

# Transforming the market for buildings

**Dr Mark Hinnells**

**Environmental Change Institute  
University of Oxford**

40% House was supported by the Tyndall Centre

BMT is supported by EPSRC and Carbon Trust under Carbon Vision

UKERC is supported by EPSRC, ESRC, and NERC

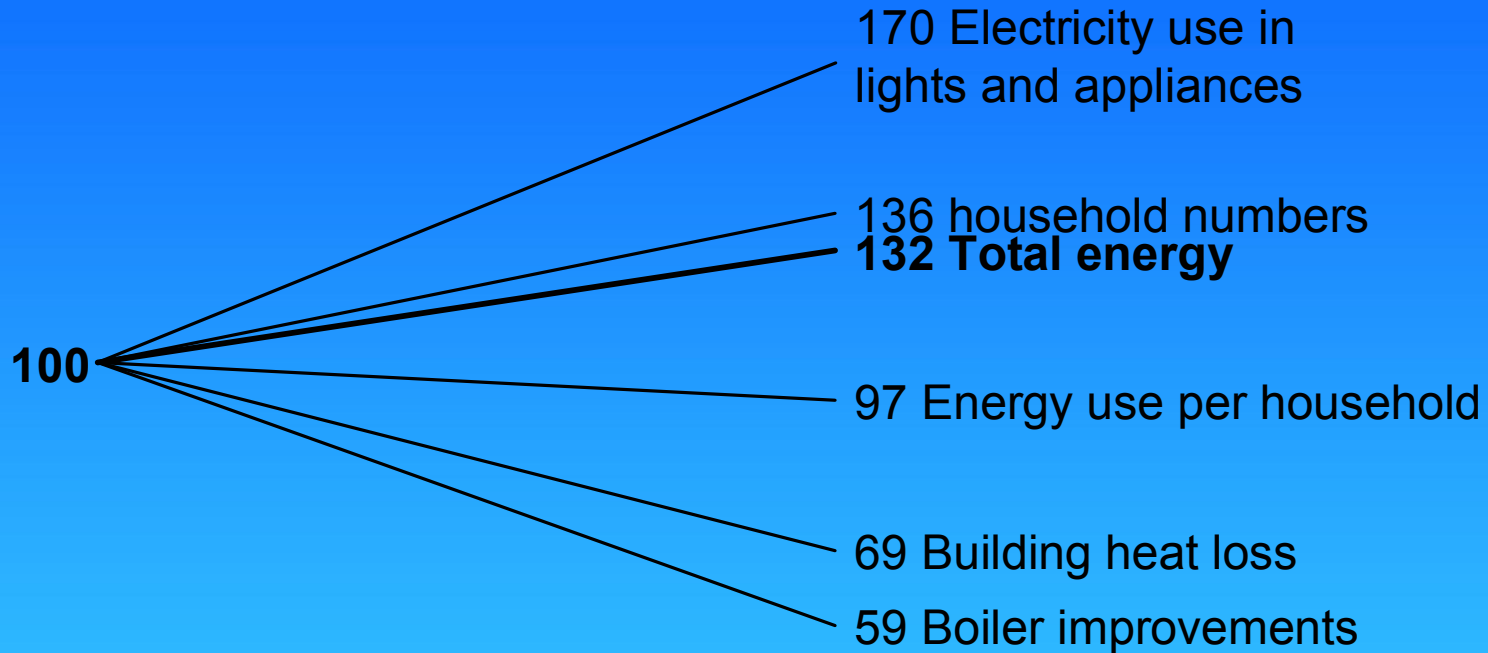


# Transforming the market for buildings

- Lessons from 40% House
- Ongoing research under Carbon Vision, UKERC and Supergen



# Energy trends 1970-2001



- Improvements in efficiency are outweighed by increases in households and in services

Based on Shorrock and Utley (2003)



