Energy Management in UK Non-Domestic Buildings - A new perspective to provoke reduced carbon emissions

Kay Emblen-Perry
Senior Lecturer, Sustainable Management
Worcester Business School, University of Worcester

Les Duckers
Principal Lecturer
Coventry University

Symposium "Sustainable Development Research at Universities in the United Kingdom" Manchester, 5th & 6th April 2016

University of Worcester
www.worcester.ac.uk

Presentation contents

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3. The Energy, Ownership and Impacts Framework
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Research Context

- **Energy**: Long term market forces have driven continual improvements in the energy efficiency of technologies resulting in 2 features:
  - Vastly increased per capita consumption of energy and carbon emissions
  - Historically designed energy system and usage patterns that reflect pre-climate change viewpoints

- **Non-domestic buildings**: Evolution in property ownership over the last 150 years created a complex pattern of building ownership/occupation
  - The legacy of diverse tenancy styles is recognised to have generated non-cooperative energy relationships between owners and tenants, the Owner-User Stalemate
  - Non-domestic buildings contribute 18% of UK carbon emissions

Research Context: Non-domestic Buildings

- Longevity of current building stock and slow replacement rates contributes to energy inertia within UK non-domestic buildings
  - 70% of non-domestic buildings standing in 2050 will have been built before 2005 to lower energy efficiency standards (Kelly, 2010)

- Non-domestic building ownership as a driver of energy inefficiency and source of carbon emissions has received little attention within energy research and by policy planners
  - Provoking an expansion of energy efficiency within the stock of non-domestic buildings could provide a significant opportunity for carbon abatement in the UK

