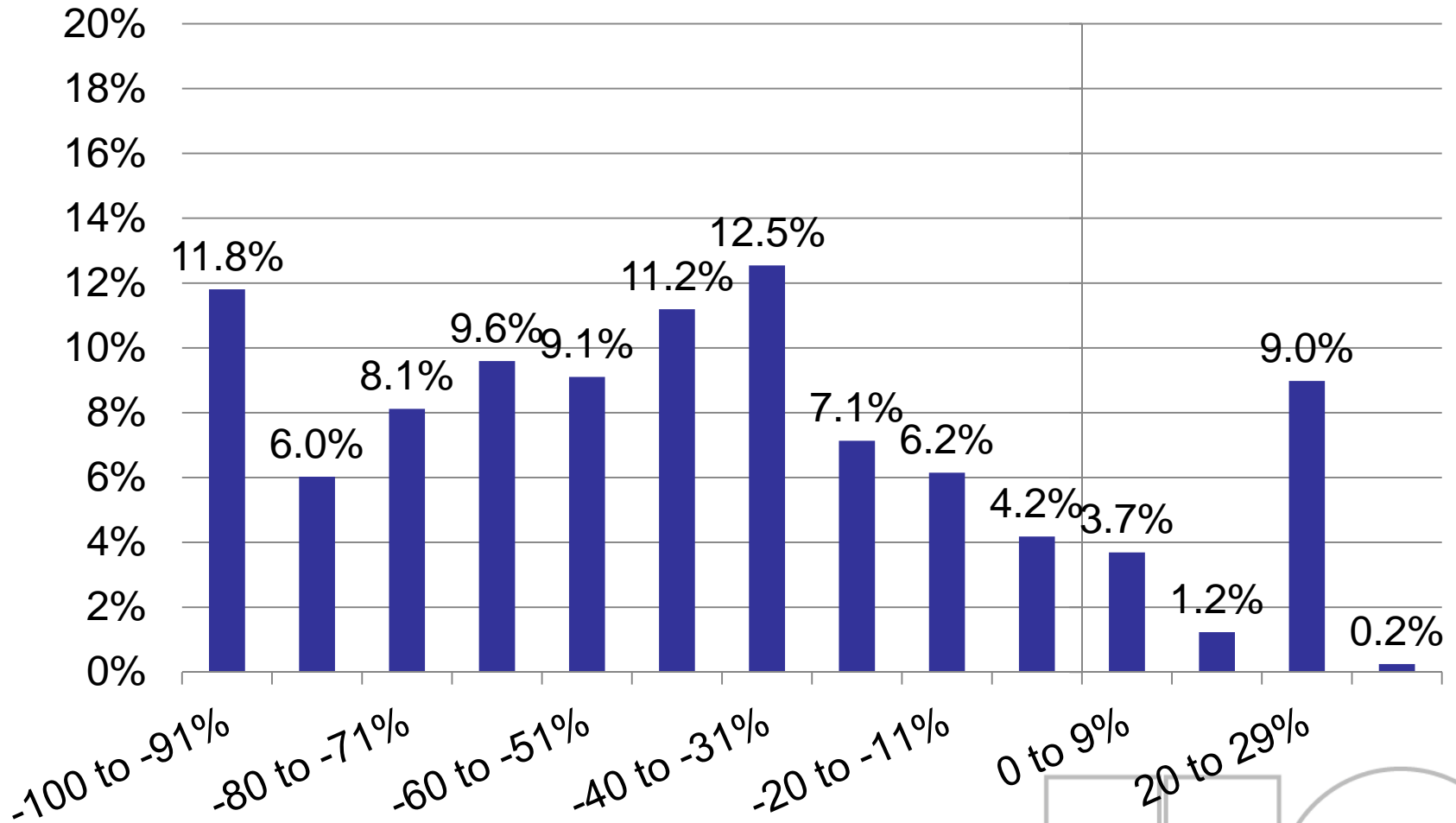
DISTRIBUTION % PREFERENCES MYPOWER



FREQUENCY OF THE RANGE OF ELECTRICITY