UKERC
The Meeting Place

Energy and Climate Change 2012-2050: Business Transformation in Uncertain Policy Landscapes

Workshop Report

28-29 September 2011, St. Hugh's College, Oxford

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Edited by Timothy Cooper, UKERC Meeting Place and the workshop Steering Committee

This document is a report by the organiser of a technical meeting set up as part of UKERC's research programme. It is believed to be an objective record of the meeting but has not been separately reviewed by the participants

ORGANISERS

THE UK ENERGY RESEARCH CENTRE

The UK Energy Research Centre carries out world-class research into sustainable future energy systems. It is the hub of UK energy research and the gateway between the UK and the international energy research communities. Our interdisciplinary, whole systems research informs UK policy development and research strategy.

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THE UK ENERGY RESEARCH CENTRE MEETING PLACE

UKERC also acts as a two-way portal for the UK energy research community for both UK stakeholders and the international energy research community. The National Energy Research Network (NERN), supported and facilitated by UKERC, acts as an umbrella network for energy researchers across all disciplines. The UKERC Meeting Place, based in Oxford, is a key supporting function of UKERC that aims to bring together members of the UK energy community and overseas experts from different disciplines, to learn, identify problems, develop solutions and further the energy debate.

http://www.ukerc.ac.uk/support/themeetingplace

SMITH SCHOOL OF ENTERPRISE AND THE ENVIRONMENT

The Smith School is an interactive hub within Oxford University that engages with, educates and equips public and private enterprise with the solutions, knowledge and networks needed to address the major environmental challenges facing our planet.

CO-CONVENERS:

SAUDER SCHOOL OF BUSINESS, BRITISH COLUMBIA, CANADA

The Sauder School of Business is one of the world's leading academic business schools. Located in Vancouver, Canada's gateway to the Pacific Rim, Sauder provides a global business perspective at a dynamic crossroads of the international marketplace. Dedicated to rigorous and relevant teaching, our programs generate business leaders who drive change and shape industries and organizations around the world

UNIVERSITY OF CALIFORNIA, BERKELEY – CENTER FOR ENVIRONMENTAL PUBLIC POLICY

Founded in the wake of the gold rush by leaders of the newly established 31st state, the University of California's flagship campus at Berkeley has become one of the preeminent universities in the world. The national and international awards held by faculty underscore Berkeley's preeminence. A total of 21 faculty have been named Nobel Prize winners, including the eight who are current faculty members, along with 32 MacArthur Fellows and 4 Pulitzer Prize winners. The Center for Environmental Public Policy (CEPP) at the Goldman School of Public Policy (GSPP) aims to bridge the gap between environmental theory and policy implementation. It integrates interdisciplinary environmental theory and policy implementation through its seminars, workshops, and conferences.

UNIVERSITY OF MELBOURNE, AUSTRALIA

Established in 1853, the University of Melbourne is a public-spirited institution that makes distinctive contributions to society in research, teaching and engagement. Melbourne's teaching excellence has been rewarded two years in a row by grants from the Commonwealth Government's Learning and Teaching Performance Fund for Australian universities that demonstrate excellence in undergraduate teaching and learning. Melbourne was ranked the top Australian university by the Times Higher Education World Rankings in 2011 and 2nd in Australia by the 2010 ARWU SHJT Shanghai Jiao Tong University China Academic Ranking of World universities.

Executive Summary

This workshop bought together thirty five experts from research and business to understand the factors that enable or disable radical transitions to a low carbon future, to articulate potential response strategies at the local, national, regional and global level, to focus on the UK today and a global tomorrow, with reference to organisational levels and linkages.

Dr Jeff Hardy, Knowledge Exchange Manager, from UK Energy Research Centre gave a provocative talk to stimulate the participants in addressing the aim and objectives of the workshop to outline potential future scenarios.