# Population

## 40% House scenario

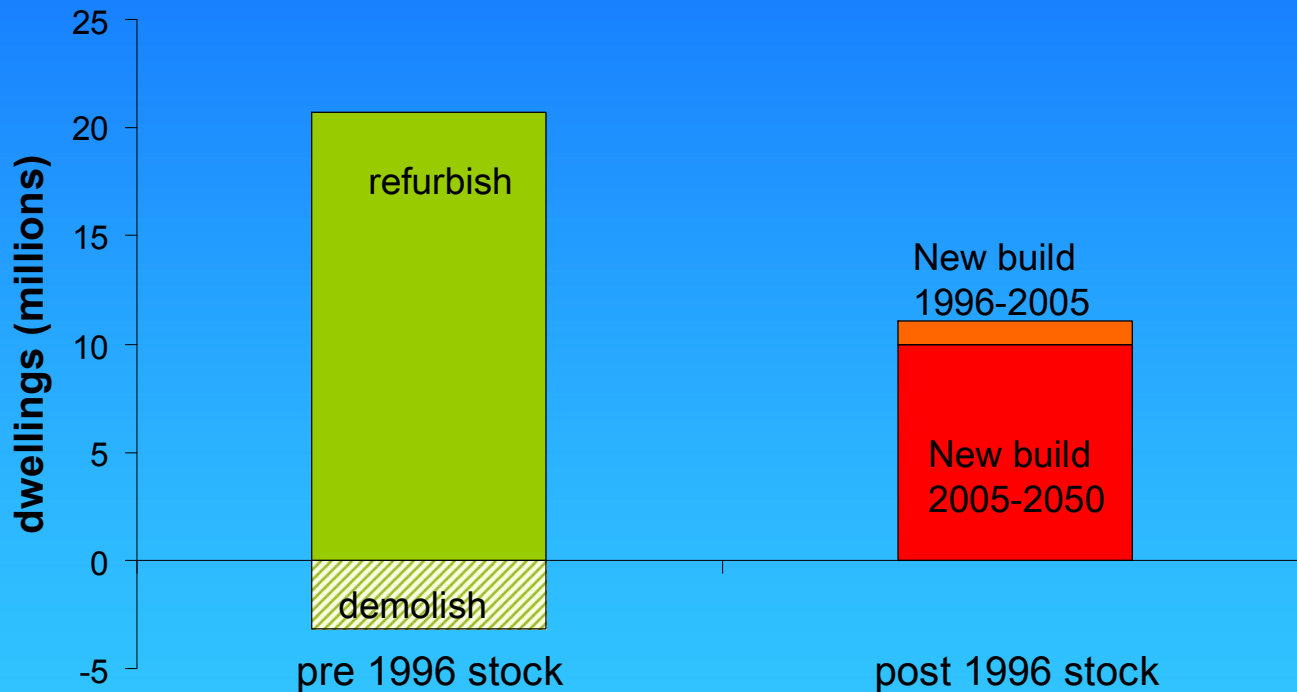
	1996	2050
<b>UK population</b>	59m	67m
<b>Number of households</b>	24m	32m
<b>Household size</b>	2.5	2.1
<b>% of population aged 65+</b>	16	25

- Household numbers projected to increase by a third with more people and smaller households



