Ipsos MORI

Findings from the DECC 2050 Deliberative Dialogues

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Executive summary

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The Department of Energy and Climate Change (DECC) commissioned Ipsos MORI and Involve to conduct three deliberative dialogue workshops across England and based on these, to develop a toolkit to enable further dialogue about pathways to reduce UK greenhouse gas emissions by at least 80% by 2050 compared to 1990 levels. Complementing this research, Ipsos MORI also analysed responses to the My2050 Simulation[1]. The findings on the My2050 simulation and the toolkit can be found in separate reports. The aim of the workshops was to engage with local community leaders in a dialogue about the 2050 emissions target, to understand how local community leaders might approach the challenge of reducing UK greenhouse gas emissions; and establish if using the 2050 Calculator and the engagement process changed participants' views on the subject. The work was funded by DECC and the Sciencewise Expert Resource Centre (ERC), a programme of the Department for Business, Innovation and Skills.

The deliberative dialogues took place in Ulverston, London, and Nottingham. In the first two locations, the workshop lasted the full day, and in Nottingham for an evening. Throughout the events, participants had an opportunity to

- try out the 2050 Calculator on computers,
- engage in group discussions about the themes that are relevant to using the Calculator to develop a successful pathway, and then
- attempt to finalise a pathway on the Calculator that they would like to see implemented.

The group discussions were moderated, and supported by stimulus material and an 'on-demand' expert, who could help with more detailed questions. This format was the same across the three workshops, but timings, number of computers, and number of experts on hand varied between locations. In total, 87 participants took part in the workshops across the three locations. Participants were all community leaders and included local councillors, representatives of business and non-governmental organisations (NGOs) and the voluntary sector as well as other elected representatives. The key findings of the study are highlighted in this summary.

What the events achieved: The workshops engaged participants in discussions about the 2050 target. The approach allowed community leaders to find out more

about the challenges the UK faces in relation to meeting our 2050 emissions target, the options the country has, and also gave them the opportunity to develop pathways for achieving the target. People engaged with the subject, and learned more about some of the less well known technologies (so their opinion shifted from not aware to starting to recognise the importance of levers such as electrification of transport), however, they did not necessarily change their views or behaviour about more well known technologies (e.g. nuclear) as a result of the workshops.

Participants' attitudes to environmental themes: Most participants were interested in climate change (perhaps partly as a result of their role as community leader), and were interested in learning more about the topic. Personal ownership of the topic varied somewhat by audience type and location. Overall, NGO representatives tended to take the activist stance, whereas business representatives looked at the issue from a business angle and councillors seemed to consider ownership as policy and regulation issues at national level. Ownership among elected members varied depending on the focus of their work. Comparing locations, buy-in seemed strongest in Ulverston. In London, participants appeared less likely to link the proposed change back to their local area. Nottingham fell in-between the two.

Approaches to the Calculator: Participants' approaches to developing a pathway seemed to be driven by considerations about what we should be doing, what seemed achievable, and what was thought to be desirable. Nuclear technology, wind, electrification, and bio-energy tended to be the technologies that evoked the strongest, and often negative, reaction and as such were often excluded. Participants also mentioned some variables that they felt were missing from the Calculator, such as some aspects of human behaviour change and future technological advancement (e.g. nuclear fusion). The absence of costs meant some felt it was difficult to make an informed decision on the best strategy to pursue.

Reactions to the stimulus: Among the four Big Themes, energy efficiency was the most popular as participants were already familiar with this theme. It was also most relevant to people's everyday lives, and participants liked the personal financial benefits involved in trying. Participants also agreed with low-carbon electricity generation, but were divided about the best approach. Electrification of demand and availability of bio-energy faced more challenges as the arguments in favour were not as clear.

Participants' 2050 pathways: Not all participants bought into the 80% target, and others struggled to develop a pathway that hit the target. The most popular Calculator levers were those that were closest to participants' everyday lives: home insulation, domestic transport

[1] http://my2050.decc.gov.uk/

behaviour and domestic transport electrification, domestic freight, international aviation, tidal and wave, and solar panels. Participants tended not to distinguish between national and local pathways. Over the course of the day, participants increasingly explored levers which were less familiar to them (such as carbon capture and storage (CCS) and geo-sequestration) when they realised that behaviour change combined with renewables would not necessarily be sufficient to meet the target.

Further engagement: Depending on DECC's objectives, there are a number of options to take the engagement process forward, such as further engagement with stakeholders or the general public, concentrating on informed final pathways, developing a network of national champions, rolling out the collection of pathways, or to focus on organisational pathways.

1. Introduction: The 2050 pathways workshops

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1.1 Background

The 2008 Climate Change Act committed the UK to a legally-binding greenhouse gas emissions reduction target of 80% by 2050, with 1990 as baseline. This highly ambitious target will entail changes to individual lifestyles and their local communities. Historically, the debate about which steps we take now as well as in the coming decades has been at a national and international level. The Deliberative Dialogue workshops were an opportunity to put local communities at the heart of the debate and explore how they believe the challenge should be tackled. The work was funded by DECC and the Sciencewise Expert Resource Centre (ERC), a programme of the Department for Business, Innovation and Skills.[2]

To facilitate engagement with the public, DECC developed the 2050 Calculator. This tool lets users create their own UK emissions reduction pathway, and see the impact using real UK data. Within the tool, users can also see example pathways that show different ways of reaching the 2050 target. The Calculator was publicly available on the internet before the workshops. On 3 March 2011, during the fieldwork period, the revised version described overleaf was launched.

In addition to the Calculator, DECC uses a number of other engagement initiatives in relation to the 2050 target. These include

- My2050 Simulation: a simplified version of the Calculator which uses just 14 levers;
- the underlying Excel workbook: a more detailed version of the Calculator which allows people to see underlying assumptions; and
- videos featuring David MacKay, DECC's Chief Scientific Adviser, who explains the challenges ahead.

A key purpose of the workshops was to find a way to enable community leaders to effectively engage with the Calculator tool. The Calculator, which offers more levers than the My2050

[2] The Sciencewise Expert Resource Centre (ERC), funded by the Department for Business, Innovation and Skills (BIS), helps policy makers to understand and use public dialogue to inspire, inform and improve policy decisions around science and technology. It consists of a comprehensive online resource of information, advice and guidance together with a wide range of support services aimed at policy makers and all the different stakeholders involved in science and technology policy making,

Simulation and therefore more potential pathways, is ideal for probing beyond the top of mind issues. While it is more complex to engage with initially, the fact that experts were on hand throughout the workshops to offer advice and support made them a good environment in which to use the Calculator. Through these discussions, the user learns about the complexities, choices and trade-offs that achieving an 80% reduction entails. The amount of time available in a workshop setting allowed for engagement with such a more complex tool. While the Simulation would have been a more simple tool, this would potentially have masked the nuanced responses, particularly from more informed participants, who, if anything, wanted more options/levers rather than fewer.

These 2050 initiatives have received considerable coverage through mainstream media, such as the BBC website and The Guardian. Our partner *Involve* has also developed a toolkit that is designed to facilitate engagement in the wider community. This is reported separately.

Complementing this research, Ipsos MORI also analysed responses to the My2050 Simulation. The findings can be found in a separate report.

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including the public. The Sciencewise-ERC also provides co-funding to Government departments and agencies to develop and commission public dialogue activities. *www.sciencewise-erc.org.uk*

The 2050 Calculator Web tool

The tool presents users with three charts, describing the demand for energy, the supply of energy and the greenhouse gas emissions for the UK. Below the charts is a list of sectors. For each sector of the economy, four trajectories have been developed, ranging from little or no effort to reduce emissions (level 1) to extremely ambitious changes that push towards the physical or technical limits of what can be achieved (level 4). These are indicated by four numbered boxes.

Clicking on a number selects a trajectory and the charts recalculate. If the user moves their mouse over the levels, a box will appear describing what that choice represents. Users can also find out more about each sector and what the changes would mean in practice by clicking the question mark icons next to each sector - these will display a short summary introducing the sector and explaining the levels and choices available.

Source: Create your pathway – 2050 Web tool, DECC website

1.2 Workshop objectives

DECC commissioned Ipsos MORI and Involve to conduct three Deliberative Dialogue workshops across England and based on these, to develop a toolkit to enable further dialogue about climate change. The workshops were designed to meet the following objectives:

- to engage with local community leaders in a dialogue about the 2050 emissions target;
- to understand how local community leaders might approach the challenge of reducing UK greenhouse gas emissions; and
- to establish if using the 2050 Calculator and the engagement process changed participants' views on the subject.

These events were the first research opportunity to explore how people outside of DECC engage with the Calculator. The workshops were designed as a pilot and this report focuses particularly on the participants' journeys in engaging with the Calculator on the day and how, if at all, the stimulus and discussion influenced their pathways.

1.3 Methodology

To maximise the opportunity for dialogue and deliberation, DECC was clear that it wanted to use workshops to engage with community leaders rather than online or other methods of engagement. Workshops encourage interaction and debate, thus maximising engagement and potential dissemination after the dialogues. Other approaches might have allowed for greater numbers of participants, but engaged with them in far less depth. The workshops were run according to the Sciencewise-ERC Guiding Principles.

1.3.1 Deliberative Dialogue workshops

Three Deliberative Dialogue workshops were conducted in England. Throughout the events, participants had a the opportunity to try out the Calculator on computers, engage in group discussions about the environmental themes that arise when using the Calculator, and then attempt to finalise a pathway on the Calculator that they would like to see implemented. The group discussions were moderated, and supported by stimulus material and an 'on-demand' expert, who could help with more detailed questions. This format was the same across the three workshops, but timings, number of computers, and number of experts on hand varied between locations. Full details of the discussion guides and stimulus materials are appended to this report.

Group work during London workshop

The following figure provides an overview of the workshops that took place.

Fieldwork overview

The table below provides a summary of attendance for the different events. Please see the section 'Attendance on the day' in the Appendices for more detail on recruitment.