During day one participants wrote up what factors they thought hinder transformative climate action and were then involved in coordinating them into hexxie to form related discussion groups for the workshop. The following clusters were developed:

1. Technology
2. Cost / Economics
3. Lock in to Fossil Fuels
4. Behaviour change.
5. Politics

For the second day participants discussed radical and incremental strategies for creating a culture of innovation between business, government and civil society for a low carbon world in the following groups:

1. High emitting organisations (Business)
2. G20, Global
3. UK – National

Concluding and emerging themes:

- Government still needs to take bold leadership with credible commitments (e.g. money spent on defence compared to renewables)

- However, there needs to be behaviour and buy-in as a broad requirement because there needs to be a market pull on these issues

- Getting over existing assets/sunk costs (for fossil fuel industry) must be acknowledged and the 'glide path' to low carbon energy future must not create lock in the lowers investment opportunity in renewables (i.e. nuclear industry)

- Need to provide for long-termism and draw on existing models that might work in other contexts (e.g. subsidies for fossil fuels)

Contents

Introduction

The central objective of the workshop was to understand the conditions under which low carbon economy futures can be achieved through effective and scalable business transformation. The first day of the workshop focused on the question: What are the factors that enable or disable low carbon transformation? What are clear examples of cases where these factors have catalysed or constrained change? The second day explored how best to create a culture of innovation among relevant stakeholders and what a 'post-carbon peak' economy looks like.

Context Setting

The purpose of this workshop was twofold:

1) understand factors enable/disable radical transitions to low carbon future
2) articulate response strategies local national regional global level, UK today, global tomorrow, with reference to organisational levels and linkages

Business, policy makers and academics are all trying to get to grips with barriers opportunities that business can make out of the low carbon agenda. 80% of the energy sector's emissions till 2020 are already locked in, as new assets together with existing assets that have either just been constructed or in the construction phase. Therefore the window of opportunity is closing. Therefore, there is a need to move towards a low carbon future and to think through what are the factors and barriers and to design strategies in order to do this.

The following presentations from this workshop can be found on www.ukerc.ac.uk/support/themeetingplace here

How do we create a culture of radical transformation?
Adam Bumpus, University of Melbourne

What does a post-peak carbon economy look like?
Jeff Hardy, UKERC

Transformation in an uncertain policy landscape
Tim Pyke, E.ON UK

What does a post-peak carbon economy look like? Jeff Hardy, UKERC

Dr Jeff Hardy, Knowledge Exchange Manager, UK Energy Research Centre gave a provocative talk to stimulate the discussion for the day and to outline potential future scenarios a summary of his talk is below together with comments from the audience.

- It is technically feasible to achieve a 50% lower carbon world, although a range of technologies and efficiencies are required to achieve that.
- Of course the cost, scale of effort, and social-environmental feasibility are other factors that need to be taken into account.
- Due to the importance of energy services in the economy and society, a policy to decarbonise electricity to 90% lower carbon by 2030 enables other energy services to low carbon electricity. E.g. heat and to some extent, transport.

5 potential future models of scenarios of energy were shown:

1. "Broadband model". Limiting the amount of energy that can be consumed at one time
2. "Mobile phone tariff model". Functioning as a pay as you go usage.
3. "Google Energy". Electricity would be too cheap to meter, therefore companies would need to provide another service to make money.
4. "Local energy" for local people and local trading in energy units
5. "Mad max". Local energy but valued so highly instead of trading, people fight over it.

Comments

- Interesting how much there is behavioural element in the options, which is a different emphasis from what is normally seen.
- As a consumer, no one wants electricity per se, as they actually want the service it provides, not electricity itself. It is important to look at the end point and thinking outside the box. It is the energy services people want.

- The models are essentially focused on the end user. The first too they are essentially tariffs, which are really difficult to think of for 40 years and generally do not get it right. However, it is good to think from a consumer perspective.
- What are we rationing? The end user will have the option of what they want to use they should still attempt to ration their energy use because even though it is low carbon energy, its going to be expensive to build. There must be, simultaneously, an attempt to limit end use.

