THE RESEARCH PROGRAMME

RATIONALE

According to the International Energy Agency, existing buildings account for approximately 40% of the world's total primary energy consumption and 24% of the world's CO_2 emissions. There is a great opportunity to make significant reductions in demand, thereby reducing the need for supply and end-use energy costs. The introduction of effective energy efficiency measures in the built environment is therefore essential if governments and business are to address successfully both energy security and ambitious carbon reduction targets.

Similarly, rising energy costs encourage households and businesses to reduce energy consumption. There is a growing body of evidence that 'greener', more energy efficient buildings are valued more highly in the property market than conventional buildings, which increases the commercial incentive to invest in properties with improved sustainability performance. Investments in energy efficiency may also be an important contributor to economic recovery.

In 2011 the Energy Efficiency in the Built Environment (EEBE) research programme with Grosvenor and Cambridge University is delivering three main research outputs that have practical relevance and which will help property owners and developers establish optimal strategies for energy management. The research will be presented in three streams:

1. generating and using scenarios for the future of energy management in the built environment;
2. investigating the interventions needed to overcome barriers to energy efficiency; and
3. contributing to the understanding of the current policy landscape and trends.

For additional information about the research programme or the research streams, please use the contact details provided on the back of this publication.

RESEARCH STREAM 1: FUTURE SCENARIOS FOR ENERGY MANAGEMENT

In March 2009 EEBE concluded that, when considering the future of energy management in the property sector, it was critical to gain an understanding of the longer-term consequences of current decision making. It was recognised that a common assumption so far had been that the energy performance of the property sector would (or should) improve incrementally as a result of increasing regulatory and other pressures. However, in the longer-term the world in general, and energy management in particular, could be very different to anything that might result from such incremental changes. It was noted that there is a preoccupation with 'picking solid winners', rather than identifying flexible and adaptive responses to our changing and uncertain energy-related challenges. However, in the long lifecycles of property investments, any responses to energy management need to be 'future proofed'. Responses based on short-term signals or trends could result in commitment to and over-investment in technologies that may become redundant or inappropriate in the longer-term. Hence, EEBE embarked on a process of scenario planning to better understand future energy implications for the property sector.

Grosvenor and Cambridge agreed that the research programme should investigate the most appropriate responses to energy management in buildings and property developments from now until 2050. This aligns with the UK's commitment to make an 80% reduction in greenhouse gas emissions against a 1990 baseline by 2050, and related initiatives.

In this publication we touch on the theoretical foundations of scenario planning and the process that the research team undertook, identify some of the key outcomes of the work along with the boundaries and constraints to the assertions and, finally, suggest how the scenarios can be used to direct corporate strategy and practice and can guide legislation.

THE RESEARCH PARTNERSHIP

ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT (EEBE)

Grosvenor and Cambridge University have joined together to undertake research into 'Energy Efficiency in the Built Environment' (EEBE). EEBE's focus is the reduction of primary energy use and carbon emissions in the built environment. EEBE's specific interests are assessing policies to promote energy efficiency in the built environment and developing strategies for the future of energy management. Current and planned research activities target existing and new buildings and developments as well as residential and commercial properties, with case studies from the UK and around the world.

EEBE's four aims are to:

- Explore possible future scenarios for energy efficiency in the built environment towards 2050.
- Examine the interventions needed to overcome the barriers to energy efficiency.
- Contribute to the understanding of the current policy landscape, regulations and performance of energy efficiency in the built environment.
- Promote knowledge exchange between thought-leaders in research, government and business on the theme of energy efficiency in buildings.

This Grosvenor - Cambridge initiative was established in 2008 and is based at the Cambridge Centre for Sustainable Development. Today it represents a wider consortium of companies and organisations from both the private and public sectors. Resources are made available from members of the consortium which include: Buro Happold; Department for Communities and Local Government; Department of Energy and Climate Change; Department for Environment, Food and Rural Affairs; EPSRC; Grosvenor; Jones Lang LaSalle; LessEn; SIG; and the Urban Land Institute. Other contributors have included: AEA Technology, Arthur D Little, Arup, Cambridge City Council, Cambridgeshire County Council, London Development Agency, and Westminster City Council.

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GROSVENOR

Grosvenor is a privately owned property group active in some of the world's most dynamic cities. We recognise that our future success as a business is tied to the sustainable growth of the cities in which we have a presence. We have a vested interest in the future shape of the urban landscape and aim to help create attractive and vibrant cities in which people want to live and work.