Summary: participants per event				
	Ulverston	London	Nottingham	**Overall**
Type				
Councillors	12	5	6	**23**
Elected members of local governance boards and committees	7	6	4	**17**
Local representatives from business forums	2	11	6	**19**
Local representatives from non-governmental organisations (NGOs)	7	18	3	**28**
Total	**28**	**40**	**19**	**87**

Source: Ipsos MORI

Although numbers are small, it is worth noting that the stakeholders who agreed to attend the workshops appeared more engaged with the topic than the general public overall. In other research, we found that 22% of the general public in 2010 thought that climate change is likely to be a serious problem for Britain, compared to 41 out of 81 participants at the start of the workshop. Likewise, 11% of the general public strongly agreed that they can personally make a difference regarding climate change, as did 30 out of 84 workshop participants at the start of the day.[3] The following table provides more detail:

To what extent do you agree or disagree with each of the following statements about climate change?

		Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	No opinion	Don't know	Blanks
I personally feel that I can make a difference with regard to climate change	*Start (N)*	30	27	9	6	2	-	3	7
	End (N)	24	32	8	1	-	-	1	17
	2010 Cardiff University / Ipsos MORI (%)*	11%	42%	15%	21%	10%	1%	1%	-%
I think that climate change is likely to be a serious problem for Britain	*Start (N)*	41	25	7	3	-	-	2	6
	End (N)	37	17	8	4	-	-	-	17
	2010 Cardiff University / Ipsos MORI (%)*	*22%*	*40%*	*16%*	*15%*	*4%*	**%*	*3%*	-%

This theme is repeated for other questions around climate change. The marked-up event questionnaire with comparative data (where applicable) can be found in the Appendices.

[3] Comparative data from the Energy Futures and Climate Change Survey 2010 for Cardiff University. Results are based on 1,822 face-to-face in-home CAPI interviews with members of the British public (England, Scotland and Wales) aged 15+. Fieldwork was conducted between 6 January and 26 March 2010. Data were weighted to the profile of the known population. Where results do not sum to 100, this may be due to multiple responses or computer rounding. Results are based on all respondents unless otherwise stated. An asterisk (*) represents a value of less than one percent, but more than zero.

1.3.2 Timing

The workshops took place between 28 February and 8 March 2011. They preceded the earthquake and tsunami that hit Sendai, Japan, on 11 March 2011. These events may have altered opinions, in particular relating to nuclear technologies. Findings should be seen in this context.

1.3.3 Sampling and recruitment

Locations were chosen to give a geographical spread as well as a good spread of environmental indicators. Urbanity and sensitivity to environmental issues (e.g. having experienced flooding) were felt to be important distinguishers influencing awareness of energy and climate change within the local population. It was therefore decided to cover a spread of metropolitan, urban, and rural locations, with measures of likely sensitivity to environmental concerns flowing from locality. The following table summarises our knowledge about the areas before fieldwork:

Fieldwork location			
	Ulverston	**London**	**Nottingham**
Urbanity	Rural	Metropolitan	Urban
Council types covered	County, District, Parish/Town	City/Borough/Met	City/District
Anticipated sensitivity to environmental concerns, based on exposure	High	Low to medium	Low to medium
Exposure	High exposure to non-carbon sources such as power stations (including nuclear) and wind farms; affected directly by flooding	Metropolitan environmental concerns, such as air and noise pollution, public transport, and energy prices etc; little exposure to non-carbon energy sources such as wind farms or events such as flooding or coastal erosion	Environmental topics in this area may include domestic smoke emissions, emissions and noise from industrial premises, air quality and the protection of local assets from environmental threats

Source: Ipsos MORI

The sampling process was designed to cover a **cross-section of representatives** in each location. As specified by DECC, this included

- different councillor types, i.e. parish, district, county or city councillors;
- elected members of local governance boards and committees;
- local representatives from business forums; and
- local representatives from non-governmental organisations (NGOs).

Overall, 23 councillors, 17 elected members, 19 business representatives, and 28 NGO representatives attended the events.

Participants were recruited by telephone from lists compiled using active search and the GovEval database. They were sent introduction and confirmation letters by email or post.

Given that these audiences are difficult to recruit for half or full-day workshops, recruited participants were encouraged to refer others that would fit the categories above. A summary of the audience breakdown per event and a detailed recruitment methodology (including information on honoraria) are appended to this report.

1.4 Interpreting qualitative research

Unlike quantitative surveys, qualitative research is not designed to provide statistically valid data on what any given population as a whole is thinking. It is illustrative rather than statistically reliable and, therefore, does not permit conclusions to be drawn about the *extent* to which something is happening. Unless indicated otherwise, views have been chosen as those that were fairly widely expressed among the target audience. Care should be taken when interpreting them because a large number of variables could drive a participant's attitude.

Qualitative research is used to shed light on *why* (rather than how many) people have particular views and how these views relate to demographic and other characteristics, and the experiences of those concerned.

During the report, we will also make reference to quantitative findings from 85 pre- and 84 post-event questionnaires. Because of the small base sizes, and the nature of the sample, findings cannot be generalised to a larger population. However, where we report on changes between the start and end of the day, these are significant as they represent a census of the pre- and post- participants. Numbers rather than percentages are given to avoid confusion and to encourage the reader to treat this as qualitative data.

2. What the events achieved

2. What the events achieved

This section covers successes and challenges of the Deliberative Dialogues, what people can achieve by the end of a workshop, and what can and cannot be done within the different workshop formats.

2.1 Successes

Overall, the workshops worked well in achieving the objectives set. The Deliberative Dialogues enabled participants to get involved in discussions about the 2050 target. They allowed them to find out more about the challenges the UK faces, the options the country has, and possible trajectories to achieving the 80% reduction in emissions.

Most participants found it easy to engage with the Calculator, and seemed to better understand the complexity of the challenges after trying to develop a pathway. Some realised as a result of the Calculator that the target cannot be met without using levers they would not otherwise consider. They may be more open to discussions around these levers as a result of the workshops, even if not necessarily in favour of them.

Most were also keen to find out more about the topic and therefore embraced the additional information that they were presented with throughout the day. Many commented that they felt more informed as a result of the information contained within the Calculator. The pathways, in conjunction with the discussion, provided a tentative understanding of how local community stakeholders may approach the 80% reductions challenge.

Although not an explicit objective, the workshops were also a good opportunity to bring members of the public in direct contact with DECC. This is likely to have made the Department and government look more approachable and to have helped mitigate some worries about the policy agenda for those present.

2.2 Challenges and caveats

Notwithstanding the successes outlined above, there are a number of limitations and caveats to consider.

While people engaged with the subject, this does not necessarily mean that they changed their views or behaviour as a result of the workshops. Views on the environment and climate change seem to elicit a similar level of emotion as do moral values or political views, and therefore views on this issue do not change easily. Even without knowing the details, many

participants already considered the climate change challenge a hard task, and the workshops further emphasised this point.

Some participants did not want to reach the 80% reductions target, and stopped midway. These participants appeared to see the target as an ideal or arbitrary rather than a necessary change, or a target that they were not willing to embrace voluntarily.

Participants' knowledge or self-perceived knowledge is a further consideration. Overall, the audience brought more prior knowledge and perceptions than expected to the discussion. This may be because of a heightened exposure to environmental and climate change discussions among representatives.

Some people had incomplete knowledge or misperceptions about some technologies, which they strongly believed to be based on facts and felt strongly about. As the Calculator assumes a rational discussion based on facts, this provided challenges in interpreting the results of the pathways as well as for the wider use of the Calculator.

Finally, there were some recruitment challenges. In some areas, some participant groups were harder to engage than others. These tended to be elected members of governance boards, for whom the topic did not appear to have the same professional relevance as for the other groups. The length of the event was also an issue. It was harder to recruit people for a full day, with some wanting to send different delegates for the morning and the afternoon session. Turnout was better for the full-day events than for the evening workshop, although this was partly because of a council meeting taking place on the same evening at the last minute.

2.3 What people achieved by the end of the workshop

Due to different set-up in terms of number of participants, number of computers and experts per event, the workshops differed in their outcomes. Trialling the impact of different numbers of computers meant that individual pathways were only submitted in Ulverston, while the set-up in London and Nottingham resulted in group and pair pathways. Overall, 22 individuals or groups submitted successful pathways, i.e. that achieved a 80% reduction, out of a total of 51 final pathways. This differed by location, with 11 out of 16 London groups creating successful pathways, compared with 9 out 23 in Ulverston and 2 out of 12 in Nottingham. The small number of successful pathways in Nottingham (2 out of 12) was most likely due to the restricted amount of time participants had to spend using the calculator at this event.

In **Ulverston**, located in the Lake District, participants displayed a great willingness to learn about climate change and new technologies. They did not necessarily change their views, but were genuinely interested in hearing other people's thoughts and having a fact-based discussion about the topic. Some envisaged further involvement with the Calculator, saying they may use this tool for a continued dialogue. Most were relatively satisfied with their final pathway, although not all met the 80% target.

In **London**, participants tended to have engaged with the subject matter prior to the workshops and were less willing to reconsider their views. As a result, this workshop provided less of a learning experience for participants. Nevertheless, most participants engaged well with the Calculator and the discussion. Out of all participants, those in London were more vocal about perceived limitations of the tool. Because of their prior exposure to climate change discussions, they came with their own views on how the 2050 challenge should be approached, but trying to capture these views on the Calculator did not necessarily result in a viable pathway. In some cases, the levers participants were looking for could not be accommodated in the Calculator [for more details, please see section 4.4 Questions arising when engaging with the Calculator]. There was some discomfort with the final pathways, with some people feeling that they were more extreme or 'fudged' than was considered realistic.

Because of the shorter format of the **Nottingham** event, the workshop sparked interest and participants went away with new information. For most, there was too little time to finalise a pathway they were completely happy with, and some intended to revisit the Calculator.

In fact, during the call-backs after the events, a few participants across the three locations said they had since revisited the Calculator and/or mentioned it to other people.