PRICE CHANGES



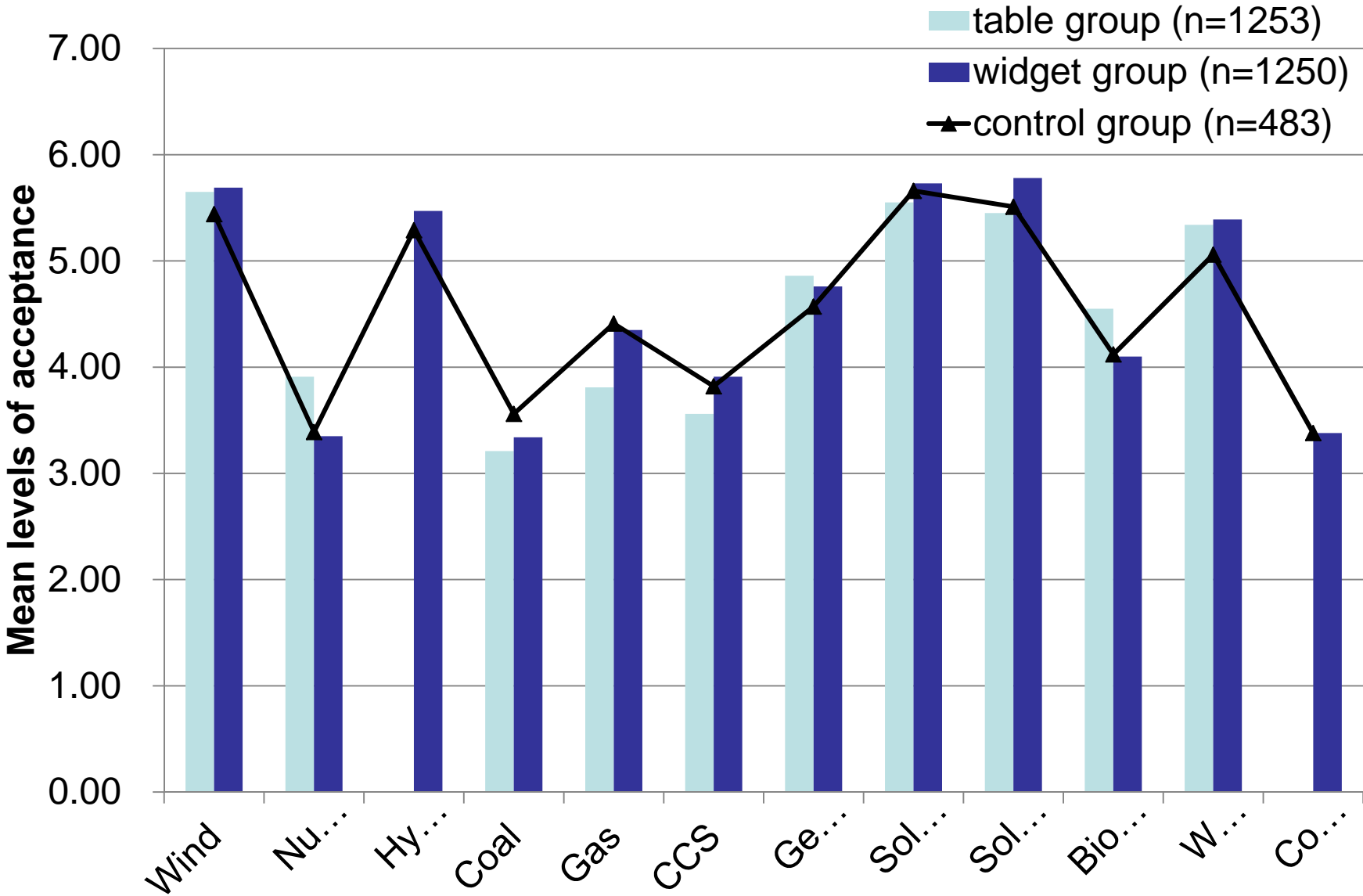
FREQUENCY OF RANGE OF CARBON EMISSION CHANGES