Working Session 1A: Factors that hinder transformative climate action

Workshop Process:

Participants were asked to write down three barriers on a hexxie post-it note, and then stick up on a poster board at the back of the room. Participants were actively involves in coordinating hexxie clusters to form groups of similar topics for discussion.

Participants originally came up with seven clusters. Participants were then asked to nominate what they thought was the most important to discuss, to narrow down topics to five, for the follow sessions:

1. *Technology*
2. *Cost / Economics*
3. *Lock in to Fossil Fuels*
4. *Behaviour change.*
5. *Politics*

The other topics not discussed were Policy and Timeframes.

Participants then discussed these topics in self-selected groups in the following two sessions.

1. *Factors that hinder transformative climate action*
2. *Factors that facilitate transformative climate action*

Participants then reported back their discussions in plenary with a summary provided below:

Technology – high cost of alternative technologies

- This is a global problem, consumers and policy makers are key actors
- It is generally seen as always 20 years away, with limited rates of return
- It is not clear who will invest and why, the state funds direct development however there are increased levels of caution at present due to the current economic climate (i.e. people want pensions not risk)
- The combustion engine was a major mover because it was something we did not have before; in addition to being relatively inexpensive, it provided multiple new opportunities and solutions. We still want to have the same end product [energy] but to have it produced in a different [low carbon] way.

Costs

- It costs more to do effectively the same thing with low carbon. If it did not cost more, then we might probably end up doing it anyway as fossil fuels are a finite resource. A green future will cost more than a brown.
- The Stern review stated that at least in the longer term green future will be a lot better for the environment and economy.
- Although long-term vision for investment is difficult at the moment, this is not the most far-sighted time frame the financial community has ever known.

Politics

- Politics is power – really we are discussing the *political economy* of climate change: who makes that win and makes that loss.
- The ability to transform is in the organisations at the corporate and international level. But the inherent issue is that they cannot get beyond the issue of short term gains

- There are some very powerful players in this field, and referring back to the mentioned 'Mad Max' scenario, military power may control future resources.
- Expenditure on lobbying in expensive, and difficult to create a direct policy nexus when there is little reward for long termism.

Fossil fuels

- Fossil fuels creates "lock in": the inherent functionality and infrastructure of our modern society has been developed around fossil fuels.
- Fossil fuels are cheaper and well understood making them 'go to' options
- Lock in is strong because fossil fuels are dominant incumbent in market and society; economics favours a continuation with fossil fuel aspiration; and gas, oil and coal do what they do very well. They are storable and if they did not produce GHG it would be the best energy source.

Behavioural change

- Apathy is a key barrier – company, consumer or investor apathy leads to inaction or lack of positive action.
- From the consumer perspective there are several important pillars which need to be removed. Denial is fuelled by bad science and the lack of awareness of real fundamental issues. This creates senses of doubt in the science and a perceived inability 'to make a difference'.
- Pace of change – human nature does not interpret climate change events as a threat due to their long term nature.
- Collective apathy – If people believe no one else will act, then a sense of collective apathy develops hindering pro-active action.

Working Session 1B: Factors that facilitate transformative climate action

Participants were asked to discuss the same issues reflecting on the following questions:

- *Explain and emphasise why are these really barriers, and are these because people are wanting to pass the issue onto someone else?*
- *The linkages between the barriers that the group has identified*
- *Turning barriers into opportunities? Keep in mind what enables a barrier to become an opportunity*

Participants then reported back their discussions in plenary with a summary provided below:

Technology

- The underlying driver is the services that people demand and rely on, not how that energy is produced.
- If there were an alternative to the steam turbine that was cleaner and cheaper it would already have been developed.
- Was it the development of the fuels that led to the development of technology, or the other way around? How can this be used in the low carbon context?
- The last energy transition in 1880s had prime driver for services that people want.
- Its not clear if we will see transformative change, we may have to settle for incremental change. Perhaps over two generations.
- We need to build the markets to host the new technologies
- Intellectual Property is essential and there are different ways of running IP for new tech – how distributed and how used to create new tech
- Early adopters good but often problems which sets the technology back even further than incremental changes