In addition to the pathways, there was also evidence that people took on board the information they were presented with. Where participants did not hold strong opinions on a particular lever, some seemed to now revisit or form their view, as shown in the changes between the start and end of the event questionnaires in the table overleaf. Most of these changes related to changes among the top 5 levers to pursue, in particular to domestic transport electrification (14 more participants voted this lever into their top 5 at the end of the day) and using solar panels for electricity generation. NB when looking at the following table, numbers rather than percentages are quoted due to small base sizes. Please note that the question was multiple choice and more options were picked in the post-questionnaire which inflates the number of mentions in the post workshop column.

	Top 5	Top 5	Top 5	Don't pursue	Don't pursue	Don't pursue
	Start	End	**Change**	Start	End	**Change**
	(N)	(N)	(absolute value)	(N)	(N)	(absolute value)
Domestic transport electrification	18	32	14	7	3	4
Solar panels for electricity	19	30	11	1	4	3
Insulating homes	48	57	9	3	1	2
Solar panels for hot water	15	24	9	1	3	2
Biomass power stations	17	9	8	3	7	4
Average temperature of homes	9	16	7	6	4	2
Domestic freight	31	24	7	1	1	0
Geosequestration	8	15	7	4	4	0
Offshore wind	30	37	7	10	12	2
Hydroelectric power stations	26	20	6	1	1	0
International aviation	41	35	6	2	2	0
Electrifying home heating	9	14	5	13	7	6
Marine algae	5	10	5	7	9	2
Coal power stations fitted with carbon capture and storage technology	20	16	4	23	17	6
Geothermal electricity	13	17	4	2	4	2
Producing and managing livestock	9	13	4	7	11	4
Domestic transport behaviour	54	57	3	4	1	3
Onshore wind	19	22	3	15	13	2
Energy efficiency of heavy industry sector	45	42	3	2	1	1
Size of heavy industry sector	16	14	2	9	4	5
International shipping	16	18	2	5	3	2
Size of commercial demand for heating and cooling	26	28	2	2	1	1
Gas power stations fitted with carbon capture and storage technology	15	17	2	12	12	0
Electrification of commercial cooking	6	5	1	15	6	9
Electrification of home cooking	5	4	1	16	8	8
Home lighting & appliances	11	10	1	7	4	3
Storage, demand shifting & interconnection	12	11	1	3	0	3
Using home heating that isn't electric	9	8	1	4	2	2
Commercial lighting & appliances	10	11	1	1	2	1
Micro wind	9	10	1	13	14	1
Nuclear power stations	27	28	1	25	26	1
Importing electricity	3	2	1	19	21	2
Importing bioenergy	4	5	1	20	22	2
Dedicating land to bioenergy crops	6	7	1	17	20	3
Volume of waste and recycling	24	24	0	0	1	1
Tidal and wave power	36	36	0	2	4	2

2.4 What can and cannot be done within the different workshop formats

Variations in the length of the workshops, computer-to-participant ratio, and the number of experts meant all three workshops followed different formats.

2.4.1 Ratio of computers to participants

Where there was one computer per participant as in Ulverston, people tended to engage more with the pathway, but the format allowed for comparatively less discussion. As a result, participants may have given less thought to the trade-offs between options as they did not have to convince anyone else of their point of view. Where groups of three or more shared a computer, such as in London, there tended to be more discussion, but less focus on the pathway, which meant that some groups got stuck on one lever, unable to reach a decision.

Paired working, as took place in Nottingham and London, seemed to strike a balance between the two extremes, allowing for a pathway-focused discussion. Extending the period for group-based discussion following initial individual working may be an option, although unless people have their pathway in front of them they find it difficult to remember what they selected for each of the levers. Having computers on tables for discussions makes it harder to engage in eye contact and have a group conversation (most preferred to close their laptop screen so that it did not block their line of sight), If printing facilities were available this could be a solution, although might add to the cost of the events. .

2.4.2 Length of event

The full-day events gave participants the opportunity to thoroughly engage with the Calculator, develop a pathway, and to read some of the information they were presented with in the one-page summaries (although few viewed all of these). It is important to note that they were not deliberating on the relative merits of each lever in depth as participants did not go through arguments of those who supported and those who questioned a particular technology consistently. However, there was a sense that after a full day, people felt they were now ‘done’ with the Calculator and would not necessarily go back to it. In contrast to this, the evening session seemed to result in greater readiness to go back to the Calculator in their spare time and to engage beyond the workshop. This was because an evening could only give participants a taster session, which felt rushed for some (where for example, some

participants wanted more time to familiarise themselves with the information on technology levers).

One expert per table worked best in providing on-demand extra information and clarification. While it was possible to conduct the events with roving experts, this placed the onus on the moderator to point out misperceptions, requiring a high level of subject knowledge. The role of experts was to

- explain technical details;
- look at pathways;
- draw attention to any inconsistencies; and
- answer other ‘how to’ questions that participants had.

3. Participants’ attitudes to environmental themes

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This section explains the perceptions and motivations participants brought to the workshops. It lays out participants' views on why they agreed to attend the workshop, their engagement with environmental themes prior to the workshop, awareness of the 2050 target, whether their voiced opinion changed during the day, and how much ownership they appeared to take personally for the challenge.

3.1 Reasons for agreeing to attend the workshop and expectations

Most participants across different locations and participant groups said they agreed to attend the workshop 'to learn' and because of an interest in environment and climate change. In addition, some had a specific agenda, such as a technology they felt strongly about, or a particular audience they wanted to represent, such as elderly people and/or youth. For some, the workshops were also a forum through which they hoped to find out more about government policy. This tended to be related to a concern that government intended to push a particular agenda or technology that they did not agree with, such as nuclear technology, electrification, or bio-energy. For some, information-gathering and having a factual dialogue was the priority, while others focused on voicing an opinion or concerns.

3.2 What participants brought to the workshops

3.2.1 Location

Location appeared to have a strong impact on what participants brought to the workshops, reflecting different local concerns and environmental sensitivities.

Ulverston participants appeared relatively well-informed about technologies and engaged with the subject matter. Out of the three groups, they seemed most informed about the local context but also able to look at the issue from a UK point of view. This is likely to reflect the area's exposure to discussions about the environment, how to preserve the natural beauty of the Lake District, while also gaining employment through the nuclear industry and utilising renewable energy sources.

London participants tended to voice stronger and at times more radical opinions and preconceptions about climate change, reflecting their stronger involvement with the matter prior to the workshops. They tended to take a London-focused view in discussions, thinking

about the impact on them personally, transport, and the rise in energy costs. They were less likely to consider the impact on the wider UK.

Again, Nottingham participants fell in the middle, with stronger personal concerns and perceptions, but able to see the wider implications beyond the impact on them personally. In Nottingham, location seemed to drive perceptions less than in other locations.

However, given that the audience composition differed across locations, it is hard to say if this due to location. It is likely that the higher proportion of environmentally involved audiences in London and Nottingham, which may not reflect the wider stakeholders in these places, played a role. Furthermore, from other research we know that London audiences often voice their opinions more strongly.

3.2.2 Prior knowledge and typologies

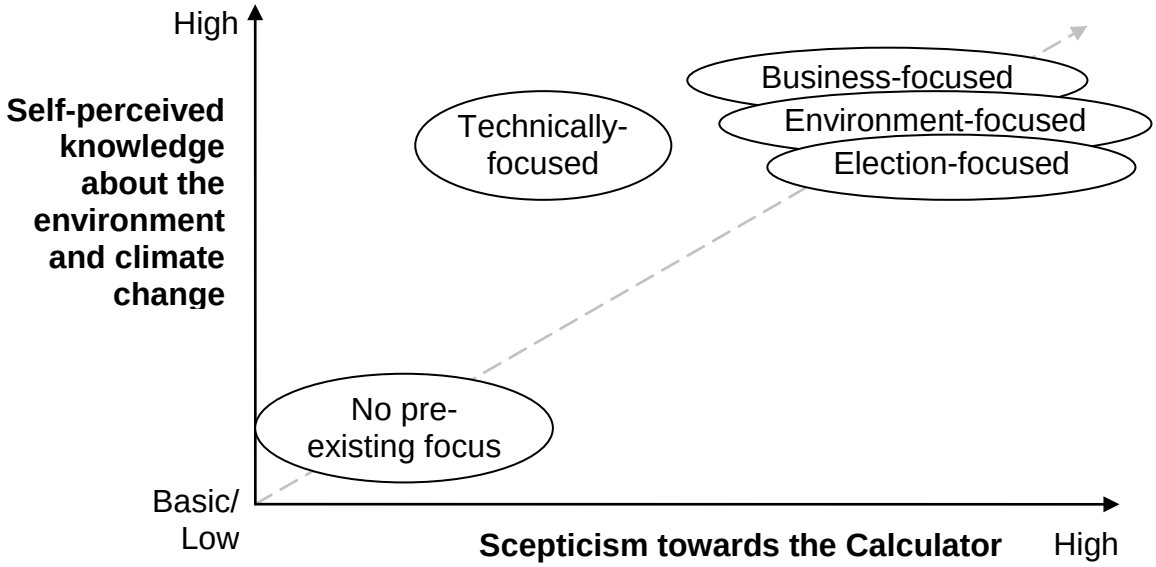
Some participants arrived with good overall knowledge on environment and climate change. However, overall, participants' prior knowledge was sketchy and a mix between knowledge, half-knowledge, and misperceptions about the topic and technologies involved. From the participants' own point of view, this was considered factual knowledge and often strongly defended. Most had one or two technologies or levers that they felt strongly about, but knew little about the remaining levers (such as geosequestration or CCS) and the interaction between them.