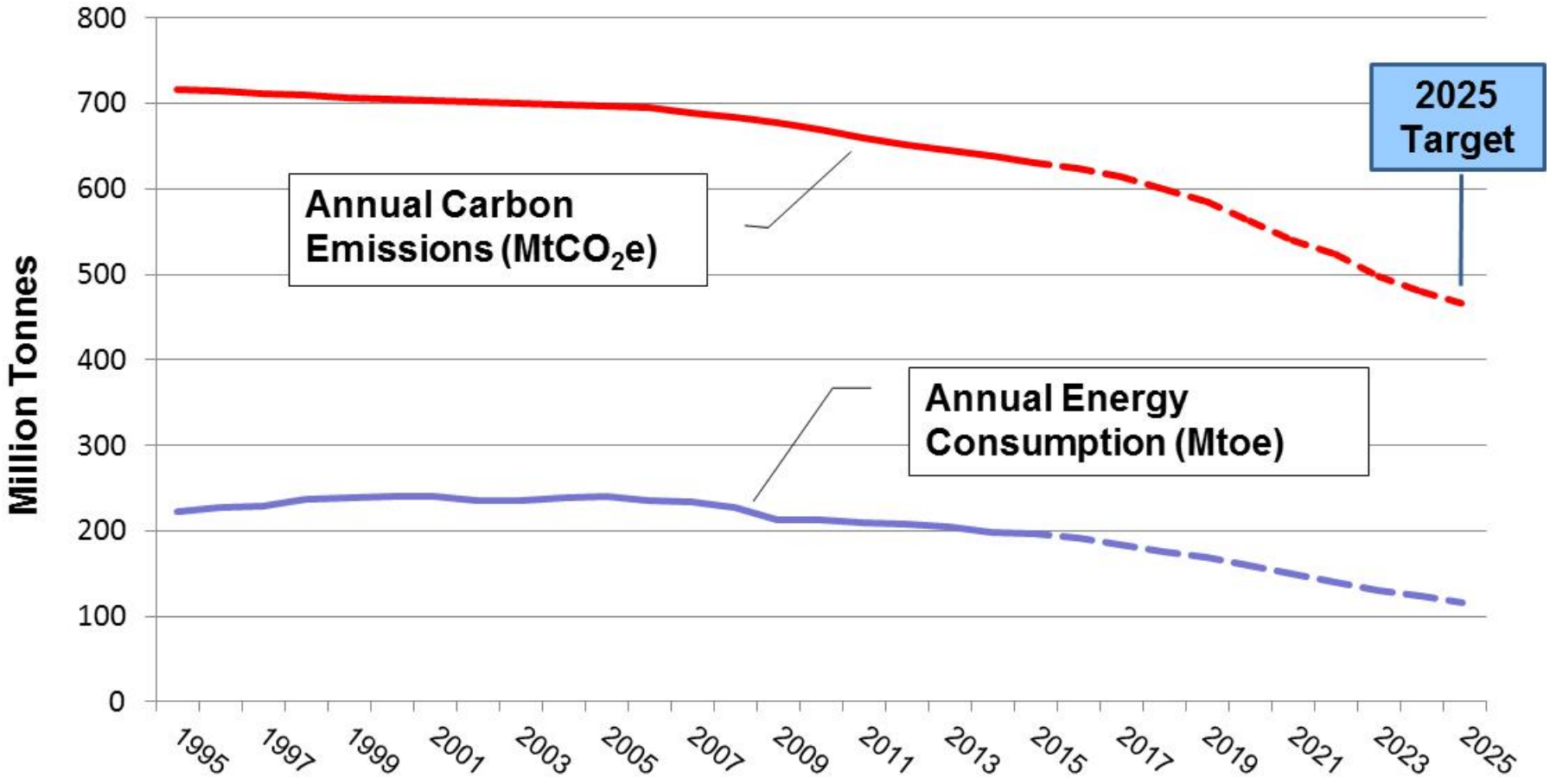
Research Context: Energy Policy

- Challenging UK carbon reduction targets have been set to drive mitigation of climate change

- Energy policy attempts to provoke rational economic responses:
  - Information campaigns – domestic and non-domestic consumers
  - Levies and commitment incentives for large, intensive energy users
  - Financial and motivational incentives for voluntary good practice

- Actions have achieved reductions less than required to deliver mitigation measures essential to avoid climate change disaster
  - Energy inertia continues

Consumption of Energy and Emissions of Carbon



Source: Department of Energy and Climate Change (2016)

Energy Consumption: The Challenge

- Energy writers and analysts largely agree that energy improvements have not been adopted as expected [1]
  - ‘Energy Inconsistency’ developed with gap between proven energy efficiency improvements and what has actually been implemented

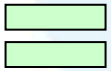
- Financial and non-financial incentives have not encouraged owners and users of non-domestic buildings to adopt tried and tested improvement opportunities that save money
  - Therefore an alternative driver of energy inertia must be in play
  - This research hypothesises that this is the impact of building ownership

[1] De Canio: 1993; de Groot et. al.: 1999; Janda: 2009; Warde: 2010; Committee on Climate Change: 2015

Research Hypothesis

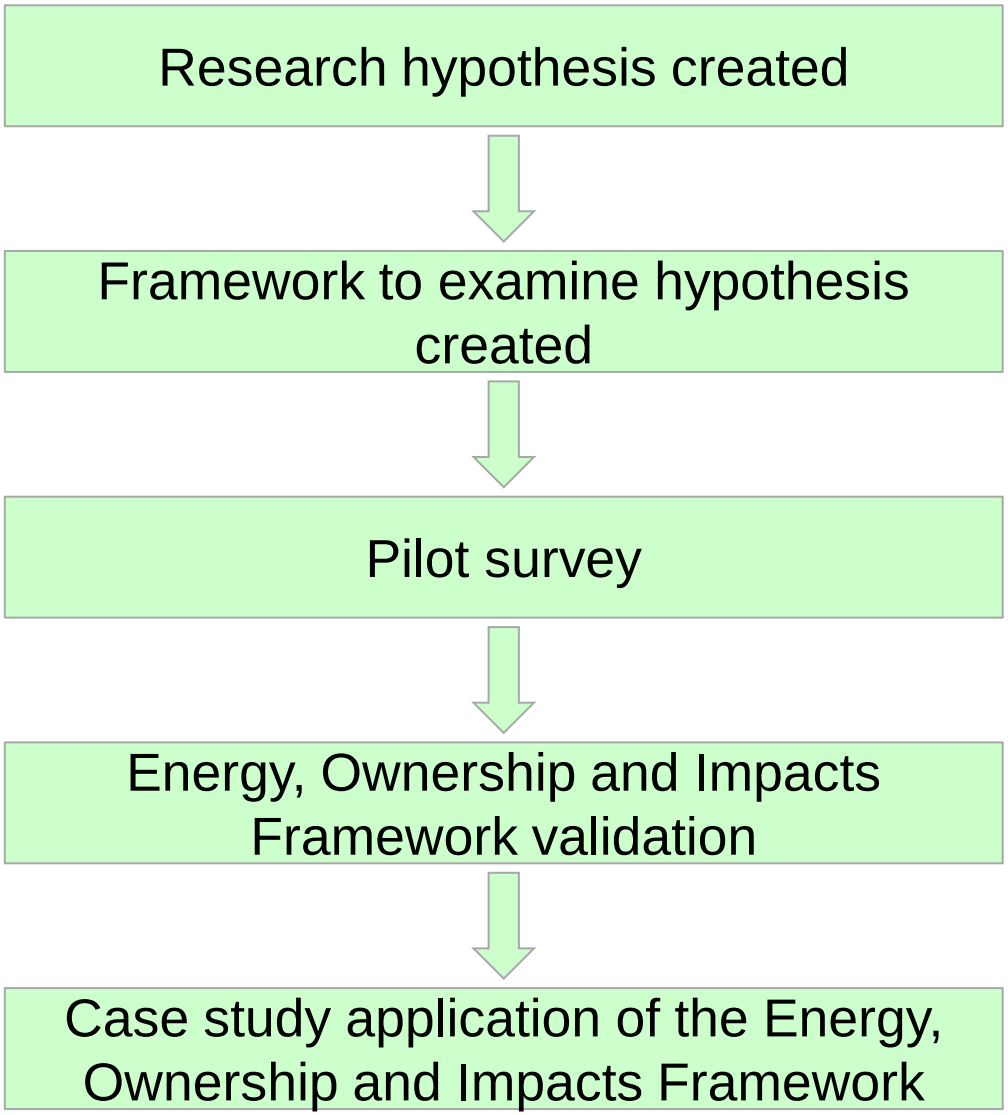
Authors' experience of organisational energy behaviours suggested building ownership may drive inertia