Grosvenor is committed to achieving environmental sustainability. We aim to reduce our environmental impact by creating and managing well-designed, environmentally-sustainable buildings and places.

In 2011 we produced our first Environment Review. This is available to download at: www.grosvenor.com

Future energy challenges will inevitably impact the property sector as a whole and the industry needs to be proactive in addressing this. Through our partnership with Cambridge University we are seeking to explore potential impacts and responses and share these with the wider property sector, to help move our industry towards a more sustainable future.

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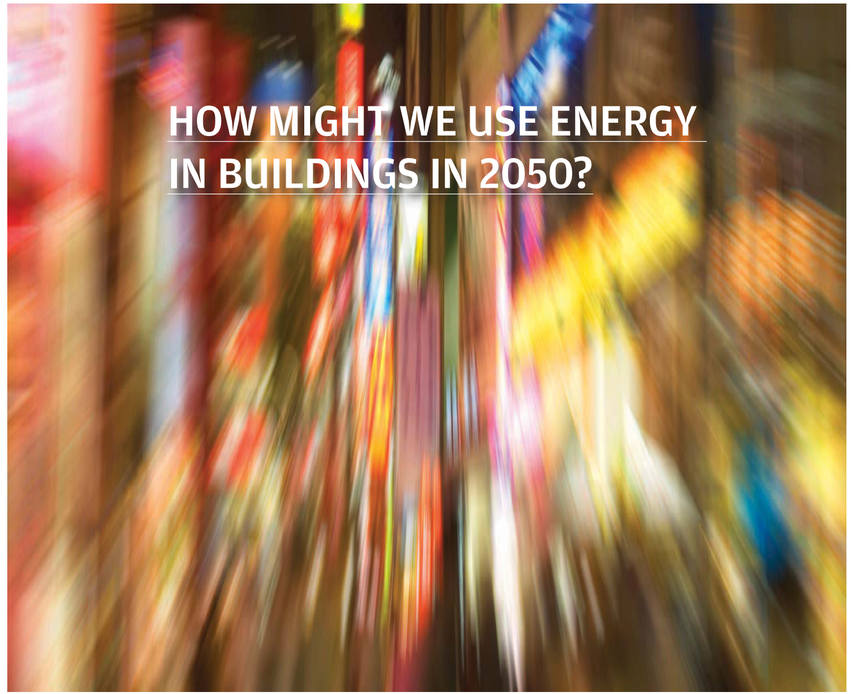
GROSVENOR

RESEARCH INTO THE FUTURE OF

ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT



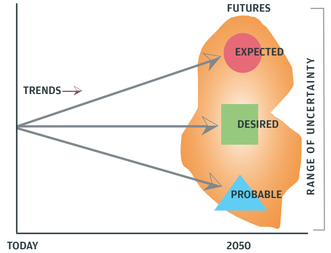
UNIVERSITY OF CAMBRIDGE Department of Engineering | Centre for Sustainable Development

EEBE Energy Efficiency in the Built Environment

GROSVENOR

STREAM 1: FUTURE ENERGY SCENARIOS

FOUNDATIONS, PROCESS, AND CONSTRAINTS



Event	Purpose
Workshop 1 Cambridge, 2009	Identify the critical axis for scenario development and develop names and sketch/outlines for the scenarios based on the preliminary research.
Workshop 2 London, 2009	Further develop the scenario 'end states' and refine the narrative outlines by considering 11 clusters of driving forces and their possible extreme outcomes.
Workshop 3 London, 2010	Use the developed scenarios to consider the associated impacts and implications for the property industry. This was done by using adapted 'wind tunnelling' and 'gaming' approaches with specific questions related to energy and the property industry.

Theoretical Foundations

Scenarios can be defined as the disciplined process of thinking through alternative, plausible futures that are fundamentally diverse yet internally consistent. They reflect different perspectives of the past, present and future, and elaborate different strategic agendas for each one. As a concept, scenarios can refer to both a description of possible future states (end states) and a description of the developments that have led to them (scenario paths, or storylines). As one of the disciplines within futures studies, scenarios are exploratory and learning tools, not to be confused with forecasts or predictions.

The strengths of this technique and its advantages are due to its ability to deal with some key issues underlying the failings of traditional methods for forecasting and planning:

- **Complexity** – The exploring and learning achieved through the scenario process enables decision-makers to gain a better understanding of the increasingly complex environments in which they operate
- **Uncertainty** – Rather than ignoring or quantifying uncertainty by (arbitrarily) assigning probabilities, scenarios fully accept uncertainty, striving to understand and include it in the thinking and planning process through the development and exploration of multiple futures
- **Change and Discontinuity** – Unlike traditional extrapolation techniques, the scenario development process allows the consideration and exploration of alternative futures determined by different developments (in technology, society, politics etc) which can represent significant ruptures with the past.