There were no clear distinctions between the different audience groups which were recruited. Instead, cross-cutting typologies evolved during the workshops as outlined in the table overleaf:

Audience typologies					
	No pre-existing focus	**Environment-focused**	**Business-focused**	**Technically-focused**	**Election/ representation-focused**
Knowledge about levers	Basic general understanding	Good general understanding, 1-2 areas of specialism	Interaction between emissions reduction and businesses	Excellent understanding, of 1-2 areas of specialism	Good general understanding, 1-2 areas of specialism; Understanding of public opinion
Motivations	Concerned about personal costs and impact	'environmentalism' / reducing emissions while limiting environmental impact	Concerned about cost for business and/or impact on employment	1-2 'favourite' technologies	What would get most public buy-in, as linked to their re-election
Attitude to Calculator	Neutral, perhaps concerned about tech difficulty	Some sceptical – point to what's missing e.g. more extreme behaviour change	Mixed – some point to what's missing, suspect agendas being pushed	Appreciate the technology behind it; interested and receptive	Cynicism towards behaviour change assumptions and funding, sometimes based on 'I tried it and it was hard'

Source: Ipsos MORI

Self-perceived knowledge about the environment and climate change appeared to influence participants' attitude towards the Calculator. Those who considered themselves more knowledgeable overall, or who considered themselves to hold specialised knowledge (for example, some business-focused participants), tended to be more sceptical towards the Calculator and point out more caveats than other groups. The following schematic lays out self-perceived knowledge vs. scepticism towards the Calculator, as conveyed through discussions on the day.



3.3 Awareness of and reactions to the 2050 target

Awareness of the 2050 target appeared fairly high among participants. Overall, 56 out of the 85 who filled out the pre-event questionnaire indicated that they had heard of the target before the event. This differed slightly by audience. NGO representatives were more likely to be aware of the target than average, and elected representatives and business representatives were slightly less so. There were differences by location as well. In London and Nottingham, proportionally more participants said they had heard about the targets than in Ulverston. This may be explained by the higher number of environmentally involved representatives at those events.

As the base sizes are small, these differences are indicative only and not statistically significant, but they tally with the qualitative information derived from the discussions.

Many participants felt that 80% reduction in emissions sounded high and difficult to reach. Some questioned the desirability of such a high target, and likely required changes in lifestyle, meaning there was no buy-in into the target. Some felt that a lot of technological change could happen in 40 years and alleviate the effects of climate change, meaning less drastic changes are required. Struggling with the Calculator furthered this initial cynicism. Many appeared to see the target as an ideal rather than a serious figure to work towards. However, had the target been set at 50% participants might have aimed even lower. Additionally, some business representatives were concerned that targets were not set with businesses in mind.

3.4 Taking personal ownership for the 2050 challenge

Taking personal ownership for the 2050 challenge (i.e. feeling it is something that they personally need to play a role in) appeared to be related to the different audience groups (councillor, elected representative, business, NGO) and location.

3.4.1 By audience group

Individuals played many roles in their lives beyond their elected roles, based on which they were recruited for the workshops. This means that some of the voiced opinions may reflect a personal rather than a professional view that they would pursue in their elected role. Despite this caveat, some themes were common in a particular audience group, and some participants explicitly used examples from their professional life to illustrate a point. The common themes by audience group are outlined below.

Councillors tended to consider ownership of the 2050 challenge as a policy and regulation issue at national level, which for most required little personal ownership. This may be linked to an ultimate concern about their chances for re-election, because of which some do not want to be seen as pioneering initiatives that may be controversial or unpopular with their constituents.

This is reflected by the data from the self-completion questionnaire. At the start of the events, councillors tended to be least likely to agree with the statement 'It is my responsibility to help to do something about climate change' and 'I think that climate change is likely to be a serious problem for Britain.' However, by the end, this audience group appeared to be most likely to have increased their sense of ownership of the challenge, with 16 out of 18 agreeing that they 'can personally make a difference' (up from 14 out of 21)[4], and 15 out of 18 agreeing that it is their responsibility, up from 13 out of 21. Again, the results are indicative only, but reflective of a feeling among some councillors that the tool was a good way of educating others and getting them involved in planning around the target.

Business representatives appeared to be concerned about implications for businesses, such as obstacles through further regulations. Out of the four audience groups, they appeared most sceptical about how achievable and realistic the target was. Some suggested that businesses could take more ownership, but rejected the idea of a purely conviction-based buy-in. They emphasised that regulations were needed to push businesses in the right direction, or that there needed to be a clear financial or other bottom-line benefit.

[4] 21 councillor participants filled in the pre-event questionnaire, 18 completed the post-event questionnaire

Business representatives were the least likely group to agree that 'I feel a sense of urgency to change my behaviour to help to reduce climate change' at the start of the day, but were the most likely to change their mind about this by the end of the day (from just under half at the start to two thirds at the end).

NGO representatives tended to take the most activist stance out of all the groups, with variations depending on focus of their NGO. Most in this category were willing to take fairly high personal ownership. This was evidenced in their high levels of agreement with statements about ownership of climate change in the start-of-the- event questionnaire. They said they were willing to make personal changes to their life and expected others to do the same. They were also the least likely to change their mind about their sense of ownership by the end of the day. Many did change their mind about the achievability of the target however, and thought it would be easier to achieve by the end of the day than at the start.

Ownership among **elected members of governance boards** varied depending on the focus of their work. Buy-in tended to be more focused than for the other groups, such as a particular concern with the impact on the elderly. Both at the start and by the end of the day, they were the group that were the least likely to agree that they can personally make a difference with regard to climate change.

3.4.2 By location

Location also played a role in determining the degree of personal ownership. Buy-in seemed strongest in Ulverston as participants were acutely aware of how high the stakes were locally, such as the beautiful landscape as a value in itself, but also the link between environment and employment through tourism and the nuclear industry. During the discussions, London participants appeared less likely to link proposed changes back to their local area. This may reflect the higher degree of transience among the London residents in general. We often find that increased transience results in less personal identification with and investment in the local area. In line with the overall findings, Nottingham fell in-between the two, but because of a shorter format, there was less time to develop the discussion around ownership.

From the questionnaire data, London participants appeared more likely than those in the other two locations to say they 'personally feel that [they] can make a difference with regard to climate change'.

4. Approaches to the Calculator

4. Approaches to the Calculator

This section explores to what extent participants engaged with the web tool version of the 2050 Calculator. It covers questions such as what participants looked at first, questions they had, different approaches in developing a pathway, and how they balanced desirability and feasibility. It also covers the criticism and scepticism expressed by some participants.

4.1 What participants looked at first

Participants employed different strategies in engaging with the Calculator, for instance they may start with

- levers that they were already **familiar** with, such as insulation or domestic transport;
- levers that they **liked** before the workshop, such as wind or solar energy;
- levers that were **controversial** and/or evoke **strong emotions**, such as nuclear energy, to gauge their impact;
- levers that they **knew nothing about**, such as geosequestration or CCS; or those
- levers that are located on the **top left**, continuing to work through all levers in a systematic manner. This was especially the case for participants who did not hold strong views already and/or were working in pairs.

There were no clear differences between subgroups in terms of the strategy they employed. Those who chose the a systematic approach tended to take longer as they also liked to study the one-pagers in greater detail than those taking other approaches.

4.2 Different approaches to developing a pathway

Given the complexity of the subject, it is impossible to make experts out of participants in a day (or half a day!). Many struggled in finalising a pathway they were happy with, and some refused to meet the target, feeling it was unrealistically high to start with.

Whether they developed a pathway that met the reductions target or not, considerations tended to focus on change in the **lifestyle**, assumptions about **cost considerations**, and perceptions about **technology**.

Most participants sought to minimise the change in lifestyle that a pathway implied, unless this change was considered an improvement. They tried to maintain the status quo, while

also minimising perceived risks, for instance, trying to achieve the same energy supply without sources such as **nuclear plants, CCS, or geosequestration**. Linked to maintaining the status quo was the desire to minimise the financial impact, especially at a personal level. Some participants emphasised the importance of financial incentives in achieving behaviour change.

Most participants arrived at the workshop with preconceptions about some of the technologies. **Nuclear technology, wind, electrification, and bio-energy** tended to be the technologies that evoked the strongest, and often negative, reaction. Often this was a gut reaction, not based on objective knowledge, but had a similar importance to the participant as a moral value or a political view. Depending on whether they rejected or favoured a particular technology, participants tried to avoid it completely – even if it was needed for a pathway – or used it as the core of their pathway. The remaining levers which did not evoke such strong views were then worked around.

Fear of the unknown also often influenced pathway design, with participants avoiding levers they did not know much about.

The manner in which participants developed a pathway followed on from their initial approach to the Calculator. Some participants focused on a few levers which they wanted to see as part of the pathway, or a few whose usage they wanted to minimise. Some participants took an exploratory approach and looked at what levers had the biggest impact.

Participants' approaches appeared to be driven by any of the following:

- what they felt we **should be doing**, most likely a result of earlier, unrelated communication about climate change. This related to using more renewable energy sources;
- what they perceived to be **achievable**, that is, what they considered an effort they were willing to place on themselves and the country and that could see getting the necessary buy-in;
- what they perceived to be **desirable**, which for most tended to be a lighter effort than was seen as achievable. For those with an activist background, achievable and desirable tended to overlap. In some cases, the suggested desirable target was even higher than the Calculator permitted.

4.3 Balancing desirability vs. feasibility

Participants **balanced desirability and feasibility** through the levers that they felt less strongly about, thus mitigating the impact on the measures that were important to them, such as cost or lifestyle. Where participants felt strongly about not using one, they did not include it, even if it was needed for a successful pathway, thus ultimately giving more importance to desirability than feasibility.

4.4 Questions arising when engaging with the Calculator

Where participants struggled in engaging with the Calculator, this often related to the understanding of terminology and issues in locating the information they were looking for. For example, some participants struggled with

- understanding technical **terms** such as CCS or geosequestration, or making a judgment about the **technology** behind them;
- **complicated wording**, such as 'no noticeable modal shift' in the domestic transport behaviour lever;
- understanding the **meaning of the levels** 1 to 4, as these differ slightly for every lever, the **difference between 1-4 and A-D** levels;
- the meaning of the **colour** change when a different level is selected – does green imply that this is the greenest option, and does red signify a level to stay away from; and
- understanding the **graphs.**

Other questions concerned how to get rid of coal, how the levers interact, and why setting most levers on 4 does not result in a working pathway.