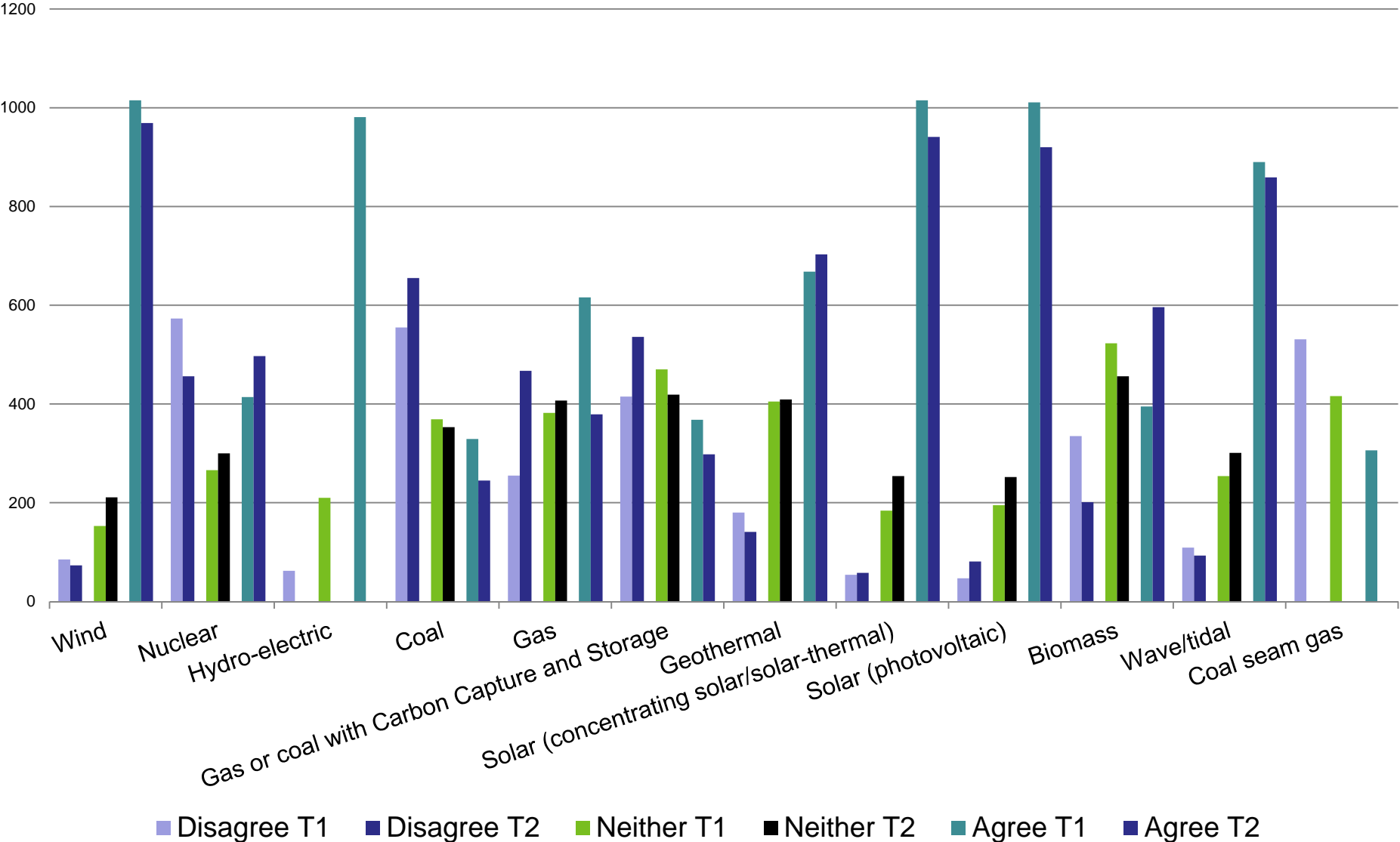
THE AVERAGE ENERGY MIX AND IMPACTS

Energy source/technology	%	SD
Renewables	23.35	26.74
Gas	28.30	25.55
Coal	8.67	12.24
CCS	32.82	26.00
Nuclear	6.86	18.00
IMPACT OF ENERGY MIX	%	
Change in electricity price	22	15.14
Change in emissions	-44	35.23

