

## 1.0 Scenario Workshop Results: Research Priorities

### 1.1 Workshop Process for Identifying Research Priorities

The main element of the project was a *Scenario Workshop* held on the 19<sup>th</sup> and 20<sup>th</sup> of February 2004 in London. Twenty-three participants attended, representing a wide range of organizations and disciplines (See *Appendix 3*).

*Council*, a groupware tool using portable computers linked by a wireless network, was used at the Scenario Workshop to supplement and accelerate face-to-face discussions. *Council* allows all participants to state their views and review each other's ideas simultaneously. It has a wide range of capabilities, including the ability to rank and prioritize. It can immediately organize and display the resulting information in charts and graphs and provide a full written record of participant interactions. It allows participants to state their views anonymously, encouraging open expression of ideas.

Visualization of ideas was also used to stimulate discussion. Joe Ravetz from the University of Manchester served as a graphic facilitator, covering the walls with drawings on flip charts pages to illustrate ideas emerging in the discussions. Throughout the workshop, participants were encouraged to make rough sketches and pass them to Joe Ravetz.

Using the scenarios as a framework for discussion, workshop participants explored:

- Key areas where research is necessary to help inform policy development, business strategy, and public opinion
- The style and conduct of research in response to these needs
- Methods and approaches that need to be applied more extensively, or which need to be further developed
- The potential for interdisciplinary work crossing the boundaries between the social and the natural sciences
- The extent to which new conceptual approaches to research may need to be developed, and by whom
- The ways in which research is communicated and used, and the linkages between researchers and those who do or could use research knowledge.

The discussions in the workshop produced a comprehensive listing of potential research topics with a clear message to research funders about which research themes are most important, in the view of the invitees, for the TSEC programme to support. The discussions differentiated between important short term areas of research (where results can be achieved in 3-5 years) and important long term areas of research (where work begun now will require more time to achieve its full results). Research topics that were viewed as important on both time scales were also highlighted. Once priority research topics were identified, discussions focused on methodological approaches and research styles, with an emphasis on providing guidance to the ESRC

and other Research Councils on how best to collaborate within the context of interdisciplinary research.

The first day of the two-day Scenario Workshop was devoted to identifying priority topics for economic and social research. The four scenarios developed in the project were used as a framework to structure the discussions. During the day, participants had an opportunity to deeply engage with the scenarios, imagining what kind of challenges and opportunities might arise between now and 2050 in each of the alternative futures. Because the scenarios were so different, ranging from a problem-plagued “hard times” future to a “best feasible” future, participants were challenged to think through what kind of economic and social research topics would be most relevant under a wide variety of future circumstances.

The Workshop began with a warm up exercise, using the Council groupware system to prioritize a “starter list” of research topics gathered in the interviews conducted during the project. This familiarized participants with the Council system and established from the outset the purpose of the Workshop and the kind of final product to be achieved. Then, working in small groups organized around the four scenarios, participants were challenged to answer the following question:

***Assume this scenario is going to become reality. What does this mean in terms of KEY TOPICS that social science research should NOW address so as to contribute to building a sustainable energy economy in the context of this scenario?***

Overnight, all the topics for research generated during the day’s discussions were arranged into a grouped and consolidated list. At the start of the second day, participants were mixed into four new discussion groups, given time to review the full list, and then asked to discuss the following question, designed to insure that everyone had a last opportunity to get all their ideas and priorities into the list.

***What additional topics (important but neglected topics, novel topics, critical but controversial topics, nearly impossible to study topics) do you feel are missing from this list?***

All the additional topics that arose from discussing this question were added to the list of topics generated the day before. The resulting master list of research topics was then used for three separate exercises using the Council groupware system (See Appendix I).

In the first voting exercise, each participant had a laptop computer on which the master list was displayed. Participants were first asked to vote on what they judged



to be the most important social science research topics related to sustainable energy that will yield results in the short term – the next 3 to five years. This was the “low hanging fruit” question related to research priorities.

The second vote was on the most important social science research efforts related to sustainable energy that will only yield their full results over the long term –the next 20 to 50 years (The impact would be long term, not the inception of the research).

In the third exercise, participants worked in four small groups. Each group was asked to choose a small number of the topics they felt to be of particularly high priority and to set out the reasons for making these particular lines of research a top priority.