Some participants, especially at the London workshop, were critical of and sceptical towards the Calculator. This criticism and scepticism was related to the 80% target, a perception that this might be a tool to push government's preferred agenda, and levers/sectors that some thought were missing from the Calculator. Exploring example pathways helped alleviate some of these concerns.

4.5 Perceived shortcomings of the Calculator

Some participants felt that the Calculator did not account explicitly enough for **human behaviour change** or the **costs** required meeting the target, nor does it allow for significant **future technological advancement** (e.g. nuclear fusion). Most participants felt that these were key measures, although most understood that they would be difficult to incorporate into the Calculator. Some participants thought that the **assumptions on the demand side** were not radical enough and could go further.

Moreover, some activities are hidden deep in the Calculator so participants struggle locating them. For instance, some participants thought that **recycling**, **use of fuel cells**, and **reducing packaging** had not been accounted for.

5. Reactions to stimulus and discussion

5. Reactions to stimulus and discussion

This part of the report explores how people reacted to the stimulus. The following tools were used to help developing a pathway: two-page summaries of four cross-cutting Big Themes, example pathways, and extra Calculator tabs.

5.1 Reactions to the Big Themes

After familiarising themselves with the Calculator, participants in their groups were presented with stimulus material around four cross-cutting themes: growth and mix of low-carbon electricity generation, energy efficiency, electrification of demand, and availability of bio-energy. Overall, participants found it hard at this stage to see the connections and nuances. They also struggled with the fact that all Themes are important to achieving a successful pathway. There were no clear distinctions between audiences in favouring particular Themes.

Growth and Mix of Low-Carbon Electricity Generation. Participants were familiar with and agreed with the idea of moving away from fossil fuels, but were divided on the best method. Common considerations included cost, visual impact, and over-dependency on one source of energy. Tidal and wave and hydro-electric power stations were popular as many participants felt that these made best use of the UK's natural resources.

Energy Efficiency. Participants were most familiar with this lever as it is the one most relevant to people's everyday lives. This made it easy for them to see the benefits, especially cost-saving. The discussions focused on home insulation, reducing room temperatures, and appliances. Because many had already tried themselves, or knew someone who had, they were typically positive about insulation and saw this as a way to combine financial benefits through lower heating costs with a positive for the environment. Some felt that the required up-front costs may be an obstacle, which could be overcome through regulation and incentives. Reducing home temperatures was more controversial, and there was an assumption that was an absolute measure, i.e. would have to do this all the time, rather than allowing for variations for those where this may have a detrimental effect on their health. In terms of appliances, some thought that the market does not sufficiently cater for energy-efficient models, which could be addressed through regulation. New-build houses were seen as an obvious way to reduce emissions or increase efficiency and some wanted this made more explicit in both Calculator and policy.

Electrification of Demand faced some scepticism from participants. This related to the cost and the danger of becoming too reliant on one power source, and the embedded energy that is needed (i.e. generation of energy costs energy). Participants tended to be ambiguous towards the idea of electric cars where they have proved to be expensive to run so far, and impractical because of the lack of infrastructure. Equally, cooking with gas was popular and many did not want to 'waste' the existing gas infrastructure. Some environmentalists felt this was avoiding the issue that decreasing demand is much more important than electrifying it.

Availability of Bio-energy. Opinions were divided on this Theme, with participants liking some aspects of it, but being firmly against others. Most liked the idea of utilising waste, including human waste, as the resources for this form of energy generation exist anyway. There was also some discussion about gaining energy out of landfills. However, participants tended to be fairly sceptical about bio-crops, fearing that competition for land may lead to food shortages. They wanted to know more about the worldwide impact, including the impact on poorer countries. There was a moral concern amongst some that bio-energy may lead to exploitation of poorer countries where the UK imports their food or financially incentivises them to grow bio-crops to the detriment of food production. Some also worried about depending on other countries for either food or energy.

5.2 Example pathways and extra tabs

Comparatively little time was spent on the example pathways and extra tabs so these are topline findings.

The **example pathways** worked to show people that it is possible to achieve the 80% target, and doing so without a heroic effort on many levers. This helped mitigate the cynicism that the target was unrealistic. Letting participants look at each other's successful pathways generally had a similar impact. 'Sponsored' pathways such as from Friends of the Earth may also increase buy-in of those who are more sceptical towards the Calculator. However, many did not find pathways that exactly met their needs and were surprised how far they moved away from the target by just altering assumptions on one or two levers.

The Calculator includes extra tabs that help visualise the impact of a pathway. Some participants used the **Area** tab, which helped them understand better the impact on land and sea use. However, because of the use of quadrangles, some still found it hard to imagine the impact on their local area. Some technically-minded participants enjoyed the information provided in the **Flow** tab, but generally this was felt to relatively complicated to understand and appreciate. The tab also led to some frustration, such as when participants could see

that coal was a big input still but there was no obvious way to avoid using coal in the Calculator. Finally, some participants found using the **story** tab helpful in summarising their pathway.

5.3 Discussion

Along with the stimulus, the group discussions that followed the stimulus presentation appeared to influence participants. Especially if presented strongly, other participants' *views* and concerns seemed to be as important as the *facts*, if not more so. Unlike the moderators and experts, participants were able to convey opinions rather than neutral facts, and do so in a sometimes highly emotional manner. Although they may have been doubtful of their expertise, some participants seemed to see their peers as more neutral than the DECC staff, who were perceived to have an agenda. This resulted in cases such as a participant mentioning the negative impact of marine algae on other marine life, some participants preferred to err on the side of caution and avoid this technology for their pathway. This was especially the case for the 'average' group, as these tended to hold the least-defined views.

Discussing the national vs. the local level did not appear to have an impact on the pathways.

5.4 Impact of stimulus and discussion

In **Ulverston**, the stimulus appeared to have a relatively strong impact on participants. They came to the workshop fairly open-minded, and the stimulus provided them with background knowledge. This allowed them to see some levers that they did not feel strongly about from a different angle and let them consider some technologies they would not have thought about before. Moreover, the discussions helped expose people to different opinions, which may have softened some of the extremes in the pathways. Ultimately however, people's own beliefs and values tended to be most important. Even after stimulus and discussion, some would purposively not reach the 80% target because they had started off convinced that the target was unrealistic [please see also section 3.3 Awareness of and reactions to the 2050 target].

In **London**, the stimulus had some impact, but preconceived ideas dominated how people approached the Calculator. The discussions had a very limited effect in moving participants away from these preconceptions. Most effective were perhaps the example pathways as they showed that, for example, a nuclear-free pathway was possible.

In **Nottingham**, the shorter workshop duration meant that less time could be spent on stimulus and discussion, and there was no time to go into detail on the example pathways or

other tabs. As a result, people struggled and most did not reach 80%, and failed to understand some of the interlinkages between the different levers.

6. Participants' 2050 pathways

6. Participants' 2050 pathways

This section looks at the pathways participants devised, and if there was any change over the day when considering national vs. local pathways, elaborating on any themes and trends.

6.1 Pathways participants devised

In reading the analysis of the pathways that the participants created on the day, it is important to remember that very few of them represent pathways that the participants were fully happy with, for several reasons:

1) Few found operating the Calculator easy, even with the experts and facilitators on hand. Some participants with less experience of technology in particular found it difficult, and did not have enough time to really get to grips with all of the levers and tabs.

2) In two of the events, participants shared calculators. Often this led to interesting discussions, debate and compromise pathways that were acceptable to all who were working on the pathway. For some however, it made creating an acceptable pathway very difficult.

3) Some participants got frustrated and gave up on their pathways. This happened particularly when they had reached a 60%+ reduction on 1990 emissions levels and found that they could go no further. Some were also convinced that 80% reductions were not achievable anyway and stopped for this reason. Other reasons were a conviction not to include a particular methodology (e.g. nuclear), relying heavily on desirability rather than achievability, and not understanding the interactions between the different levers.

Therefore, the analysis here can give some information on the starting points and strategies that some used, but should not be considered as definitive pathways. Summary tables of participants' final pathways can be found on pp. 43-44.

6.2 Most-used levers

For their final pathways, participants tended to focus on reducing demand rather than changing the way energy is supplied, with the nine most most-used levers all relating to demand. Most stayed in familiar territory, such as things that could be changed around the house, in transport, and changes businesses can make to their heating, lighting, and

appliances. The top 5 most-used levers are discussed here: home insulation, domestic transport behaviour, home heating electrification, international aviation, and commercial demand for heating and cooling.

Across all of the events, participants most used the **'home insulation'** lever. This was set to '4' in 40 of the 51 final pathways created, and many participants set this lever on three or four in their first pathway. This is probably because of the familiarity with the concept, as many participants had personal experience of having insulation fitted, and it was a topic that came up often in the discussion of the energy efficiency tab. While many London participants pointed out the difficulty of insulating the housing stock in the capital, this lever was set on 4 in all but two of the final pathways. It is worth noting that the conversations did not include discussion of costs, and participants appeared to make the general assumption that choosing this (or any) lever would not entail direct costs for homeowners. Therefore, setting this lever on 4 is not an indication of a willingness to pay to insulate their own home better.

Considerations around transport were another popular way of getting closer to the 80% target. **'Domestic transport behaviour'** appeared to be second-most popular, with 26 out of 51 final pathways set on '4' for this lever. Again, this was a familiar concept, and an area where many felt confident that ambitious changes could be made. Some participants in London thought that the assumptions on this lever do not go far enough. This was because the lever did not include a sufficient modal shift to walking, something that is more easily achieved in a big city. However, in contrast those in Ulverston were convinced it went too far to be implemented locally, because the area does not have the public transport to sustain a move out of cars.

Reducing **'commercial demand for heating and cooling'** (26 final pathways set on '4') topped the commerce-oriented levers. This was closely followed by '**home heating electrification'** (23 final pathways set on '4'). Again, both concepts here were easy to understand and easy to relate to.