The impact of building ownership identified as a research/policy gap within literature



Research hypothesis:
Ownership of non-domestic buildings is the driver of the energy inertia

Research Methodology



Research Methodology

Research hypothesis created

Framework to examine hypothesis created

Pilot survey

Energy, Ownership and Impacts Framework validation

Case study application of the Energy, Ownership and Impacts Framework

- Segmentation of non-domestic building sector based on building ownership and purchase route of energy
  - 8 segments established
- Energy, Ownership and Impacts Framework

Research Methodology

Research hypothesis created

Framework to examine hypothesis created

Pilot survey

- Pilot survey of UK SMEs undertaken

Energy, Ownership and Impacts Framework validation

Case study application of the Energy, Ownership and Impacts Framework

Research Methodology

Research hypothesis created

Framework to examine hypothesis created

Pilot survey

Energy, Ownership and Impacts Framework validation

Case study application of the Energy, Ownership and Impacts Framework

- Initial survey identified shared energy attitudes, and common behaviours associated with them, within each ownership segment
- Segment position found to influence participation rates in energy efficiency and conservation interventions

Research Methodology

Research hypothesis created

Framework to examine hypothesis created

Pilot survey

Energy, Ownership and Impacts Framework validation

Case study application of the Energy, Ownership and Impacts Framework

- Impact of shared energy attitudes within each ownership segment examined in relation to a case study company

Energy, Ownership and Impacts Framework

	Categories of non-domestic building ownership (energy bill payee shown in brackets)							
	a Building owner and tenant (tenant from utility)	**b** Building owner as the user (owner from utility)	**c** Building owner and franchisee (1) (owner from utility)	**d** Building owner and branch (head office from utility)	**e** Building owner, manager and tenant (tenant from utility)	**f** Building owner as the energy provider and user (tenant from landlord)	**g** Building owner as a commercial investor (tenant from utility)	**h** Building owner and franchisee (2) (franchisee from utility)
Low cost of energy as a business overhead	✓	✓	✓	✓	✓	✓	✓	✓
Split incentive for energy investment	✓		✓	✓	✓	✓	✓	✓
Lease terms restrict action possible	✓		✓	✓	✓	✓	✓	✓
Energy user does not see energy bill			✓	✓				
Competition for corporate investment funds	✓	✓		✓				
Corporate behavioural barriers		✓		✓				
Corporate financial barriers		✓		✓				
Lack of energy saving advocate				✓				
Disincentive to reduce energy use – energy provided to tenant			✓	✓	✓	✓		
Disincentive to reduce energy use – energy as labour replacement	✓	✓	✓	✓	✓	✓	✓	
Owner remote from day to day activities of building			✓	✓	✓		✓	
Access to energy efficiency information	✓	✓						✓