## 1.2 Key Themes from the Research Topic Discussions

Four lists of research priorities are set out below. The first is a list of *key themes that emerged from all three ranking exercises*. The second is the result of a whole group vote on *short-term research priorities*. The third is the whole group vote on *long term priorities*. And the fourth list is the set of *priority topics selected in small group discussions*.

### 1.2.1 Key Themes

One of the most striking results of the workshop is that out of a large number of research topics proposed and considered, a relatively small number of broad topics or themes were rated as most important in all of the ranking exercises. *The topics listed below are therefore areas which we strongly recommend to the ESRC for research funding.*

To clarify the meaning of these topics, examples are given of specific comments entered into the Council system by Workshop participants. In the fast-paced Workshop process, participants entered comments into the Council system in a brief, telegraphic style. The examples of comments are presented “as given,” without editing or elaboration.



## Summary of Recommended Research Topics

### Topics Rated High on All Three Lists

(Short Term, Long Term, Small Group Priority)

Psychology of Consumer Energy Choices  
Government Foresight and Long Term Action  
Accelerating Energy Efficiency Improvements  
Positive Images of the Future to Motivate Change  
Encouraging Innovation  
Media and Public Opinion

### Topics Rated High on Short Term Priorities List and also a Small Group Priority

Vulnerability  
Liberalized Energy Markets  
Distributed Generation  
Joined Up Government

### Topics Rated High on Long Term Priorities List and also a Small Group Priority

Improved Metrics for Decision Making and Investment  
Aviation  
Changing Values

## 1. Psychology of Consumer Energy Choices

Examples of participant statements:

- How people make energy decisions
- Psychology of consumer choice – how do consumers make energy choices?
- How do people, in reality, make their energy decisions, including choosing equipment, choosing the whole range of devices they use, making housing purchases, etc.?
- What influences consumer preferences when it comes to energy-related consumption or any consumption where energy is an important part of the functionality of the product or service?

## 2. Government Foresight and Long Term Action

Examples of participant statements:

- How do we change the political system to provide incentives to government to think longer-term? And indeed to take long-term decisions?
- How to improve foresight in government and the setting of long-term goal
- Research on new approaches to planning that set long term goals, but run technical and social experiments, make extensive use of the market, and maintain flexibility about how to achieve the goals.

- How to bridge inconsistencies between short-term political imperatives and long-term energy policy requirements?

### 3. Accelerating Energy Efficiency Improvements

Examples of participant comments:

- Research into how energy efficiency can be delivered cheaply through energy consumers (individual, commercial, industrial) becoming more expert in the procurement of energy efficient equipment and buildings.
- Research on where compulsion in adopting energy efficiency measures is likely to be necessary.
- Research on best ways of informing and motivating personal behaviour to reduce energy use.
- What sorts of instruments and tactics need to be deployed by all levels of government to improve energy efficiency quickly and cheaply?

### 4. Positive Images of the Future to Motivate Change

Examples of participant comments:

- Research on the power of positive images of the future to motivate change.
- Can government programs be deliberately focused on positive visions that go beyond “solving problems” and be more effective as a result?
- How can this [consumer choices] be influenced to focus more on sustainable products as being “aspirational”?



### 5. Encouraging Innovation

Examples of participant comments:

- What changes are needed in regulatory framework, policies, etc. to let new innovations in energy efficiency and supply move into the marketplace as rapidly as possible? Are there sufficient incentives to promote the types of innovation that are required here?
- What innovation is required in the regulatory and pricing system to encourage these sorts of innovation? E.g. compulsory purchase of electricity from renewables and CHP, or feed-in tariffs. Research on institutional arrangements that have worked best for fostering rapid technological innovation.

- What is the right policy to support innovation? (personnel, skills, funding incentives, resources for equipment, etc.) What does UK need to do to develop the skills and R&D base to be able to take advantage of this scenario [Leading the Next Industrial Revolution]?
- How do established industries respond to changes in technology to deliver both the incremental and more radical technical changes? Thinking in terms of customers' attitude to risk? What are the (government) incentives required to accelerate the uptake of new technologies? Talking here about moving from demonstration to commercialisation and in some cases diffusion beyond early adopters.

## **6. Media and Public Opinion**

Examples of participant comments:

- How can the media be used effectively without appearing to be an arm of the ‘nanny state’?
- How do media communication, scientific information, government and business leadership, and other factors need to come together to galvanize public opinion on climate change?
- How do you engage the public and build a consensus behind the required government action?