MEAN LEVELS OF SUPPORT



CHANGES IN PREFERENCES

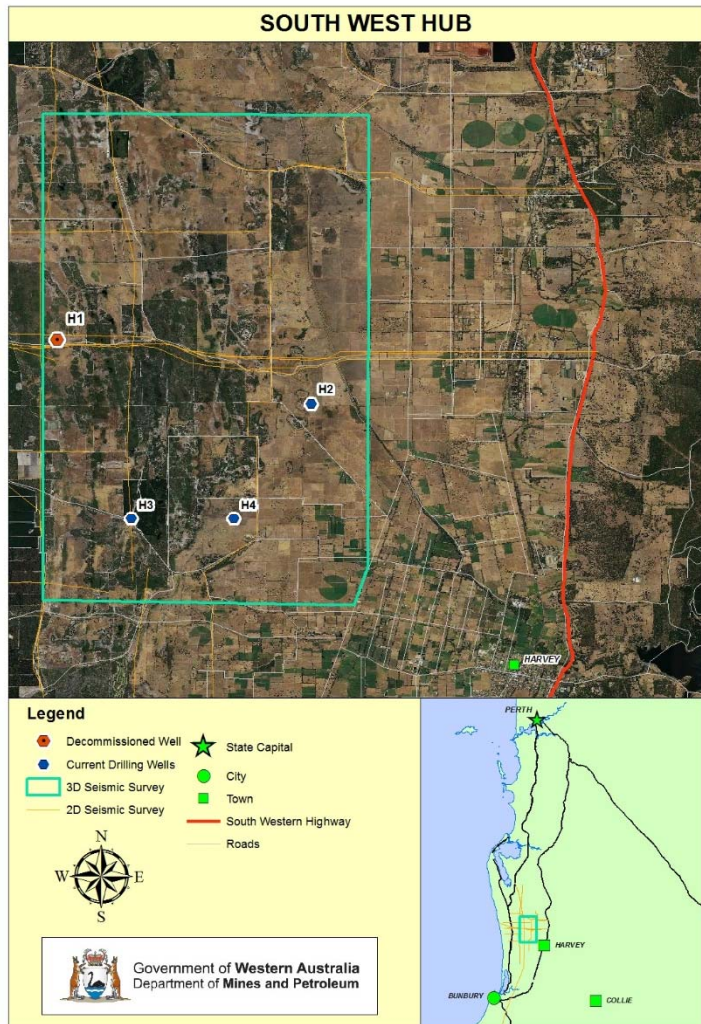


WHAT WE HAVE OBSERVED

- On average people have been reluctant to agree to price increases when asked the general question.
- When given the options in the MyPower tool they have chosen a more stringent emission reduction–price increase combination than their first answer indicated.
- Might mean that people are reluctant to give a blank cheque for price increases when asked an open question.
- When given very specific detail about cost–emission trade–offs and how to achieve them they are more comfortable selecting something with reasonable ambition.



SOUTH WEST HUB – WESTERN AUSTRALIA



- Between major CO₂ emitting areas in Perth and Collie
- Rural area known for fresh produce: dairy, beef, fruit and vegetables
- Changing demographics

3D SEISMIC COMMUNITY ENGAGEMENT



OBJECTIVES:

- Over 125+ landholders
- Understand local concerns regarding CCS
- Improve one on one negotiations/discussions
- Examine how communities wish to engage with projects
- Examine role of trust
- Effects of local context – legacy issues
- Compare and contrast local engagement with broader communication

3D SEISMIC COMMUNITY ENGAGEMENT

- Lack of consultation and need for information
- Concerns about safety and impact on future generations
- Devaluation of property and the local area
- Environmental values and management
- Privacy issues and threat to lifestyle
- External advice from others
- Social norms talk amongst community +ve
- Opportunities for compensation +ve
- Historical context – legacy issues -ve
- Media articles -ve
- Process issues -ve



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SOUTH WEST HUB DRILLING PROGRAM



- Two wells for core and data logging using mineral rigs
 - 1200 metres
 - 1500 metres
- Third well some core, more for instrumentation and water/pressure testing using a water rig
 - 1850 metres

CARBONNET PROJECT - VICTORIA

Industry engagement:

- Industry briefings
- Joint work programmes with industry
 - KHI HESC project
- Event sponsorship
 - BCIA Workshop
 - National CCS Week
- Collaboration
 - GCCSI
 - CO2CRC
 - IEACCC, IEAGHG
- Publication of technical papers
 - Knowledge sharing



CARBONNET PROJECT - VICTORIA

Community Engagement:

- Public perception is critical
- Understanding local interests and issues
- Close liaison with local government authorities and community groups
- Briefings to community groups
- Providing access to information
 - Fact sheets
 - Website
 - E-newsletter
 - Presentations



