

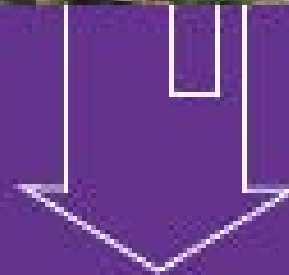


achieving zero

delivering future-friendly buildings



Brenda Boardman



Environmental Change Institute



Achieving zero: delivering future- friendly buildings

Building solutions
to the climate crisis

AECB, Oxford

8 June 2019

Brenda Boardman

Emeritus Fellow

ECI

University of Oxford



Aims

- Zero carbon emissions from all energy use in all UK buildings by 2050
- Strong focus on energy services, not energy
- Through demand reduction
- Feasible, big picture
- People and policy context –how to make it happen



Importance of buildings

- 41%+ of all UK CO₂ emissions
- 40% of all energy
- 2/3rds of all electricity
- 80% of peak electricity demand (lighting)
- **£31bn on fuel costs**
- **£35bn on building maintenance**
- **Worth £5.3tn**

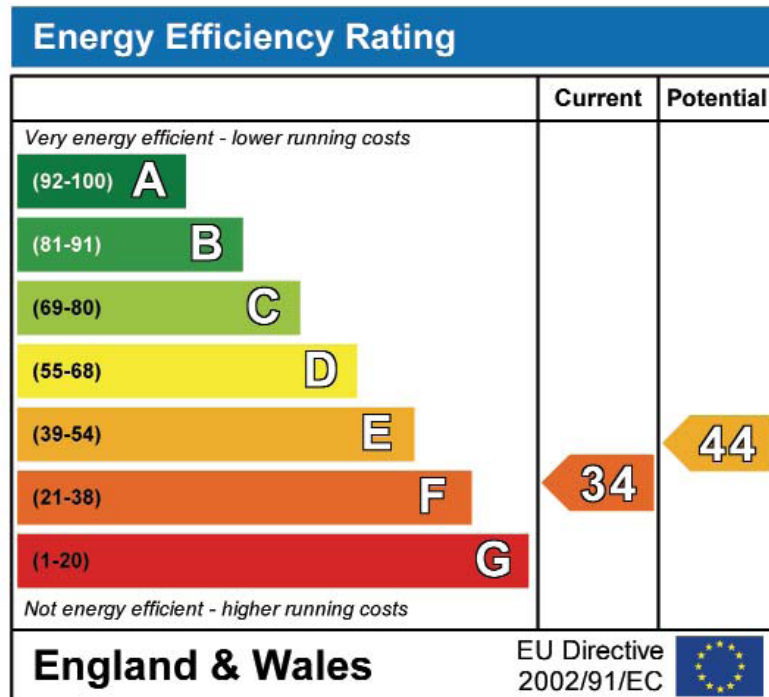
Energy Performance Certificate



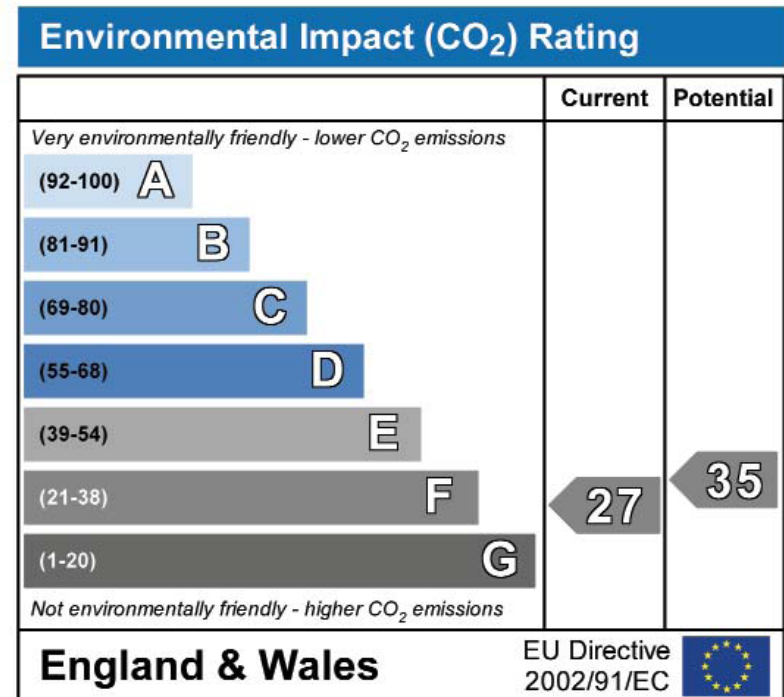
[address]