## **7. Vulnerability**

Examples of participant comments:

- Research on extent of vulnerability that will be created by growing pattern of import dependence. Research on the “vulnerability chains” of energy supplies.
- If we lost 30% of our electricity supply, how would we maintain health services, etc? What are key vulnerabilities and how to deal with them? How to "case harden" the system to be able to maintain the most critical functions? Research on our capacity to cope with significantly lower energy supplies.
- Public perceptions of – and values placed on – security and reliability of supply.
- More international relations research is needed in the energy field. Geopolitics and anticipating potential future shocks. International relations research into security of global markets and geopolitical conditions that might prevent the [Leading the Next Industrial Revolution] scenario from coming about in the first place?

## **8. Liberalized Energy Markets**

Examples of participant comments:

- Research on liberalizing energy markets in a way that does not frustrate needed investments, especially in energy efficiency.

- Research on investment markets - how government can help these markets keep functioning for energy investment even in difficult circumstances?
- What do we know from research on the effect of price signals on industry and householders - i.e. scenario assumes bigger impact on industry than households. The extent to which changes in technologies and technological systems can be driven rapidly in response to market signals - e.g. research on technologies and sociotechnological change in other contexts / countries / historical times.
- A determination of the price the public would pay to achieve improved supply diversity rather than be extremely reliant on gas from mainland Europe.

## **9. Distributed Generation**

Examples of participant comments:

- What are the economic benefits of centralised versus distributed generation? What are the carbon benefits? What are the social benefits and issues?
- How can the regulatory system best incentivise the development of the distributed grid and its control systems?
- What standards, policies and technical changes are needed to allow distributed renewable energy sources and other small scale technologies to be integrated into the power grid?

## **10. Joined Up Government**

Examples of participant comments:

- How can policy makers be persuaded to shift from rhetoric to reality in relation to joined up thinking in energy?
- What are the opportunities arising from EU enlargement for UK-based R&D?
- How decentralized can we make sustainability targets? E.g., regional, local authorities, communities?

## **11. Improved Metrics for Decision Making and Investment**

Examples of participant comments:

- What are the “best practice” methods for making comprehensive comparative evaluations of different energy supply and efficiency options, taking into account economic costs, environmental impacts and societal evaluations?
- Research on better metrics that reflect sustainable progress - GNP, life cycle costs, different components of quality of life, things we know about but still aren't widely used and standardized to influence decision making and investment.
- A sustained social science effort to look at indicators of quality of life... relation to environmental sustainability... to give a more accurate picture of progress/lack of progress and focus public attention on quality, not just quantity measures.

## 12. Aviation

Examples of participant comments:

- How to develop a long-term strategy for aviation given its rapid short-term growth, and the expected increase in fuel prices and inclusion of aviation emissions in international agreements, which would then suppress demand. How to manage false expectations?
- Aviation white paper vs. energy white paper 60 percent target [contradictory forecasts and goals]
- With higher energy prices, could we see a change in attitude toward journey times and some shift from air to boats?

## 13. Changing Values

Examples of participant comments:

- How can value-shifts supportive of sustainability be fostered? How is it possible to change deeply embedded cultural tendencies (e.g. towards conspicuous consumption)?
- How can green world views come to dominate other world views/ value systems? How can new post-consumerist values be nurtured?
- How can efficient resource use be rewarded by non-material incentives?

## 1.3 Top Research Priorities - Short Term

The short term research topics (those where important results could be produced in 3 to 5 years) selected as most important by workshop participants are listed below. All topics receiving 7 or more votes are listed, in rank order. All the statements are in the participant's own words, as entered by them or by note takers into the *Council* system.

**Table 1. Results of Top Research Priorities Short Term**

Number of Checks	Items
15	Research into attitudes of the general public - into the conditions under which they would be prepared to modify their consumption profile in response to strong pricing signals. Psychology of consumer choice - how do consumers make choices? How can this be influenced to focus on more sustainable products as being "aspirational"?
13	Research on extent of vulnerability that will be created by growing pattern of import dependence? Research on the "vulnerability chains" of energy supplies.
12	How do communication, education, credibility of science and other institutions, and scientific information have to come together to galvanize public opinion on climate change?
12	What are the economic benefits of centralised versus distributed generation? What are the carbon benefits? What are the social benefits/issues? How can the regulatory system develop to incentivise the development of the distributed grid and its control systems?
11	Research into how energy efficiency can be delivered cheaply through