# Housing stock changes

## 40% House Scenario

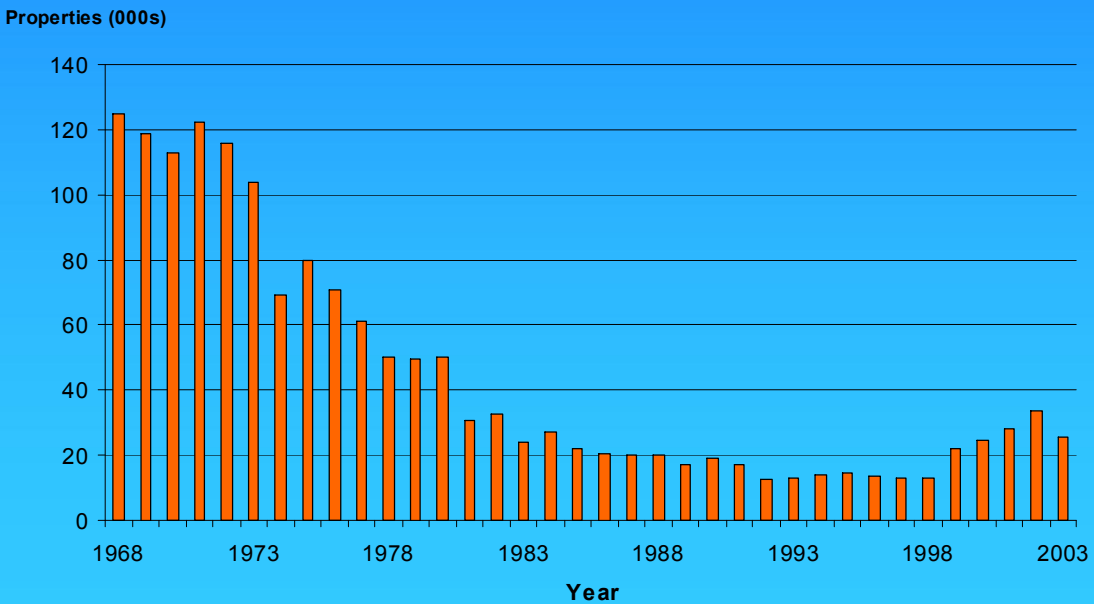


- 75% of 31.8m homes existing in 2050 are already built



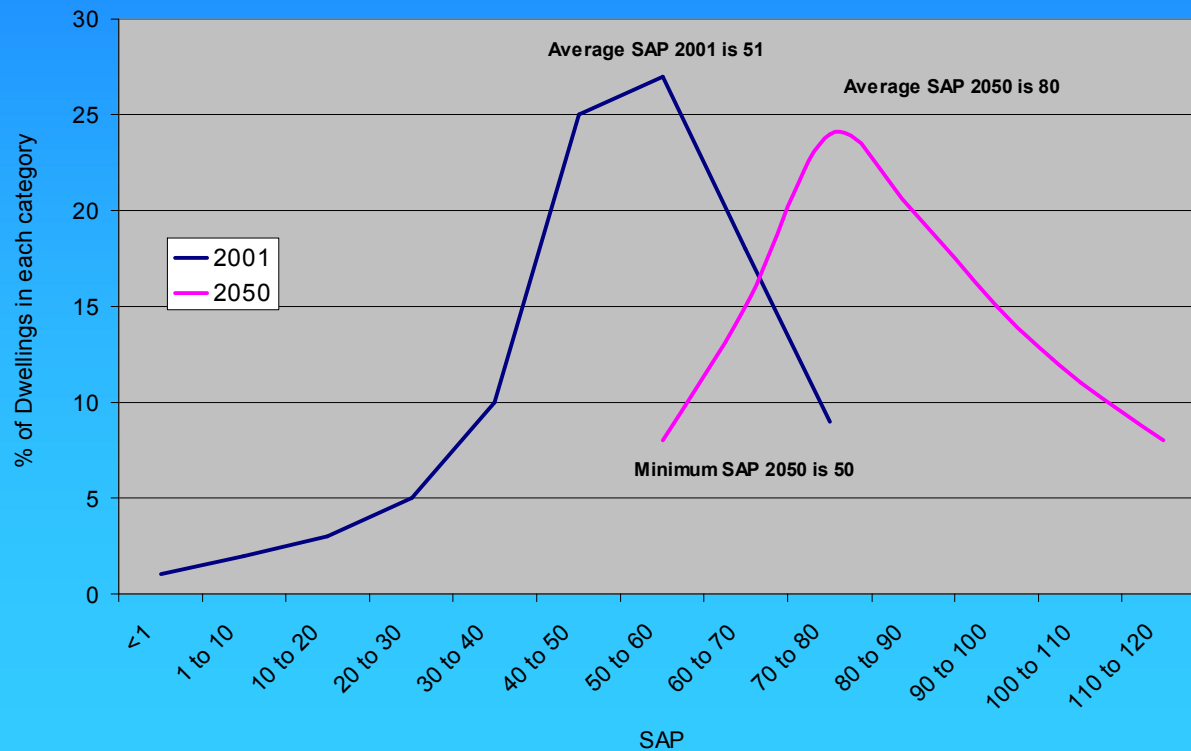
# Demolition rates

- Demolition rates up to 80,000 by 2016
- Up by 4x from currently
- Still below historic levels
- Lifetime of a home down from 1200 years to 300 years



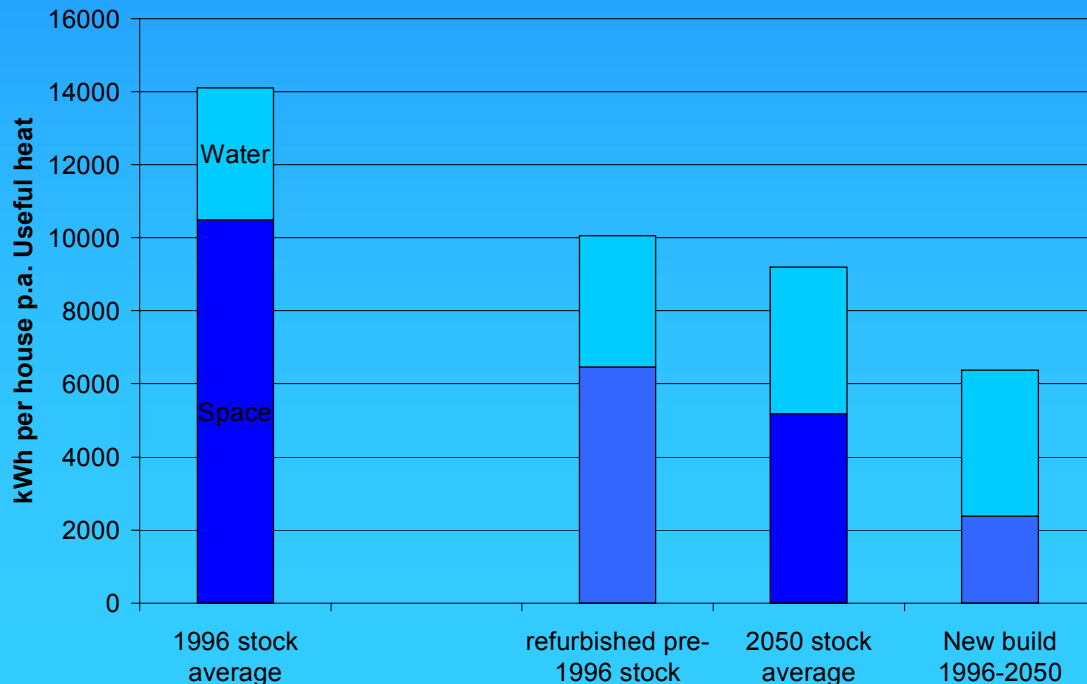
# Transforming the housing stock

- Current average SAP must become the minimum
- Average improvement = 1 SAP point p.a. equivalent to the current rate
- But, LZC is additional