Dwelling type: Semi-detached house
 Date of assessment: 15 May 2008
 Date of certificate: 16 May 2008
 Reference number: 0000-0000-0000-0000-0000
 Total floor area: 69 m²

This home's performance is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills will be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.



Minimum standards and property value

- Energy Act 2011: illegal to rent out F and G from 2018
- Fuel Poverty Strategy 2014: all C by 2030
- Clean Growth Strategy 2017: all residential to be band C by 2035
- minimum standards create link between property value and energy efficiency



Building policy matrix

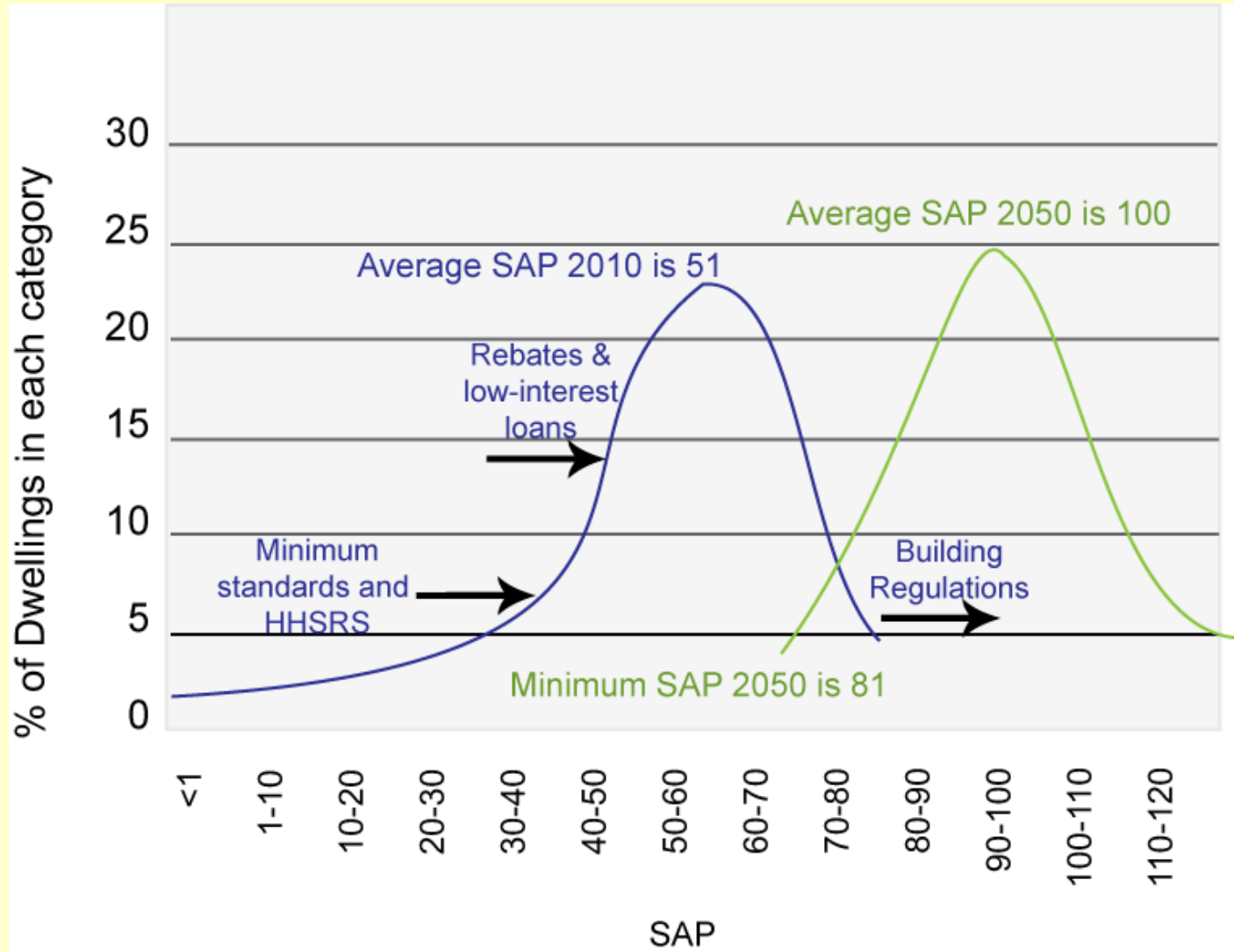
	Property owner Theoretical energy use: mainly gas	Occupant Actual energy use: Includes all electricity
Residential	Minimum standards based on EPC 81% of all energy	
Business	Minimum standards based on EPC 69% of all energy	