	energy consumers, including commercial and industrial energy decision-makers at the micro level, becoming experts in the procurement of energy efficient equipment and buildings
11	Why would green world views come to dominate other world views / value systems? E.g. quality of life versus standard of living. How can new post-consumerist values be nurtured? How can efficient resource use be rewarded by non-material incentives?
11	How can policy makers be persuaded to shift from rhetoric to reality in relation to joined-up thinking in energy (e.g. aviation white paper vs. energy white paper 60% target)?
10	How decentralised can we make sustainability targets? E.g. regional, local authorities, communities? E.g. is there a national grid? Can regions manage their own grids?
10	How do we change the political system to provide an incentive to government to think longer-term? And indeed to take long term decisions? How to improve foresight in government and the setting of long-term goals?
10	How can the media be used effectively without appearing to be an arm of the 'nanny state'?
9	Research on liberalizing energy markets in a way that does not frustrate needed investments, especially in energy efficiency. Research on investment markets - how government can help these markets keep functioning for energy investment even in difficult circumstances.
9	Can energy efficiency policies change the investment behaviour of those that can already afford it but choose not to do so - i.e. the middle classes?
9	How will public understanding of climate change develop? How can development in this area be affected if it does not progress 'satisfactorily'? Attribution of climate impacts (better models) and communication of the results to public
8	Ability to buy local acceptance (through planning gain, free electricity / shares) of intrusive supply - renewables and nuclear.
8	If we lost 30% of our electricity supply, how would we maintain health services, etc? What are key vulnerabilities and how to deal with them? How to "case harden" the system to be able to maintain the most critical functions? Vulnerability analysis can be useful for many circumstances. Research on our capacity to cope with significantly lower energy supplies.
8	What are the opportunities arising from EU enlargement for UK-based R&D?
8	What do we know from research on the effect of price signals on industry and householders - i.e. scenario assumes bigger impact on industry than households. the extent to which changes in technologies and technological systems can be driven rapidly in response to market signals - e.g. research on technologies and sociotechnological change in other contexts / countries / historical times
7	Public perceptions of - and values placed on – security and reliability of supply.
7	How do established industries respond to changes in technology to deliver both the incremental and more radical technical changes? Thinking in terms of customers' attitude to risk? What are the (government) incentives required to accelerate the uptake of new technologies? Talking here about moving from demonstration to commercialisation and in some cases diffusion beyond early adopters.
7	What innovation is required in the regulatory and pricing system to encourage energy system innovation? E.g. compulsory purchase of electricity from renewables and CHP, or feed-in tariffs. Research on institutional arrangements that have worked best for fostering rapid technological innovation. What changes are needed in regulatory framework, policies, etc. to let new innovations in energy efficiency and supply move into the marketplace as rapidly as possible? Are there

	sufficient incentives to promote the types of innovation that are required here?
7	What science is required to build consensus across political parties? How do you engage the public and build a consensus behind the required government action?
7	What kinds of technology, ideas and experience could be transferred to developing countries to promote low carbon development?
7	High energy prices will not in themselves always cause the desired reaction of encouraging investment in energy efficiency. Acceptance of other incentives such as reduction of council tax etc needs to be explored. What fiscal and regulatory mechanisms could be introduced to reward consumer behaviour appropriate to the new economic circumstances? Can the crisis actually be the trigger that forces us to adopt sustainable consumption?

## 1.4 Top Research Priorities - Long Term

The long term research topics identified by Workshops participants are listed below in rank order. These are areas of research which, if initiated soon, could be expected to have significant impacts over the next 20 to 50 years. All topics receiving 7 or more votes are listed.