'**International aviation'** (26 final pathways set on '4') was also used heavily and another where some informed participants thought the assumptions behind it do not go far enough. This lever was also easy to understand, which may explain why so many people used it to help meet their target. It is also an environmental topic that has been highly publicised in the past few years, due to environmental pressure groups and direct action at airports. This lever was least used in Nottingham pathways.

While the top 5 most-used levers were on the demand side, the most-used lever on the **supply side** was '**solar panels for hot water.'** In discussions, this was seen as a fairly

uncontroversial source of energy supply and was particularly popular in Ulverston. It was the tenth most-used lever overall, with 19 out of 51 final pathways set on '4' for this lever. '**Geo-thermal electricity'** and '**tidal and wave'** were other highly used supply levers (respectively 18 and 16 final pathways set on '4'). Participants may have considered them as particularly innocuous sources of energy as they are both renewable and do not require building large visible structures or plants and are thus useful levers for those who thought that wind energy would destroy the countryside.

6.3 Less-used levers

Less-used levers related to less-accepted energy supply methods and electrification of cooking. Perhaps counterintuitively, given that that majority of final pathways included a large amount of effort on the supply side, the lever that participants used the least overall was **'electrification of home cooking'** (38 set on '1'). This reflected a lot of conversation on the day. Even the keenest environmentalists found it difficult to envisage using electric cookers. Participants seemed to find this even more difficult to envisage than heating their home to a different temperature or building thousands of wind turbines.

This was followed by '**nuclear power stations'**, which 34 participants left at '1' in their final pathway. However, there were also 8 participants supporting nuclear who set this to '3' or '4', reflecting that this is a lever that participants feel strongly about either way.

The third least-used lever was again electrification of cooking, this time '**electrification of commercial cooking**' (22 set to '1'). For both electrification of cooking levers, none of the participants set the lever higher than '1' or '2' in their final pathways.

Mirroring scepticism towards bio-energy during the discussions, 29 participants chose to set **'biomass power stations'** on '1'. Participants were likely to criticise the scope of the Calculator in dealing with the Theme, such as not incorporating issues like access to food and global justice (see also 'Reaction to stimulus and discussion'). The low usage of this lever may therefore reveal an antipathy to biomass power, but could also be a function of oversupply. Many participants found their pathways oversupplying on a large scale, and chose to limit effort on the supply side, or limit effort to renewable sources or nuclear.

Finally, 27 participants did not envisage building any **'CCS power stations'** to help reach the target and set this lever to '1' in their final pathways. In discussions, many participants in all three locations raised questions about the viability of CCS, and thought that, for example, a '2' on this lever was more risky than a '2' on many of the other supply side levers, as the technology has not been proven. Other participants only learned about the concept of CCS

on the day of the workshop, which may have prevented them from using it. Some were concerned about the inefficiency of capturing and storing carbon and thought it best not to produce carbon in the first place.

6.4 Overview of lever usage

The following two summary tables provide an overview of lever usage in the final pathways. At the top we show both the mean for all the levers across all pathways submitted, and also the mean for just the pathways which met or exceeded the target of 80% reduction in emissions. A summary breakdown of pathways by event can be found in the appendices, although these should be treated with caution as not all pathways achieved the target and the number of pathways per area is relatively small.

More-used levers

	Reduction	Home insulation	Domestic transport behaviour	Commercial demand for heating and cooling	Home heating electrification	International aviation	Commercial lighting and appliances	Commercial heating that isn't electric	Domestic freight	Domestic transport electrification	Solar panels for hot water	Geothermal electricity	Commercial heating electrification	International shipping	Tidal and wave	Geosequestration	Home heating that isn't electric	Home lighting and appliances	Solar panels for electricity	Livestock and their management	Hydroelectric power stations
Lever sum (all)		186	169	163	160	160	157	157	157	155	152	152	151	147	145	144	144	141	141	139	138
Lever average (all)		3.6	3.3	3.2	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	2.9	2.8	2.8	2.8	2.8	2.8	2.7	2.7
Lever sum (working pathways)		**84**	**76**	**75**	**76**	**75**	**74**	**73**	**71**	**69**	**67**	**64**	**73**	**69**	**63**	**69**	**67**	**66**	**58**	**63**	**63**
Lever average (working pathways)		**3.8**	**3.5**	**3.4**	**3.5**	**3.4**	**3.4**	**3.3**	**3.2**	**3.1**	**3.0**	**2.9**	**3.3**	**3.1**	**2.9**	**3.1**	**3.0**	**3.0**	**2.6**	**2.9**	**2.9**

Pathways which achieve an 80% reduction

Nottingham group	92%	4	2	2	1	2	4	3	4	1	1	4	4	4	4	4	1	1	3	3	4
Ulverston individual	88%	2	3	4	3	4	4	3	3	3	2	3	3	3	1	4	3	2	1	2	1
Ulverston individual	88%	4	4	3	3	4	4	3	3	3	4	3	3	3	3	4	4	4	3	3	3
Ulverston individual	88%	4	4	3	3	4	2	3	4	4	2	2	3	4	3	4	3	3	2	3	2
Ulverston individual	87%	4	4	4	4	4	4	4	4	3	4	2	4	3	1	4	4	2	4	3	2
London group	86%	4	4	4	4	4	3	4	4	4	3	3	3	3	4	3	4	2	3	4	2
London group	86%	3	3	3	4	3	3	4	3	3	3	3	3	3	3	4	3	2	3	2	3
London group	84%	4	4	3	3	2	4	4	3	3	3	2	3	2	2	4	1	4	4	3	3
Ulverston individual	83%	3	2	3	4	3	2	3	2	3	1	1	3	3	3	3	3	3	3	3	2
London group	83%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	3	4	2
Ulverston individual	82%	4	2	3	3	2	3	2	3	3	4	4	4	4	2	4	2	2	2	4	4
Ulverston individual	82%	4	4	2	4	4	3	4	2	2	2	2	2	1	1	4	3	4	1	1	4
Ulverston individual	81%	4	3	4	3	3	4	3	3	2	4	4	3	3	4	4	3	3	2	4	4
London group	81%	4	4	3	4	3	3	1	3	3	4	3	2	3	3	4	3	4	4	1	3
London group	81%	4	2	4	4	4	4	4	1	4	3	3	4	4	4	3	4	2	2	1	2
London group	81%	4	4	4	3	4	4	3	4	4	4	4	3	4	4	3	4	4	3	4	4
Ulverston individual	80%	4	4	2	4	2	2	1	3	3	3	3	4	4	1	2	2	2	1	1	3
Nottingham group	80%	4	4	4	4	4	3	4	4	3	3	3	3	2	3	1	4	3	2	2	4
London group	80%	4	4	4	3	4	4	4	3	3	3	2	3	3	3	3	4	4	2	4	3
London group	80%	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	3	4	2
London group	80%	4	3	4	3	3	3	4	3	3	3	2	4	2	2	3	3	3	3	3	3
London group	80%	4	4	4	4	4	3	4	4	4	3	3	4	3	4	2	1	4	4	4	3

Pathways which do not achieve an 80% reduction

London group	79%	4	4	1	2	4	4	4	2	4	2	4	2	4	1	4	4	4	2	1	4
London group	77%	4	4	3	4	3	4	4	4	4	3	3	3	4	4	4	1	4	4	3	4
London group	76%	4	3	4	3	4	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4
Ulverston individual	75%	4	4	4	3	4	2	3	3	3	4	1	3	3	4	2	2	3	1	4	2
Nottingham group	75%	4	4	4	4	4	4	4	4	3	4	4	3	4	4	4	4	4	4	4	4
Ulverston individual	73%	2	3	2	2	1	2	2	2	2	2	2	3	3	2	3	1	3	2	2	2
Nottingham group	70%	1	4	4	1	3	2	3	1	2	4	4	3	3	4	4	1	3	4	1	2
Nottingham group	68%	4	4	4	4	4	3	4	3	3	2	4	3	4	3	3	4	3	4	3	2
London group	68%	3	3	3	3	3	3	3	3	3	3	3	4	4	3	4	3	3	3	2	2
Ulverston individual	67%	4	3	4	4	4	3	3	4	4	4	4	4	4	4	3	4	3	3	3	3
Nottingham group	67%	4	4	3	3	2	3	4	3	2	4	4	3	4	2	4	2	4	4	4	4
London group	65%	4	4	4	4	4	4	1	4	4	2	4	3	1	2	1	4	1	4	2	1
Ulverston individual	63%	4	4	4	4	4	4	4	4	4	3	3	4	2	3	3	4	4	3	3	2
Ulverston individual	60%	3	4	3	3	4	3	3	3	3	2	3	2	4	2	3	1	3	1	4	1
Ulverston individual	59%	4	3	4	4	2	4	4	4	3	4	4	4	3	3	3	2	1	3	3	4
Nottingham group	59%	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4
Nottingham group	58%	4	3	3	2	3	2	2	3	3	4	4	3	4	4	2	3	1	3	2	4
Ulverston individual	57%	4	2	4	4	4	3	1	3	3	3	3	2	2	3	1	4	4	4	2	2
Ulverston individual	57%	4	2	4	4	4	3	1	3	3	3	2	2	2	3	1	4	4	4	2	2
Ulverston individual	57%	3	3	2	3	2	3	3	3	3	2	2	2	1	2	2	1	1	2	3	2
Nottingham group	56%	4	4	1	2	1	1	1	1	2	2	1	1	1	3	1	2	1	1	2	1
Nottingham group	55%	4	3	1	2	2	3	2	3	3	2	4	1	1	2	1	1	2	3	1	2
Ulverston individual	52%	4	3	4	2	2	2	3	3	3	4	3	3	3	3	3	2	1	3	3	4
Ulverston individual	52%	4	3	4	2	2	2	3	3	3	4	3	3	3	3	3	2	1	3	3	4
Ulverston individual	50%	4	3	3	4	2	3	4	3	3	3	3	3	3	2	3	4	4	3	2	2
Ulverston individual	50%	3	2	2	2	4	3	3	3	3	2	2	2	1	2	2	3	1	1	3	2
Nottingham group	48%	2	3	2	2	2	3	2	3	3	1	2	2	2	2	1	3	2	2	2	1
Nottingham group	43%	4	2	2	2	2	1	4	2	2	2	2	1	1	2	1	2	2	3	2	2
Ulverston individual	40%	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	1	1	1	2	2