Heating decisions

- Renewable electricity needed for transport, so not available for heating
- Spend money on insulation, not a new heating system
- Enerphit+ for all buildings
- Average band A by 2050

Transforming housing





Rate of progress

Residential

- 1996-2017 = 0.8 SAP point increase pa
- 2018-2050 = 1.2 SAP points pa

Business

- 2001-2010 = 1.7% pa reduction, all energy; assume the same until 2050

Both

- Average of 100 by 2050
- 100 properties every hour to 2050



SAP and non-SAP UK housing 2015

	Energy (kWh)	Carbon	£
SAP: space and water heating, fixed lighting	81%	63%	56%
Non-SAP: other lights, all appliances	19%	37%	44%



Developing the policy matrix

	Property owner Theoretical energy use: mainly gas	Occupant Actual energy use: Includes all electricity
Residential	Minimum standards based on EPC 82% of all energy	?
Business	Minimum standards based on EPC 69% of all energy	Display Energy Certificates 100% of all energy



Appliance decisions

- Mandatory minimum standards very effective
- EU product policy expanding
- Electricity for lighting dropped 30%
1997: 2018, per UK household
- Assume all electricity use can be halved
- Requires PCA to involve people



Personal carbon allowances

- Household energy use, personal travel (not public) and flights
- Progressive
- Can be capped, parallel national carbon budgets
- Lot of preparatory work
- Probably essential to engage people