Scenario Building Process

The EEBE scenario project used a process to develop alternative, possible futures to address "what if…?" questions – based on different evolutions of key trends and drivers. The information was then used to develop a basis for generating alternative strategies and identifying the policies and interventions needed to encourage and support certain outcomes while preventing others, answering the "then…" response.

This process started in May 2009, when Cambridge University carried out preliminary work to scope the central question, "What might the future of energy management in the built environment be in 2050?" and to lay the foundation for the rest of the process. A preliminary survey of 70 UK-based stakeholders identified nearly 200 driving forces that could cause considerable variation to energy management in buildings and/or property developments up to 2050. These were consolidated into 11 significant trends and drivers.

A series of three workshops was set up to develop and apply the scenarios. Each workshop was well attended by a group representing a wide range of UK based senior property and related industry professionals, government policy makers, academics and chief scientific advisors.

Research Constraints

This research drew from a group of UK-based stakeholders, and reflects their professional and experiential views. Different results would be expected were the same exercise to take place in a different country with different societal pressures, governmental and cultural influences.

The EEBE scenarios do not aim to predict the future or find the one best answer but rather provide a tool for helping to take a long view under great uncertainty. Futures work can help policy makers and corporate entities look at today's challenges from different perspectives and test various responses to minimise cost or maximise benefits in the medium and long term. It can help identify potential risks and opportunities, assisting policy makers and businesses in gaining a better understanding of possible future environments and in developing more robust long-term strategies. It allows stakeholders to consider that any scenario may happen and so be better prepared for what they don't believe will happen. It can also inspire stakeholders to play a more active role in shaping a better future - for themselves, for their company, and for their tenants.

KEY OUTCOMES

Survey results of driving forces that could cause considerable variation to energy management in property:

CATEGORY	KEY TRENDS AND DRIVERS
SOCIAL	1. Behaviour/attitudes/values 2. Demographic changes 3. Change in living/working patterns
TECHNOLOGICAL	4. Availability of (decarbonised) energy 5. Innovation : Demand reduction 6. Economic structure and performance
ECONOMIC	7. Investment/ funding for energy efficiency 8. Cost of energy
ENVIRONMENTAL	9. Extent of climate change and its consequences
POLITICAL/POLICY	10. Strength of policy response 11. Degree of global collaboration

Excerpts from the final EEBE scenarios created by the intersection of two critical axes of uncertainty: the attitudes of society towards sustainability, and energy availability:

Positive Attitudes/Values

Low Cost, High Availability of Energy

STEADY PROGRESS ("SP")

It's all about 'being seen to be green'. People have become complacent about energy efficiency and global warming and have convinced themselves that they are doing all they can.

Energy costs: Low

Attitudes/values: Changes driven by lifestyle choices, altruism and fear.

Type of government: Driven by individuals and groups, i.e. strong communities.

Global political stability: World is outward looking with free movement of capital and goods.

TRANSFORMATIONAL CHANGE ("TC")

Huge scale changes have been triggered by mass deaths in the developed world due to climate change. People have become community minded and public spirited, prepared to share and work together to achieve carbon reduction targets.

Energy costs: High

Attitudes/values: People are increasingly opting to behave responsibly.

Type of government: Strong government, but shift of power from national to local.

Global political stability: World is inward looking and faith has been lost in national governments.

COMFORT WITHOUT CONCERN ("CWC")

No one spares a thought for energy in this high excess society. With the discovery of significant new oil fields, the cost of energy has remained steady for years.

Energy costs: Low

Attitudes/values: Lack of accountability. Blind faith solutions will be found

Type of government: Complacent

Global political stability: World is relatively stable, but there are localised conflicts in areas impacted by climate change.

GROWING DIVIDE ("GD")

This is a bipolar society where the wealthy have found their solutions at the expense of the poor. Government has failed to tackle the growing divide which is leading to growing civil unrest.

Energy costs: High

Attitudes/values: Passive approach – immediate concerns outweigh pursuit of long-term solutions.

Type of government: Strong central government, but with limited success.

Global political stability: World is inward looking and politically unstable.