Research Findings

- Segmentation of framework validated
- Investing in building energy efficient technologies and building materials generates different benefits for non-domestic building owners and users within different ownership segments
  - Drives differing attitudes towards investment in them
- Energy inertia exists as some tenancy styles discourage the adoption of energy efficiency and conservation opportunities
  - The researchers termed this position the ‘Owner-User Stalemate’
- Non-domestic building owners and users do not act as rational economic players where energy is concerned

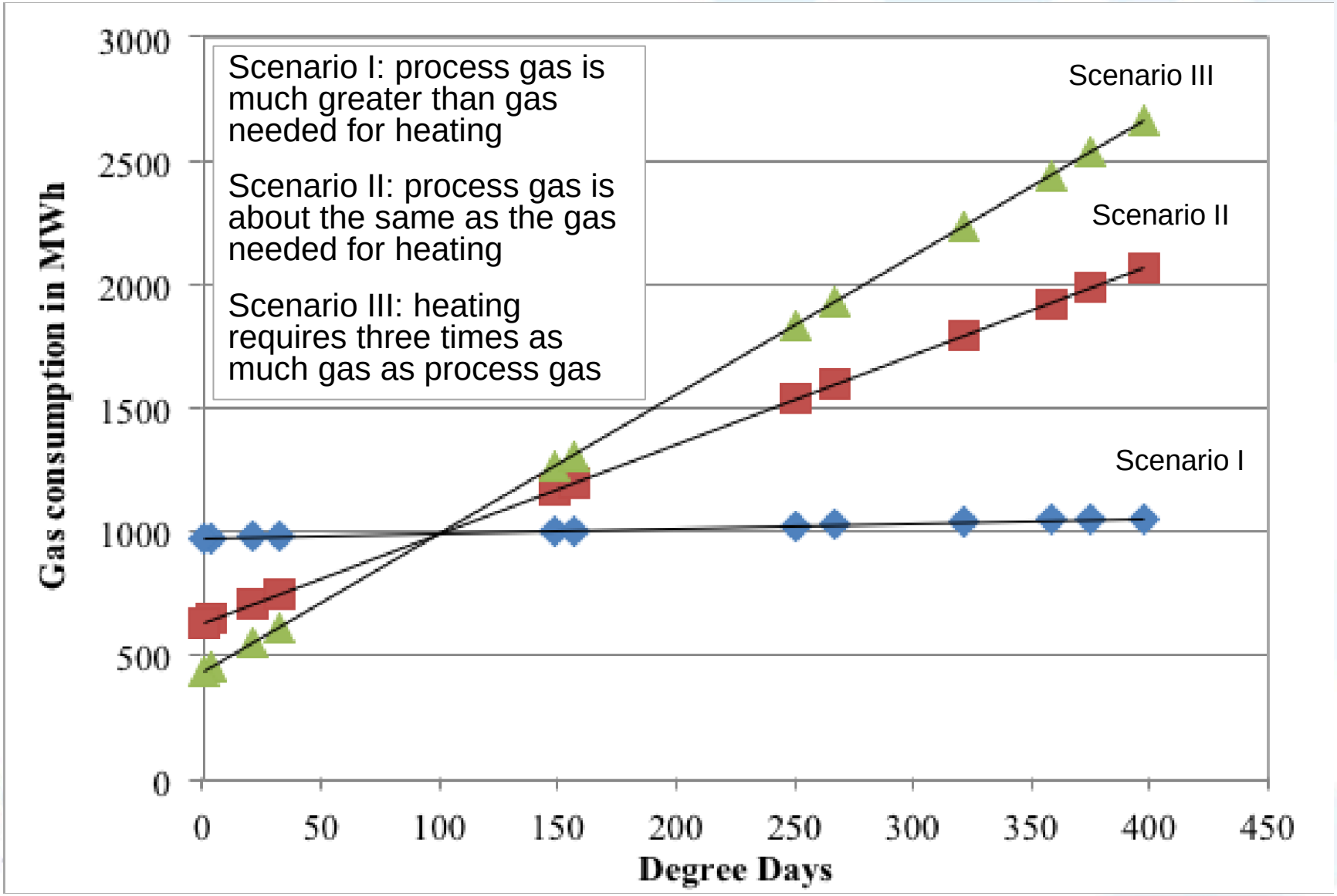
Value of the Research

- New approach to analysing opportunities to provoke energy saving and carbon emissions reductions
- Position in an Ownership Segment allows prediction of likely energy behaviours
- This knowledge can be used to target incentives to drive energy efficiency and conservation
  - Incentives can unlock the Owner-User Stalemate
- Segmentation allows prioritisation of actions to increase energy efficiency
  - Estimated energy investments vs cost savings can be calculated by segment to priorities action e.g. by largest population, ease of access, etc.