Cost and economics

- Have to consider what are you getting for your money and what is the opportunity cost?
- Public apathy means it is more difficult to change behaviour.
- Energy companies bring bad news of cost increases
- Continual discussion of the science reinforces belief climate change science is not final, which affects long-term costs and investment profiles. The challenge here is to get them to agree there is a problem, a definitive message is needed.
- The influence of The Stern Review was prominent, and perhaps an updated Stern report is needed.
- New technology is prohibited by economics. CCS is perhaps one of the most important technologies, given the amount of fossil fuel based assets. However concerns on public perception as after 4 years there is still no commercial scale trial in the UK.
- Energy companies continue to receive subsidies from the state; until subsidies are taken away there will be little incentive to invest in a low carbon economy.
- However, subsidies are also seen as economic development to prove long-term viability of future energy supply (i.e. exploration is expensive). This shows that long-term economic support for future energy is possible.
- Oil companies continue to spend exceedingly large sums of money to explore and develop their resource. These companies are held by large institutional investors that pension plans invest in. There is a huge economic dependency on these companies, and they are only going to significantly invest in renewables when they can generate a significant, and steady, return on investment.

Politics

- Inertia comes from the companies themselves being very large and having their own politics of survival, making sure there is a market and place for them. Politics also equals power, enabling organisations to stay and maintain inertia.
- Shareholders may be the bottom line in an organisation because companies will follow profits in order to compete. E.g. BP/Shell pulling out of renewables in 2008. These organisations are cash rich and therefore have the choice to follow whichever path they chose, but ultimately are responsible to their shareholders, resulting in a refocus on fossil fuels.
- Leadership is not always rewarded because strong leaders have to change their policies in order to stay in power and keep often polarised shareholders (and stakeholders) members happy.
- Inertia, therefore, exists as a self-reinforcing component.
- The use of power to control energy resources, from coal to clean coal, why not clean to low coal?
- Solutions may exist in looking at the very different politics of climate change in different jurisdictions. For example, both the market and state exist in EU and USA but the dynamics are very different between them,
- Politicians in EU feel more important to engage against companies and might get sufficient support, in US that might not be the case as this is down to the historical and cultural relationship.
- The key difference between the UK and USA is UK politicians will work towards a compromise.
- A sense of sacrifice is lacking in the USA. In the UK, having a green image to your organisation is important, whereas for companies in the USA, its common practice to break the law and pay the fine and is even a government strategy to do that sometimes if its more cost effective.

Lock in of fossil fuels.

- The current Infrastructure generation is geared towards using fossil fuels. Therefore there are a lot of assets that will be continued to be used.
- Furthermore, innovation within the fossil fuel industry has lead to gas fracking – prolonging the lifespans of those industries, making it harder for alternatives to break through
- Status Quo – when deciding on a new powerstation in the Caribbean, Barbados elected to go for the traditional fossil fuel power station, despite the cost of shipping in the resource and increasing prices. Sticking with tradition means if fuel prices rise, the economy will be to blame, not the individual who chose fossil fuel over renewables. Making the same decision as in the past is the safe option for that decision maker, therefore beyond economics, *risk* in decision making can be the key driver.
- Investment cycles. when a consumers boiler breaks down they want them to be replaced as soon as possible and are not likely to plan ahead for ground source heat pumps.
- There are, therefore, 'fleeting windows of opportunity' to change because we wait until we really need to make the decision quickly. These windows, however, can be used to leverage larger changes that lock-in new clean infrastructure and therefore ways of thinking into the future.
- There is also a need for trusted intermediaries to get over the barriers within these windows, and the need to access the minds of customers as specific points
- For mobility, electrification is key. This needs big changes in: infrastructure and public acceptability. CCS can help get around this as medium term measure.