<http://www.energyandresources.vic.gov.au/energy/carbon-capture-and-storage/the-carbonnet-project>

QUESTIONS ABOUT CCS

- CCS impacts and CO₂ behaviour underground (32%)
- Alternatives and comparisons (i.e., between CCS and other technologies/options; 22%)
- Economics of CCS and the Australian carbon price (17%)
- Current events in relation to CCS and international comparisons (17%)
- Ulterior motives and vested interests supporting CCS (7%)
- Timelines for deployment and future use of CCS (5%)

CTSC_o - QUEENSLAND

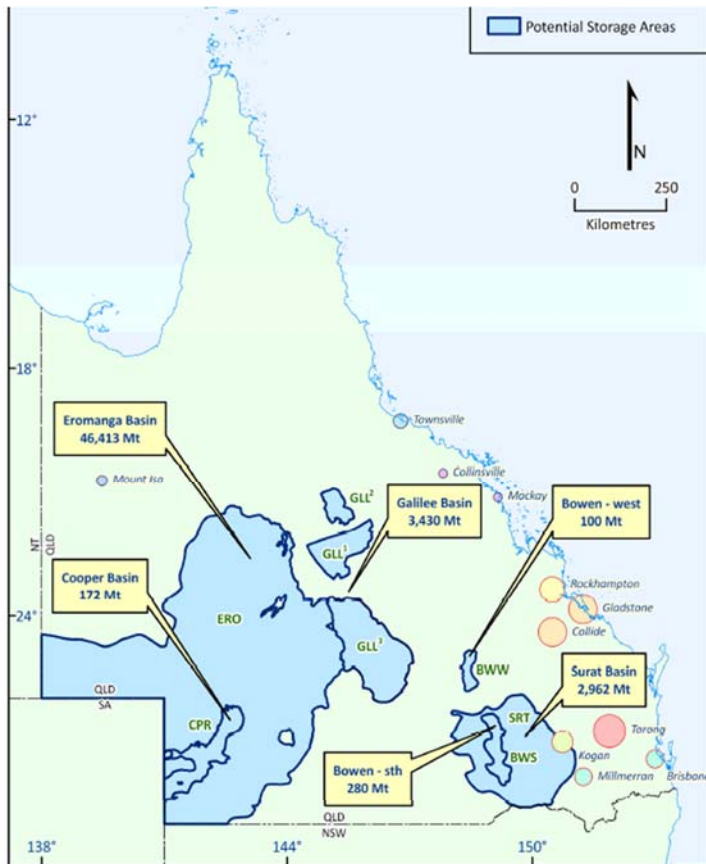


Figure HPB2: Maximum potential storage areas for reservoirs ranked as highly prospective for CO₂ geological storage. Estimated theoretical CO₂ storage volumes for high prospectivity reservoirs are labelled. Also shown are locations of major emission nodes in Queensland. Note that the western Bowen Basin and southern Bowen also contain storage areas for low prospectivity reservoirs (see 'Low Prospectivity

- Almost 3 billion tonnes of CO₂ theoretical storage
- Precipice Sandstone accounts for 1.3 billion tonnes of theoretical storage potential
- Identified as a key geostorage area under the 2009 National Carbon Storage Taskforce report and the Qld Govt GHG Storage Atlas
- Coal fired power stations closer to Surat Basin

SENSITIVE STAKEHOLDER ENVIRONMENT

- Lots of learning regional CSG
- Consultation fatigue
 - Many regional projects
 - Legislation still changing
- Active well organised lobby groups
 - Lock the gate
 - Coal4Breakfast
- Concern over regional water resource contamination by resource projects
 - Surat Basin part of Great Artesian Basin
- Opportunity to differentiate grant funded demonstration project from commercial resource developments
- Baseline survey



GORGON PROJECT - CHEVRON



<http://www.chevronaustralia.com/our-businesses/gorgon>

GORGON PROJECT - CHEVRON



- Construction activities more than 85% complete
- CO₂ injection is still planned for late this year, possibly first half 2016.
- Plan to inject 3.5 million tonnes CO₂ per year
- Will make Gorgon LNG Project the largest CO₂ injection project in the world when it comes on stream.

<http://www.chevronaustralia.com/our-businesses/gorgon>

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QUESTIONS



Thank you

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