High Cost, Low Availability of Energy

Negative Attitudes/Values

IMPLICATIONS FOR INDUSTRY

	EXPECTED TREND OR THEME IN 2050	SCENARIO			
FUTURE ENERGY GENERATION & CONSUMPTION	General public driven by concerns about security (political, border, economic, resource) and risk.	SP	TC	CWC	GD
	National policy is expected to be more locally and market driven.	SP	TC	CWC	GD
	Volatility of energy demand is smoother, brought about by innovations in energy storage and significant investments in the national grid - introducing smart grids and super grid technology.	SP	TC		GD
	25%-50% of UK energy generation is renewable.	SP	TC	CWC	GD
	At least 50% of UK energy needs met by imports.	SP	TC	CWC	GD
	Energy consumption within buildings equal to or lower than rates today.	SP	TC		GD
	Indoor environments have more strict and localised controls.	SP	TC	CWC	GD
	Improvements to the quality of the building stock achieved through retrofit rather than new development.		TC	CWC	GD
	Responding to the effects of climate change. Flooding in particular is a significant threat to property.	SP	TC	CWC	GD
IMPLICATIONS FOR THE PROPERTY SECTOR CONSIDERING RESIDENTIAL, COMMERCIAL AND RETAIL PROPERTY AS WELL AS NEW MARKETS	Residential, commercial, and retail property are as successful when located 'in the heart' of the community, although the definition of 'community' changed for each scenario.	SP	TC		GD
	All property types without good access to transportation links are performing poorly.	SP	TC	CWC	
	For residential property to outperform, necessary to successfully integrate and adopt new technological advancements particularly in the areas of energy use, thermal comfort, and communication.	SP	TC	CWC	
	For commercial property to outperform necessary to integrate the latest office technologies particularly in communication as well as adopting to changing work patterns (in all but Comfort Without Concern as more flexible space or serviced/shared office space).	SP	TC	CWC	GD
	For retail property to outperform, necessary to stay on top of what drives the 'community' and adapt accordingly.	SP	TC	CWC	GD
	Significant opportunities in changes to retail methods and technology, in particular online retailing and distribution.	SP	TC		GD
	Isolated 'big box' shops were seen as doing badly in three out four scenarios.	SP	TC		GD
	New market development in agriculture and waste and energy infrastructure.	SP	TC	CWC	
	'Full service' developers with more in-house diverse skills (in particular in engineering and technological integration) winning across all scenarios.	SP	TC	CWC	GD
	Opportunity for developers to be 'whole community' builders with reliable feedback mechanisms.	SP	TC	CWC	GD

It was also noted that in order for many of the new markets identified to be enacted, current policy regulations would need to change.

Interpreting the Outcomes

The 11 identified trends and drivers shown in the table to the upper left indicate areas that could significantly impact energy management in buildings. These can be incorporated into business and government strategy to ensure awareness and responsiveness to emerging issues.

The four future scenarios, illustrated by the table to the left, provide extreme views of possible futures. The actual future is expected to occur somewhere within the matrix, however, as it is unknown, the scenarios allow preparation for 'unexpected outcomes'. Engaging with the scenarios allows stakeholders to consider possible answers to questions under four extreme conditions which can help them to develop robust and adaptive strategies that can provide direction while simultaneously preparing for unexpected change.

The above table shows an excerpt of the results from the third workshop showing only trends or themes that had a high coincidence. Trends or themes that occur in three or four scenarios can be seen as having a higher degree of significance whereas those that occur in one or two scenarios may carry a higher degree of risk. These high coincidence trends and themes can provide a starting point for considering likely future challenges and can be used to evaluate and shape long-term strategy.

Implications for Corporate Strategy and Next Steps

We hope that with the detailed scenarios and the information on themes and trends, the research participants as well as other interested stakeholders will be able to devise more appropriate strategic plans. Property developers and managers may wish to re-examine their long term strategies in respect to climate change adaptation, technological innovation and integration, and optimum property locations, as well as re-evaluate their internal structure for monitoring and measuring performance and incorporating goals or targets that reflect these insights. The scenarios can be used by corporate groups or teams to focus on specific corporate policy queries related to energy and the property industry.

Finally, stakeholders within the industry may use this research to come together and further detail what policy interventions would be required to move towards a more desired future and/or away from a less desired one. This was highlighted throughout the scenario process and discussed in the final plenary session: the property industry is fragmented and increased collaboration is required in order to overcome obstacles. To make these sorts of changes, government support through appropriate policy is required. This can be achieved by addressing the goals and targets for the current planning system with a strong and clear united voice.