Behaviour change

- Consumer choice is sovereign. It is difficult for elected governments to do anything about. E.g. Surely its a right to fly and see one's family? We waste over a third of all food, and this is all due to purchasing behaviour, lack of awareness, household planning, lack of education and food skills. However, there are now advertising campaigns, and education, and sometimes waste food is now put into collection schemes illustrating that behaviour change can be made.
- Apathy – lack of awareness, doubt pace of change, dilemma.
- Apathy and action box – challenge is the middle – how to get to positive action, incentives – they can come from government e.g. Feed n Tariffs (FITs) bypass apathy by giving consumers an incentives. FIT is ineffective and fuelled apathy Government fuels the apathy of consumer.
- Democracy is seen as a constraint rather than an opportunity. Broad-based consumer awareness and action can create the opportunity for long-term leadership.
- Leadership in policy making with consistence (to avoid fuelling doubt). E.g. the EU ETS ruling on aviation is at least attempting something – it may not be 100% verifiable but its a system that is at least in place and an attempt at a solution to push change.

DAY 2: Radical transformation versus incremental transformation.

- Emissions need to peak between 2015 and 2021 in order to not go over a 2°C rise in global temperature, which is almost impossible as global emissions are currently following the A1F1, worst case scenario from the IPCC 2007.
- This issue is characterised by the timeframe which divides incremental versus radical transitions:
    - Peaking occurs soon, there is more scope for incremental changes
    - Peaking late: more extreme options with possible environmental or social consequences that are unwanted, however: sharp gradients require extreme action.
- Achieving a radical war-time transformation effort is almost unachievable.
- Some are of these ideas are financially within scope of some individual countries. It might be possible for one country to play a significant part even when there is not a global agreement e.g. geoengineering and the use of sulphur particulates, for example
- It is not just about retrofitting, what about possibility of developing countries to leap frog with new technologies.

Compression of timescales

- How is it possible to achieve things much faster than we have in the past?
- A few participants mentioned that, in fact, following the radical approach might be the most appropriate.
- Business adaptation not mitigation? One participant explained from a business perspective, if they were advising a company on what course of action to take, it would be not to mitigate against climate change but how to transform and adapt to a post 2°C world.
- Technology optimist view: in the worst case scenario, this threat would be treated like a war effort and everyone would unite to achieve a swift and radical change.

- Price lead point of view: Markets and technology will respond when prices go up. However, consumers and the market do not respond until prices have risen dramatically, which by that time it may be too late
- Long term targets are not that meaningful to businesses because of the timeframe and translating 2°C down to the *national* level of climate policy is difficult enough, let alone to the *corporate* level.

Working Session 2 –How do we create a culture of innovation between business, government and civil society?

Participant Process:
Participants had the choice of joining any of the following 4 groups, however the EU – regional group was dropped due to small take-up (this was incorporated into the G20). Participants were then asked to discuss radical and incremental strategies for creating a culture of innovation between business, government and civil society for a low carbon world.
The following groups were available:

High emitting organisations (Business)
G20, Global
EU – Regional (incorporated into G20)
UK – National

Participants were asked to discuss:
1) *Incremental strategies to achieve the middle ground.*
2) *Radical strategies to achieve the best future target*

Below are the summaries of the table discussions and some of the issues that arose.

High emitting organisations (Business)

Incremental

- Do Business as Usual more efficiently
- Complying with regulation limits a company because they do not want to be ahead of the curve if it would impact the business model.
- The issue is, with incremental improvements, the fundamental business model will actually be the same. Energy is a primary input therefore limited scope to drive radical reductions without altering business models

Radical

- Primary producers will be driven by what drivers exist in society. E.g. mobility: 74% of oil global production is for transportation.
- The group did not assume a price for carbon as it is politically acceptable but too low to make a difference current investment models.
- But broader valuation of ecosystem would allow companies to treat processes differently. This should move ecosystem management up to the eco-community level.
- Regulation roles are clear and all organisations operate under those limits: having a more *cooperative and aligned* incentive to achieve carbon reductions under regulation would help achieve a low carbon transformation.
- This would require Green Champions, but global geopolitics means this can't happen
- Anything that affects costs could jeopardise exploration operations thus companies have to analyse if they can be competitive in the market with low carbon technologies such as CCS.
- Given the nature of the industry and existing assets, there risk is high down the radical pathway for first movers.
- However, incremental is the reluctant company; radical is the leader.