Less-used levers

	Reduction	Volume of waste and recycling	Energy intensity of industry	Storage, demand shifting and interconnection	Average temperature of homes	Marine Algae	Offshore wind	Small-scale wind	Bioenergy imports	Growth in industry	CCS power station fuel mix	Land dedicated to bioenergy	Type of fuels from biomass	Electricity imports	Onshore wind	CCS power stations	Biomass power stations	Electrification of commercial cooking	Nuclear power stations	Electrification of home cooking
Lever sum (all)		136	131	130	128	126	118	112	112	104	104	103	103	95	87	86	83	80	79	64
Lever average (all)		2.7	2.6	2.5	2.5	2.5	2.3	2.2	2.2	2.0	2.0	2.0	2.0	1.9	1.7	1.7	1.6	1.6	1.5	1.3
Lever sum (working pathways)		**61**	**62**	**60**	**65**	**54**	**52**	**51**	**47**	**48**	**46**	**46**	**46**	**45**	**44**	**34**	**27**	**34**	**38**	**29**
Lever average (working pathways)		**2.8**	**2.8**	**2.7**	**3.0**	**2.5**	**2.4**	**2.3**	**2.1**	**2.2**	**2.1**	**2.1**	**2.1**	**2.0**	**2.0**	**1.5**	**1.2**	**1.5**	**1.7**	**1.3**
Pathways which achieve an 80% reduction																				
Nottingham group	92%	3	3	1	1	2	1	1	4	4	3	3	2	1	1	3	1	2	1	1
Ulverston individual	88%	3	2	2	2	2	1	2	2	2	4	2	1	2	1	1	1	2	3	1
Ulverston individual	88%	3	3	3	3	3	2	3	2	3	1	2	2	2	2	1	2	2	3	2
Ulverston individual	88%	3	3	3	3	3	2	2	2	3	1	2	4	2	1	1	2	2	3	2
Ulverston individual	87%	3	3	3	4	3	1	3	3	2	3	2	3	3	1	2	2	2	3	2
London group	86%	3	2	3	3	4	3	2	1	2	1	4	1	2	2	1	1	1	1	1
London group	86%	3	3	2	3	2	3	3	1	2	4	2	1	1	3	3	1	2	1	1
London group	84%	3	3	3	2	4	4	2	3	2	3	1	4	3	3	1	1	1	1	1
Ulverston individual	83%	2	3	2	3	1	1	2	3	2	2	2	2	1	1	2	1	1	2	1
London group	83%	3	3	4	3	4	3	4	4	2	1	2	2	1	2	1	1	2	1	1
Ulverston individual	82%	3	3	1	4	1	3	3	2	2	1	2	1	1	3	1	2	2	1	2
Ulverston individual	82%	3	2	3	2	1	1	4	1	2	3	3	2	1	1	1	2	2	4	2
Ulverston individual	81%	3	3	4	4	2	1	1	1	1	4	1	3	1	1	4	1	1	4	1
London group	81%	2	3	1	3	1	3	1	1	1	1	1	2	1	1	1	1	1	1	1
London group	81%	1	3	4	3	1	2	1	1	2	1	3	1	4	2	1	1	2	1	1
London group	81%	3	3	3	4	2	4	2	1	3	4	1	2	4	4	2	1	1	1	2
Ulverston individual	80%	3	3	3	4	2	2	3	3	2	2	3	4	3	1	3	1	1	1	1
Nottingham group	80%	2	2	3	2	4	2	1	1	2	1	4	1	1	2	1	1	1	2	1
London group	80%	3	3	3	4	3	3	1	2	3	3	1	2	4	4	1	1	1	1	1
London group	80%	3	3	4	3	4	3	4	4	2	1	2	2	1	2	1	1	2	1	1
London group	80%	3	3	3	2	1	3	2	3	2	1	1	3	3	3	1	1	1	1	1
London group	80%	3	3	2	3	4	4	4	2	2	1	2	1	3	3	1	1	2	1	2
Pathways which do not achieve an 80% reduction																				
London group	79%	1	3	4	4	1	1	1	1	2	1	1	1	1	4	2	1	2	1	1
London group	77%	3	3	2	2	4	3	2	3	2	2	3	2	3	1	1	2	2	1	1
London group	76%	3	3	1	1	3	4	1	4	2	1	1	1	2	1	1	1	2	1	2
Ulverston individual	75%	3	2	4	1	2	1	1	1	2	2	1	1	3	1	3	1	1	4	1
Nottingham group	75%	3	3	4	4	4	4	4	4	2	3	4	4	1	1	2	4	1	1	1
Ulverston individual	73%	3	3	2	1	3	2	2	2	1	2	3	2	2	1	2	2	2	2	2
Nottingham group	70%	3	1	2	3	2	2	2	3	2	1	1	1	3	1	1	1	1	1	1
Nottingham group	68%	2	2	3	2	1	3	4	4	2	3	2	3	1	3	3	1	2	1	1
London group	68%	2	2	3	2	3	2	4	3	2	4	2	2	2	2	2	2	2	2	2
Ulverston individual	67%	2	2	3	1	1	1	1	3	2	2	1	1	1	1	1	2	2	3	1
Nottingham group	67%	3	2	4	3	3	3	2	2	2	1	2	1	1	1	1	2	2	2	1
London group	65%	1	3	3	3	4	1	2	1	2	1	2	1	1	1	1	1	1	1	1
Ulverston individual	63%	3	3	1	1	4	3	2	4	3	4	4	3	1	1	2	4	2	1	2
Ulverston individual	60%	2	3	2	2	1	2	1	1	3	1	1	1	2	2	1	2	1	1	1
Ulverston individual	59%	3	2	3	3	2	2	2	1	2	3	2	3	2	1	3	3	2	1	1
Nottingham group	59%	3	3	1	2	4	4	4	4	3	1	4	4	1	4	1	4	2	1	2
Nottingham group	58%	3	2	2	3	4	3	3	3	2	3	3	3	2	2	3	3	2	2	1
Ulverston individual	57%	3	3	1	2	3	3	2	4	1	2	2	2	1	2	2	2	1	2	1
Ulverston individual	57%	3	3	1	2	3	3	2	4	1	2	2	2	1	2	2	2	1	2	1
Ulverston individual	57%	2	3	3	2	2	1	1	1	2	1	1	1	3	1	1	1	1	1	1
Nottingham group	56%	1	2	1	2	1	2	2	1	2	1	1	1	3	1	1	1	2	1	1
Nottingham group	55%	3	2	3	2	4	1	2	1	2	2	2	1	1	1	1	1	2	1	1
Ulverston individual	52%	3	1	3	3	2	2	2	1	2	3	2	3	2	1	3	3	2	1	1
Ulverston individual	52%	3	1	3	3	2	2	2	1	2	3	2	3	2	1	3	3	2	1	1
Ulverston individual	50%	3	2	3	3	2	2	2	2	1	2	2	2	1	1	2	1	2	1	2
Ulverston individual	50%	3	3	2	1	2	2	2	2	2	3	2	1	2	2	2	2	1	1	1
Nottingham group	48%	2	3	2	2	1	2	2	1	1	1	1	2	2	1	2	1	1	1	1
Nottingham group	43%	3	3	3	2	2	3	2	2	2	2	1	3	1	1	2	2	1	1	1
Ulverston individual	40%	3	1	1	1	2	2	2	1	2	1	2	2	2	1	1	1	1	2	1

6.4 Differences by area

Overall, pathways were fairly similar across the three locations. In particular, an emphasis on demand side was seen in all three locations, although to a lesser extent in the pathways that were submitted in Ulverston. This may be because the Calculator prompts for a national pathway by asking the user to consider levers that may be less relevant for the local context (e.g. tidal and wave for an inland location).

Differences that were observed were mainly on the supply side. In both London and Nottingham, nuclear and CCS power stations were two of the least-used levers. This was not the case in for the Ulverston pathways, where these levers were used to a much greater extent. Instead, 'land dedicated to bioenergy' and 'onshore wind' were two of the least used levers, reflecting the greater concern for the preservation of the landscape that came out in the group discussions, as well as concerns about the future of the agricultural sector.

The average pathway score differed between the three areas, with on average 79% reduction achieved in London, 68% in Ulverston, and 64% in Nottingham. These differences may reflect differences by area, differences in attendees (e.g. there were a higher proportion of NGOs in London) or be a result of the different set-up on the day (e.g. people in Nottingham had less time to develop and refine their pathway).

6.5 Differences by audience

While it was difficult to discern any particular differences in *pathways* by audience type, particularly as two events included different audiences working together on the same group pathway, it was possible to discern several typologies when it came to *creating a pathway.* These typologies showed environment-focused, business-focused, technically-focused, and election/ representation-focused approaches. They were often related to participants' representative roles, meaning that environment-focused approaches were somewhat more common, followed by approaches focusing on election/representation, business and finally the technical side, which was least common. The table overleaf outlines these typologies.

Audience typologies					
	No pre-existing focus	**Environment-focused**	**Business-focused**	**Technically-focused**	**Election/ representation-focused**
Motivations driving their pathways	Concerned about personal costs	'environmentalism' / idealism	Concerned about cost for business and/or impact on employment	1-2 favourite technologies	What would get most public buy-in, as linked to their re-election
Levers	All	Renewable energy sources, personal behaviour change	Supply side, and heavy hitters such as nuclear	Set on 1-2 favourites	What would get most buy-in e.g. insulation?
	For all, lever use was driven by personal likes and dislikes. E.g. nuclear, CCS, and geosequestration evoked strong emotions, which was only partly based on scientific facts				
Likely approach to the Calculator	Try see the effect that each lever has	Start with 4 / high on renewable energy sources	See how far they can get without using high-cost/effort technologies	Try to reach the 80% target by any means, work out the 'tricks' of the calculator	Minimise the need for radical behaviour change by avoiding 3s and 4s on the demand side

Source: Ipsos MORI

6.6 Change over the day

Many of the participant pathways changed substantially throughout the day. For the majority, the first session was primarily about getting to know their way around the calculator, and as such, it was particularly difficult to come anywhere close to hitting the target in the time allowed. This was particularly true where participants shared computers, as much more time was devoted to debating each lever. Many got caught up in detail and used the one-pagers, with the result that they only managed to work on fewer than half of the levers by the end of the session.