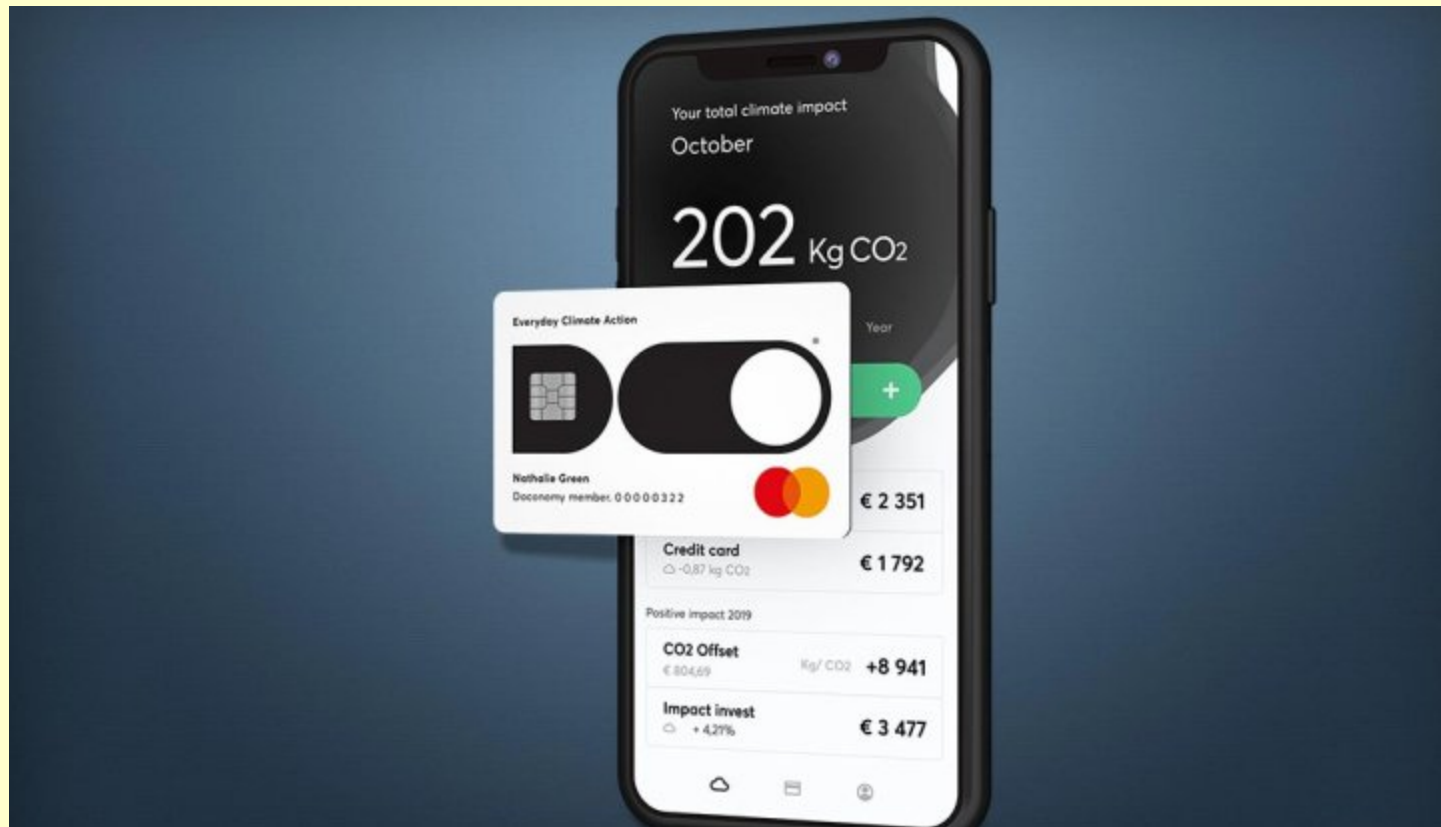


Core policy matrix

	Property owner Theoretical energy use: mainly gas	Occupant Actual energy use: Includes all electricity
Residential	Minimum standards based on EPC 82% of all energy	Personal carbon allowances 100% of all energy
Business	Minimum standards based on EPC 69% of all energy	Display Energy Certificates 100% of all energy



Carbon credit card launched by Doconomy in May





Money issues

- Enhance the equity in the building
- Building owner's responsibility
 - All landlords, private and social
- Lifetime mortgages for poor owner occupiers, at zero interest
- Financial incentives, LESA, stamp duty?
- Local authority to oversee



Résumé

- Regulation is cheap – few grants / incentives
- Clear policy trajectory to top of band A
- PCA – constrains electricity use
- Property owner responsible
- Efficient properties more valuable
- Passive heating only
- Healthier, warmer homes for all
- Smaller, not higher energy bills



Change in energy use

2009

- 215TWh of electricity
- 462TWh of gas

2050

- 100TWh of electricity – all from (off-shore) wind / solar
- No space heating
- Solar thermal, combined heat and power, green gas for hot water
- = zero carbon

Passivhaus living





Thank you

www.eci.ox.ac.uk

Brenda.Boardman@ouce.ox.ac.uk