UK - National

Incremental

- The 80% emissions reduction target by 2050 means the UK will likely be adding additional costs on our economy which other countries are not. To safeguard the international economic competitiveness of this transition, other countries need to follow suit.
- The benefits of earlier movers need to be sold e.g. the green economy, more jobs, establishing foothold in the market.

Radical

- Demand side is key. However, legislating for change on the demand side is quite complex to keep equity in view e.g. lower incomes and making costs fair. When promoting electrification of transport should the government favour one solution?
- Need electrification of transport

- Development of infrastructure to create behaviour change to enable flexible charging on the system, but this is a gigantic task.
- If manage demand side well, then won't need so much structural change
- Need to rate houses
- Localism – build local social enterprises (i.e. like architectural behaviour change)
- Organisations and investors are concerned and have lost confidence in the government who reduced the solar Feed In Tariff by 50% 5 months earlier than was planned.
- How is it possible to achieve a low carbon economy without nuclear? There is no major alternative to nuclear at present. Therefore, if nuclear is a bridge (or on the 'glide path'), how does that bridge not become a blocking point to the development of renewables?

G20 – Global

Incremental

- Continuation of current commitments with ensuring a global green deal.
- National Appropriate Mitigation Actions with a reasonable cost on carbon are all achieved.
- Establish international funding mechanisms for CCS, pilots, funding mechanisms like Tobin tax.

Radical

- Admit CCS deployment will take time so establish best available technology as a mandatory requirement to give space and time to develop CCS on aggressive strategy,
- Then, a moratorium on fossil fuels by 2050.
- Moratorium on deforestation (with compensation measures).
- Radical efficiency best available technology mandatory across economies
- Creating a redefinition of prosperity.
- Establish a coalition of the willing and a binding G20 treaty, regardless of any successful or unsuccessful UN process.
- Shift from income tax to consumption tax and perhaps dropping corporate tax. The level of consumption tax would be dependent on how that income is spent if investing into development or environmental friendly projects the tax would be less than those who chose to pursue polluting activities such as owning a large inefficient car.

Panel Session: Transformation in an Uncertain Policy Landscape

Tim Pyke, E-ON;

- EU carbon market will not act as a driver to decarbonise power grids because it cannot work without global political will.
- Government has had to step in with Energy Market Reform (EMR) and establish long term contracts

Garry Staunton, Independent;

- Technology push to market pull is never guaranteed, however in order to generate market pull, people themselves need to go through a transition from indifference, to curiosity, to desire.

Blas Perez-Henriquez, University of California, Berkeley – Center for Environmental Public Policy

- A credible commitment by government to climate policy drivers (e.g., price on carbon) is necessary to provide regulatory certainty, signalling permanence therefore allowing for long view business planning.
- Over $80billion is the current defence budget for R&D in the United States, compared to just $5billion for energy innovation. Public investment, and enhanced collaboration with the private sector, for energy transformation is required. Development of the internet is a good example of a "game changer" technology.

Harrie Vredenburg University of Calgary

- Earth success or failure is dependent on our actions.
- Liberalisation meant everyone has been counting on the market on the solution. When actually, this is a place for government to take a stronger role, but there is very little political will to do this.