Applying the Energy, Ownership and Impacts Framework

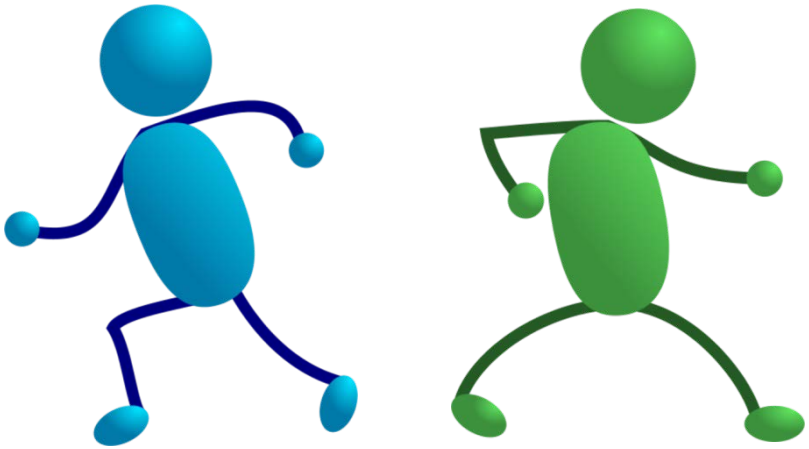
- The Three Wise Men Brewery case study examines the Energy, Ownership and Impacts Framework

Case Study: Energy Use in the Brewery



Case Study: Applying the Framework

Ownership Segment ‘a’ – Building owner and tenant



- Owner – User Stalemate likely to apply within Scenarios II and III
- Benefits accrued from building energy improvements are split between the owner and the brewery thus neither is likely to invest for the others’ benefit.

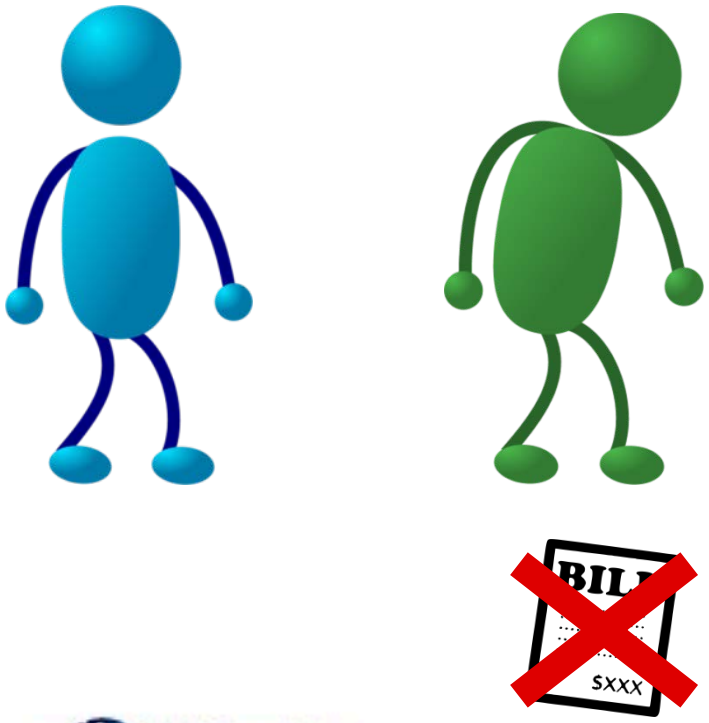
Case Study: Applying the Framework

Ownership Segment ‘b’ – Building owner as the user

- Brewers who are owner-occupiers of the building may be expected to readily invest in and implement energy efficiency actions, whether Scenario I, II or III applies.
- However, investment in energy efficiency technologies and behaviours must compete with general business investment so may not be the simple decision expected.