After the group discussion of the Big Themes and the distribution of the stimulus, many of the participants did manage to make further progress towards the 80% target. For some, the stimulus appeared to make a difference to how they approached the pathway for the second time, especially where before they had been confused about particular levers or concepts. However, for many, this second session was a continuation of the first using one of the

methods outlined in the typologies box above. Even though participants knew that all four Themes are important in creating a successful pathway, many continued to concentrate on their own preferred themes, and completely avoid the particular levers that they had objections to, such as nuclear, CCS or biomass.

6.6.1 A pathway journey

The table on the following page demonstrates a journey through pathways of one of the London groups. This is a good example of how participant pathways changed throughout the day. The group who created it were less cohesive than most, containing one committed environmentalist and one businessman who was much more pragmatic and sceptical. There was also a councillor whose input was limited but who expressed some scepticism about the final pathway.

Pathway journey for one of the London groups

On the first attempt at a pathway, this group concentrated solely on the supply side, both because they were more interested in and informed about these levers, but also because the environmentalist in the group had a strong conviction that radical behaviour change is needed, particularly in the sphere of transport, to reach the target. They used the levers relating to the commercial sector to a lesser extent, as the members of the group thought that domestic behaviour would be easier and faster to change.

After having discussed the Big Themes and received the stimulus, the second pathway that this group created came much closer to the target. They used the supply side levers this time, again concentrating on the levers that were more acceptable to the environmentalist in the group, who thought that we should only increase the use of renewable energy sources. As she felt strongly about her opposition to nuclear technology, this group never used the lever, but they did at this stage experiment with using the CCS lever and thought about using bioenergy and importing electricity. At this stage they balanced out the demand side also, putting more emphasis on changes in the commercial sector and less on personal behaviour, perhaps in part due to the group discussion which had taken place on this issue.

Finally, in creating the third pathway, this group did not concentrate on local issues as they didn't really see the distinction between a local and a national pathway, but instead chose to refine their pathway, and try to reach the target in an "environmentally friendly" way. They removed some of their oversupply issues by reducing the levers for 'land dedicated to bioenergy', 'CCS power stations' and imports and again increased some of the supply side levers so that a heroic effort would be needed on many measures of commercial and personal behaviour. The final pathway came close to meeting the target (76%) and the environmentalist in particular was proud that they had reached a similar level of reductions to other groups without resorting to nuclear.

Supply

Levers	Pathways 1st	2nd	3rd
Nuclear power stations	1	1	1
CCS power stations	1	2	1
CCS power station fuel mix	1	1	1
Offshore wind	1	3	4
Onshore wind	1	3	4
Tidal and wave	1	1	4
Biomass power stations	1	1	1
Solar panels for electricity	1	2	4
Solar panels for hot water	1	3	4
Geothermal electricity	1	3	4
Hydroelectric power stations	1	2	4
Small-scale wind	1	2	4
Electricity imports	1	4	1
Land dedicated to bioenergy	1	3	1
Livestock and their management	1	3	3
Volume of waste and recycling	A	B	C
Marine Algae	1	2	1
Type of fuels from biomass	A	D	A
Bioenergy imports	1	4	1

Demand

Levers	Pathways 1st	2nd	3rd
Domestic transport behaviour	3	2	3
Domestic transport electrification	4	4	3
Domestic freight	3	2	4
International aviation	2	2	4
International shipping	D	A	D
Average temperature of homes	1	1	3
Home insulation	2	4	4
Home heating electrification	B	C	D
Home heating that isn't electric	C	A	C
Home lighting and appliances	2	1	4
Electrification of home cooking	A	B	B
Growth in industry	B	C	B
Energy intensity of industry	2	3	3
Commercial demand for heating and cooling	1	1	4
Commercial heating electrification	B	C	D
Commercial heating that isn't electric	A	A	C
Commercial lighting and appliances	1	3	4
Electrification of commercial cooking	B	B	B
Geosequestration	1	1	1
Storage, demand shifting and interconnection	2	3	1

Pathway journey for one of the London groups

A green field represents an increased effort compared to the previous pathway (i.e. pathway 2 compared to pathway 1, and pathway 3 compared to pathway 2.
A red field represents a decrease in effort compared to the previous pathway.
No colour indicates that no change occurred since the last pathway.

6.7 National vs. local pathways

Participants tended not to distinguish between national and local pathways. This may be because the Calculator includes levers that may not be relevant to a local discussion, thus encouraging users to take a national view. Many spent the final session refining their pathways, particularly in light of the other tabs which had just been introduced by the DECC experts, as in the example set of pathways above. Some thought that it is impossible to not think at a national level as that is what the Calculator encourages. Very few of the options relate to local issues, and in cities in particular, participants struggled to see how their national pathway would affect their area specifically.

In London, some participants suggested a localised Calculator that shows customised options for the local area, i.e. only options that apply to London and that Londoners could do something about. It was felt that this would make it easier to devise local pathways.

7. Further engagement: lessons for the way forward

7. Further engagement: lessons for the way forward

This section explores lessons for future engagement, including what role tools like the Calculator or toolkit could play in engaging with a stakeholder audience, if people conveyed willingness for further engagement, and if so, in what form, and which groups might most effectively be targeted to take part in the engagement.

7.1 Lessons and options for future engagement

A key lesson from the workshops is that any further future engagement would need to unpick the objectives and to clarify

- the relative importance of finalising a pathway they are happy with vs. 'just' engaging with the subject;
- how much knowledge would DECC like the participants to take away from the engagement process vs. engaging with the subject, but without eliminating all misconceptions; and
- who DECC would like to engage with and with what aim. For instance, DECC may wish to include the general public in future workshops, or to focus on stakeholder groups that seem particularly likely to act as champions in their community.

Depending on DECC's objectives, we have the following suggestions:

1) **Engagement with / discussion about the subject among stakeholders or the general public**. We suggest using a half-day workshop. This should be fairly easy to recruit, as the event takes up less of participants' time. Participants get a taster of the subject and leave interested in engagement outside of the workshop, which DECC can then follow up on. As in Nottingham, the event could take place in the evening. You may also want to consider breakfast workshops, which can be a very successful way of engaging stakeholders in particular.

2) **Informed pathways**. Given that 3-4 hours or even a day is a short period of time to engage with such a complex subject, DECC may wish to ensure prior and follow-up engagement. A) For instance, participants could be given pre-tasks so that they arrive already familiarised with the Calculator or the 4 Big Themes and can then spend more time on developing their pathway. B) After having learned about the 4 Big Themes and

the Calculator in a workshop, participants then develop their final pathway at home. However, in this case participants may struggle to get past 60% unless they could submit an unfinished pathway to an 'online expert' for advice. C) The example pathways could be used as a warm-up exercise with participants choosing their preferred pathway (NB this was considered by the project team but we wanted to see how people would get on without prompting in the first instance as it was important not to be seen to be trying to lead participants to any particular pathway. For future engagement work this may be less of an issue as when we did introduce the examples in these workshops, people received them in the way that was intended – as a starting point for discussion).

3) **Developing a network of local champions who engage their communities into a discussion about climate change**. Stakeholders can use the toolkit to start a dialogue in their community, perhaps starting with workshop participants. The challenge will be ensuring these dialogues take place, and to make sure scientific facts are accurately presented.

4) **Collecting as many pathways as possible.** Similarly to the My2050 Simulation, you could incorporate a save mechanism in the Calculator so that Calculator users can submit their pathways. You could then analyse these data to find emerging themes, likes and dislikes. However, the pathways are likely to reflect broad preferences (e.g. reject nuclear completely), but only in some cases will show the pathway users would most like to see implemented. The tool is likely to be successful in conveying the complexity of the challenge, but in this strength lays also its drawback – it takes considerable time to design an informed and working pathway.

5) **Organisational pathways.** Rather than collecting individual pathways, some organisations, such as councils, schools or universities, may be interested in submitting an organisational pathway. This would be a pathway that their organisation would like to see implemented and that was designed through deliberation in their organisation. This could help DECC to build a partnership network, as well as tap into informed opinion. Again the toolkit could be helpful for this.[5]

7.2 Role of tools, facilitators, and experts in future engagement

Based on the workshop experience, we recommend keeping tools, facilitators, and experts as part of future engagement initiatives.

[5] Alternatively, options 1, 2 and 5 could use the My2050 Simulator as the focus of the dialogue. Interested participants could then be referred to the Calculator afterwards for them to use in their own time.

Employing a **tool**, whether the Calculator or the My2050 Simulation, works well as it forces participants to think and apply the information. Sharing the tool between 2-3 participants will ensure that deliberation takes place between participants. It also means that technology-savvy participants can help out their counterparts who feel less comfortable with technology.

Using a neutral **facilitator/moderator/administrator** gives the engagement process more credibility, ensures discussions are not driven by an agenda, and guarantees skilled mediation between those holding opposing viewpoints. In any DECC- or champion-facilitated events, there may be a risk that only those with an agenda attend. Those without strong opinions are more likely to engage in a 'research and engagement' process conducted by a neutral third party. Moreover, in a workshop or group setting, facilitators/moderators also take on some of the **expert**'s responsibilities. Given the complexity of the subject it is important that experts stay involved in future engagement initiatives if DECC wants to collect informed opinion. Without an expert, moderators could potentially use a fact-sheet on how to 'solve' the Calculator if the events are rerun in the future. This should focus on common 'errors', such as over-supply or mismatched combinations of levers.