Final Participant comments:

- A question about raising awareness of new technologies, are there sufficient good case studies out there to change the wider market or is there only enough to focus on a niche market?
- State intervention, reduced uncertainty and long-termism are all needed to provide a stable investment ground.
- EMR in UK was a large state intervention, to what extent are countries banking on that, and do they think it will be stable in 5 years time?
- A transformation from a competitive market from fossil fuel providers, into a world of high fixed costs and low fluctuation. The debate would take a long time between stakeholders and the risk to investors would be substantial. Long term contractual arrangement gives the investor more comfort in the existing market arrangement.
- International trading commodities can cause conflicts. As Canada had to reflect the USA's actions on the Kyoto Protocol, because otherwise jobs and technological investment would have gone to the USA.
- Where is the real incentive for organisations to go beyond the minimum target?
- Picking winners: there is a need to find regulatory means to encourage innovation to let them come to the forth then go forward. The process needs to encourage entrepreneurship and potential ideas promoted, but not necessarily 'picking winners'
- Want durable commitments from government, but at same time a regulatory system is needed that is flexible and can change to adapting conditions whilst providing some long term stability, or awareness of how the market will evolve.
- The introduction of sulphur trading in the United States (i.e. The Acid Rain Program) led to creation of the first market for air pollution. Sulphur trading was implemented in the context of the electric generation industry which is tightly regulated by the US Environmental Protection Agency. However, the emissions trading system for sulphur dioxide allowed for flexibility in compliance, so individuals could respond how they wanted based on their capacity to reduce emissions, while minimizing costs through the market mechanism. The US is a pioneer in developing and developing cap-and-trade systems. However, there is no political will at the moment to implement a greenhouse gas emissions trading system at the Federal level. California will start its own GHG cap-and-trade system in 2013.

Improving energy provision:

- The performance standard of current technology is far in excess of what is needed, e.g. the large take up of laptops from desktop PCs, means there is storage in place on the system, albeit at the user end.
- When power is interrupted and 2% of homes need to be disconnected from that source, it would be better have the average house reduce power consumption by 5%, by turning off non-essential goods such as laptops, thus saving the 2% who would have their supply cut off entirely? This would only be possible if there were communications coming out of the grid. Smart grids and smart appliances/houses are important for dynamic interventions and affect the level of infrastructural change needed.
- The public would develop coping strategies if power cuts became regular. e.g. Japan has recently incurred a 20% decrease in consumption level. It's a painful but possible way of achieving a low carbon world.
- Better energy management can actually deliver energy reduction to around 20%, but to go beyond 20% is challenging.
- A scenario with up to 40% renewables and 15% nuclear combined with a smart grid and appliances, can handle windless day issues. This is achievable, but it needs to be accepted it will cost more than a conventional fossil fuel world.
- Even some of the largest and powerful companies in the world will find it difficult to provide the upfront capital costs; governments will have to be involved.

Carbon reporting:

- A criterion for a low carbon world would be to have a common language to investors for decision-making. There is no compulsory standard for reporting thus reports between organisations can be confusing. There needs to be political will to institutionalise this reporting.

Incremental vs. radical:

- There were plenty of ideas for the incremental pathways with less for the radical.
- When radical pathways were discussed, governments and behavioural change played a greater role.
- Energy is a public good and the investment in our energy system whether private or public needs to provide that public good
- Business could do it if regulator and inventive structures were in place

Appendix A Programme

Energy and Climate Change 2012-2050: Business Transformation in Uncertain Policy Landscapes

28-29 September 2011, St. Hugh's College, Oxford

The central objective of the workshop is to understand the conditions under which low carbon economy futures can be achieved through effective and scalable business transformation. The first day of the workshop will tackle the question: What are the factors that enable or disable low carbon transformation? What are clear examples of cases where these factors have catalyzed or constrained change? On the second day we hope to explore how best to create a culture of innovation among relevant stakeholders and what a 'post-carbon peak' economy looks like.