Case Study: Applying the Framework

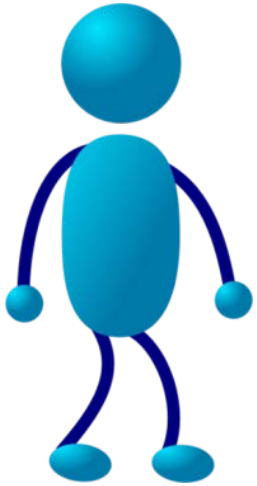
Ownership Segment ‘c’ – Building owner and franchisee (1)

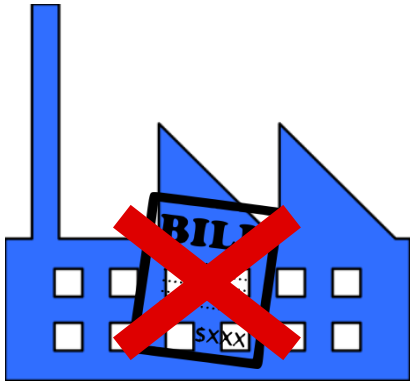


- Where the brewery is operated on behalf of another organisation without payment of rental charges, energy bills are sent to the client so that the brewery is likely to have little or no incentive to reduce energy costs unless specifically included in the service contract.
- In this context the usage and cost of energy remains hidden from the brewery.

Case Study: Applying the Framework

Ownership Segment ‘d’ – Building owner and branch





- The branch of a multi-site brewing organisation is remote from energy consumption/costs as energy purchases are controlled from a central point within the company creating a disincentive for investment in energy efficiency.

Case Study: Applying the Framework

Ownership Segment ‘e’ – Building owner, manager and tenant

- Managing agents add another level of complexity to the owner-user relationship, which further discourages energy efficiency improvements within the brewery, particularly if Scenario II or III applies.
- Where they are responsible for selling energy to the brewery, the managing agent has a strong disincentive to encourage energy reduction.

Case Study: Applying the Framework

Ownership Segment ‘f’ - Building owner as energy provider and tenant

- As the building owner provides the brewery with their energy there is little or no financial incentive for the owner to invest for building energy efficiency and little motivation for the brewery to improve energy efficient technologies whichever Scenario applies.

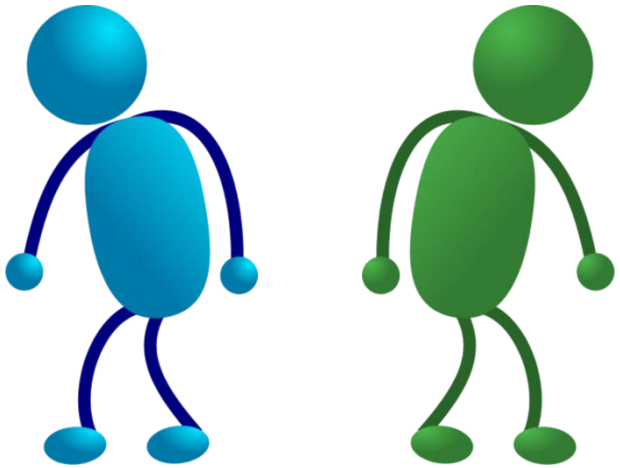
Case Study: Applying the Framework

Ownership Segment ‘g’ – Building owner as a commercial investor

- The brewery is unlikely to invest to improve building energy efficiency if situated within Scenario II or III as they are usually bound by restrictive leases which frequently prevent changes to the building fabric.
- Investing owners are likely to be remote from the day-to-day activities of the building.

Case Study: Applying the Framework

Segment ‘h’ - Building owner and franchisee (2)



- Owner – User Stalemate likely to apply with all Scenarios as split incentives will occur - the owner is unlikely to invest for a brewery franchisee’s benefit; the brewery is unlikely to invest for the owners’ benefit .

Conclusions and Future Research

- This research has established two key factors that represent opportunities to unlock the Owner-User Stalemate thus provoking reductions in energy consumption and in turn assist the mitigation of Climate Change through cuts in carbon emissions:
  1. The influence of ownership structures on owners' and users' ability and willingness to adopt energy efficiency
  2. The lack of rational economic response to energy market forces and energy policy incentives within UK non-domestic building sector

- Research on the impact of ownership is ongoing
  - Mechanism for creating tailored initiatives for each ownership segment based on the Energy, Ownership and Impacts Framework under development