**Table 2. Results of Top Research Priorities – Long Term**

# of Checks	Items
14	What innovation is required in the regulatory and pricing system to encourage these sorts of innovation? E.g. compulsory purchase of electricity from renewables and CHP, or feed-in tariffs. Research on institutional arrangements that have worked best for fostering rapid technological innovation. What changes are needed in regulatory framework, policies, etc. to let new innovations in energy efficiency and supply move into the marketplace as rapidly as possible? Are there sufficient incentives to promote the types of innovation that are required here?
13	How to develop a long-term strategy for aviation given its rapid short-term growth, and the expected increase in fuel prices and inclusion of aviation emissions in international agreements, which would then suppress demand i.e. how to manage false expectations.
13	How do we change the political system to provide an incentive to government to think longer-term? And indeed to take long term decisions? How to improve foresight in government and the setting of long-term goals?
11	Research into the attitude of the general public into the conditions under which they would be prepared to modify their consumption profile in response to strong pricing signals. Psychology of consumer choice - how do consumers make choices and how can this be influenced to focus on more sustainable products as being "aspirational"
11	What science is required to build consensus across political parties? How do you engage the public and build a consensus behind the required government action?
10	What generates quality of life and how do we communicate it? Indicators of the quality of life - The Welsh example would be useful...sustained social science effort to look at indicators of quality of life....Quality of life indicators, relation to environmental sustainability. Research on alternative measures of GNP and other measures of quality of life to give a more accurate picture of progress/lack of progress and focus public attention on quality, not just quantity measures. What research methods are needed to investigate well-being and the impact of e.g. economic growth/its absence?

10	How will public understanding of climate change develop? How can development in this area be affected if it does not progress 'satisfactorily'? Attribution of climate impacts (better models) and communication of the results to public.
10	Research on the power of positive images of the future to motivate change....more advanced, humane, environmentally sound technologies, a better quality of life. Can government programs be deliberately focused around positive visions that go beyond "solving problems" and be more effective as a result?
9	Study of how value shifts have occurred in other societies/other times and what we can learn about the drivers.
9	Research on best ways of informing and motivating personal behaviour to reduce energy use. What has to happen to actually change behaviours? Making environmental responsibility a sufficiently high status thing that people forego the big house, big car, etc Public attitudes to innovation and change should be researched. At the moment, the public is reluctant to accept much new technology.
9	How can the media be used effectively without appearing to be an arm of the 'nanny state'?
9	Why would green world views come to dominate other world views / value systems? E.g. quality of life versus standard of living. How can new post-consumerist values be nurtured? Can efficient resource-use be rewarded by non material incentives?
9	Research on new approaches to planning that set audacious long-term goals, but run technical and social experiments, make extensive use of the market, and maintain flexibility about how to achieve the goals.
8	What is the right policy to support innovation? (personnel, skills, funding incentives, resources for equipment). What does UK need to do to develop the skills and R&D base to be able to take advantage of this scenario?
8	More international relations research is needed in the energy field. Geopolitics and anticipating potential future shocks. International relations - geo-political research and effects. International relations research into security of global markets and geopolitical conditions that might prevent the scenario from coming about in the first place?
8	Ability to buy local acceptance (through planning gain, free electricity / shares) of intrusive supply - renewables and nuclear.
8	Research on extent of vulnerability that will be created by growing pattern of import dependence? Research on the "vulnerability chains" of energy supplies.
7	A determination of the price the public would pay to achieve improved supply diversity rather than be extremely reliant on gas from mainland Europe.
7	What are the economic benefits of centralised versus distributed generation? What are the carbon benefits? What are the social benefits / issues? How will the regulatory system develop to incentivise the development of the distributed grid and its control systems?
7	Can we educate for sustainable consumption (and how?), and can we address today's consumers (adults) as well as tomorrow's (children)?
7	Understanding the relative importance to people of higher standard of living (as conventionally measured) versus sustainability issues, including climate change, fuel poverty, international equity, etc.

## 1.5 Top Research Priorities “Rationale for Priorities” Discussion

Given the priorities identified in the voting, each of the four discussion groups was asked to choose a small number of topics they felt to be of particularly high priority – these could come from either the short term or long term lists. The discussion groups were free to combine priorities from the list where they thought this led to a more effective focus, and to select items that were not at the very top of the collective lists presented above. The task now was to examine the reasons for making particular lines of research a priority.

Each of the topics listed below was chosen by more than one of the four discussion groups to be among the highest priorities.

- How People Make Energy Decisions
- Government Foresight and Long-Term Action
- Vulnerability to Supply Interruptions
- Positive Images of the Future to Motivate Change
- Improved Metrics for Decision Making and Investment
- Liberalized Energy Markets
- Policies to Encourage Efficiency
- Innovation
- Climate Science and Public Opinion
- Joined Up Government
- Effective Use of Media
- Transport – Air Transport in Particular
- Distributed Generation
- Changing Location Patterns
- Changing Values