PROGRAMME
DAY 1, 28 September

13:00 **Registration (***outside Mordan Hall)* **and lunch** *(Wordsworth room)*

14:00 **Welcome and Framing** *(Mordan Hall)*
Chukwumerije Okereke, University of Oxford
Adam Bumpus, University of Melbourne

14:10 **Table Introductions** *(Mordan Hall)*
Personal introductions and shared expectations of this workshop

14:30 **Provocative Talk: What does a post-peak carbon economy look like?**
Speaker, *Jeff Hardy, UKERC*

14:45 **Working Session 1A: Factors that hinder transformative climate action**

15:15 Refreshment are available in the Hamlin Gallery until 15:45

15:30 **Working Session 1B: Factors that facilitate transformative climate action**

16:25 **Plenary Presentations**
Plenary questions, comments and reflections
Chair, *Mick Blowfield, University of Oxford*

17:25 **Drinks Reception and Networking** *(Hamlin Gallery)*

18:30 **Adjourn/Presentation Preparations**

19:30 Dinner (Wordsworth Room, Ground Floor of Main Building at St. Hugh's)

DAY 2, 29 September

9:00 **Refreshments on arrival** *(Hamlin Gallery)*

9:15 **Context Setting and Framing** *(Mordan Hall)*
How do we create a culture of radical transformation?
Speaker: *Adam Bumpus, University of Melbourne*

9:45 **Working Session 2A** – *Strategic Response Scenario1: Incremental*

10:15 Refreshment are available in the Hamlin Gallery until 10:45

10:15 **Working Session-2B -** *Strategic Response Scenario2: Radical*

11:30 **Plenary – Feedback from tables: What have we learned?**
Plenary questions, comments and reflections
Chair, *Chukwumerije Okereke, University of Oxford*

12:30 Lunch (Wordsworth Room)

13:15 **Panel Session: Organisational Perspectives and Reflections on Working Group Strategies**
Panel Chair: *Jeff Hardy*
Panellists: *Tim Pyke, E-ON;*
Garry Staunton, Independent ;
Blas Perez-Henriquez, University of California, Berkeley – Center for Environmental
Public Policy

14:45 *Refreshment Break (Hamlin Gallery)*

15:00 **Closing Plenary Session**
Questions, comments and reflections: where do we go from here?
Chair, *Peter Pearson, University of Cardiff*

15:50 Concluding Remarks
Chukwumerije Okereke, University of Oxford

16:00 Adjourn

Appendix B Attendee List

First Name	Last Name	Organisation
Alicia	Ayars	SustainAbility
Bobby	Banerjee	University of Western Sydney
Mick	Blowfield	Smith School for Enterprise and the Environment, University of Oxford
Adam	Bumpus	University of Melbourne
Zoe	Crookes	Greeenstar Trust LLP
Angela	Druckman	University of Surrey
Margaret	Gearty	Ashridge Centre for Action Research
Dan	Green	Wessex Water
Richard	Green	Imperial College Business School, London
Jeff	Hardy	UKERC
Zaid	Hassan	REOS Partners
Aaron	Holdway	Oxford University
Maia	Kutner	Carbon Disclosure Project
Paolo	Marcazzan	UK Foreign and Commonwealth Office, Vancouver
Neil	Morgan	Technology Strategy Board
Chris	Nicholls	DECC
Chuks	Okereke	Smith School for Enterprise and the Environment, University of Oxford
Peter	Pearson	Cardiff University
Blas	Perez-Henriquez	Goldman School of Public Policy, University of California, Berkeley
Tim	Pyke	E.ON UK plc
Charles	Roberts	Greeenstar Trust LLP
Wishart	Robson	Nexen Inc
Mohammed	Saddiq	GENeco
Jonathan	Silver	Greeenstar Trust LLP
Garry	Staunton	Staunton Associates
James	Tansey	ISIS, Sauder School of Business, Vancouver
Harrie	Vredenburg	University of Calgary

Appendix C Steering Committee

Adam Bumpus, University of Melbourne
Gill Coleman, Ashridge
Jeff Hardy, UKERC
Zaid Hassan, REOS Partners
Chuks Okereke, University of Oxford
Jennifer Otoadese, UKERC Meeting Place
Timothy Cooper, UKERC Meeting Place
Geoff Lye, SustainAbility
Peter Pearson, University of Cardiff
Murray Birt, CBA
Mick Blowfield, University of Oxford