# Fabric improvements 40% House Scenario

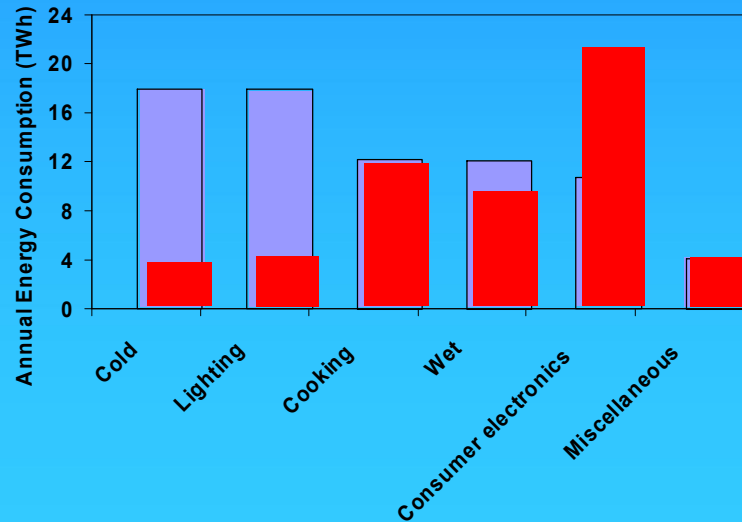
- Stock average in 2050 determined by refurb and new build
- Refurbishment is all 'cost effective' measures and more
- All new build is Bedzed standard by 2020 latest



# Lights and appliances

## 40% House Scenario

- A 44% reduction to 1680 kWh pa phh
- Cold (VIP) and Lighting (LED's) crucial
- Potential major increase in consumer electronics
- minimum standards focusing on conservation not efficiency

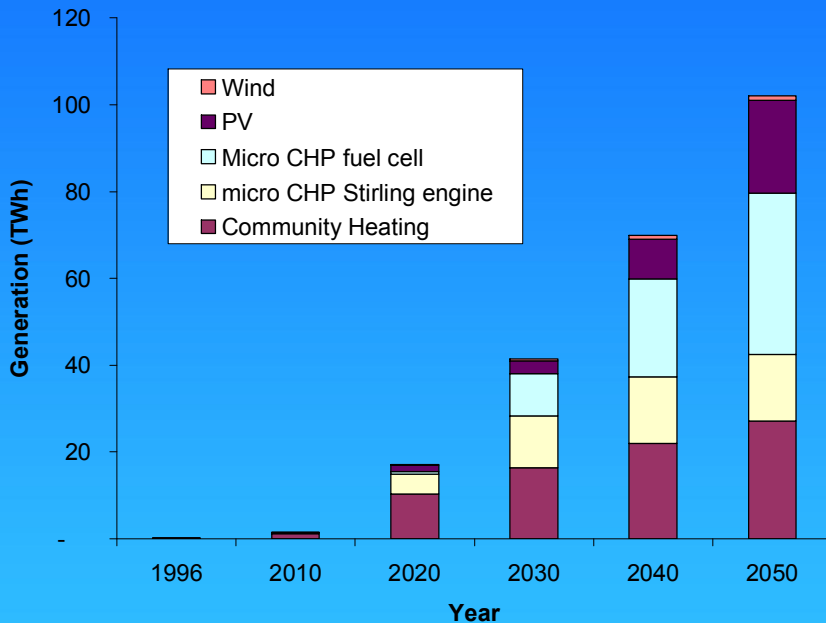


# LZC 40% House Scenario

- LZC = low or zero carbon, building or community integrated, heat and or electricity systems
- CHP, biomass, solar thermal, PV, Heat pump etc
- Based on potentials studies for each technology
  
- 45 years = 3 replacement heating systems
- Average 1.7 LZCs per home
- Half of PV and fuel cells after 2040
- Improving electrical efficiency over the period
- Technology choice dependent on rural/urban and region
  
- 60% of homes with some form of CHP (CH and micro)
- 90% of homes with roof technology (PV, solar thermal, wind)
- 80% of heat and 118% of electricity from LZC



# LZC 40% House Scenario

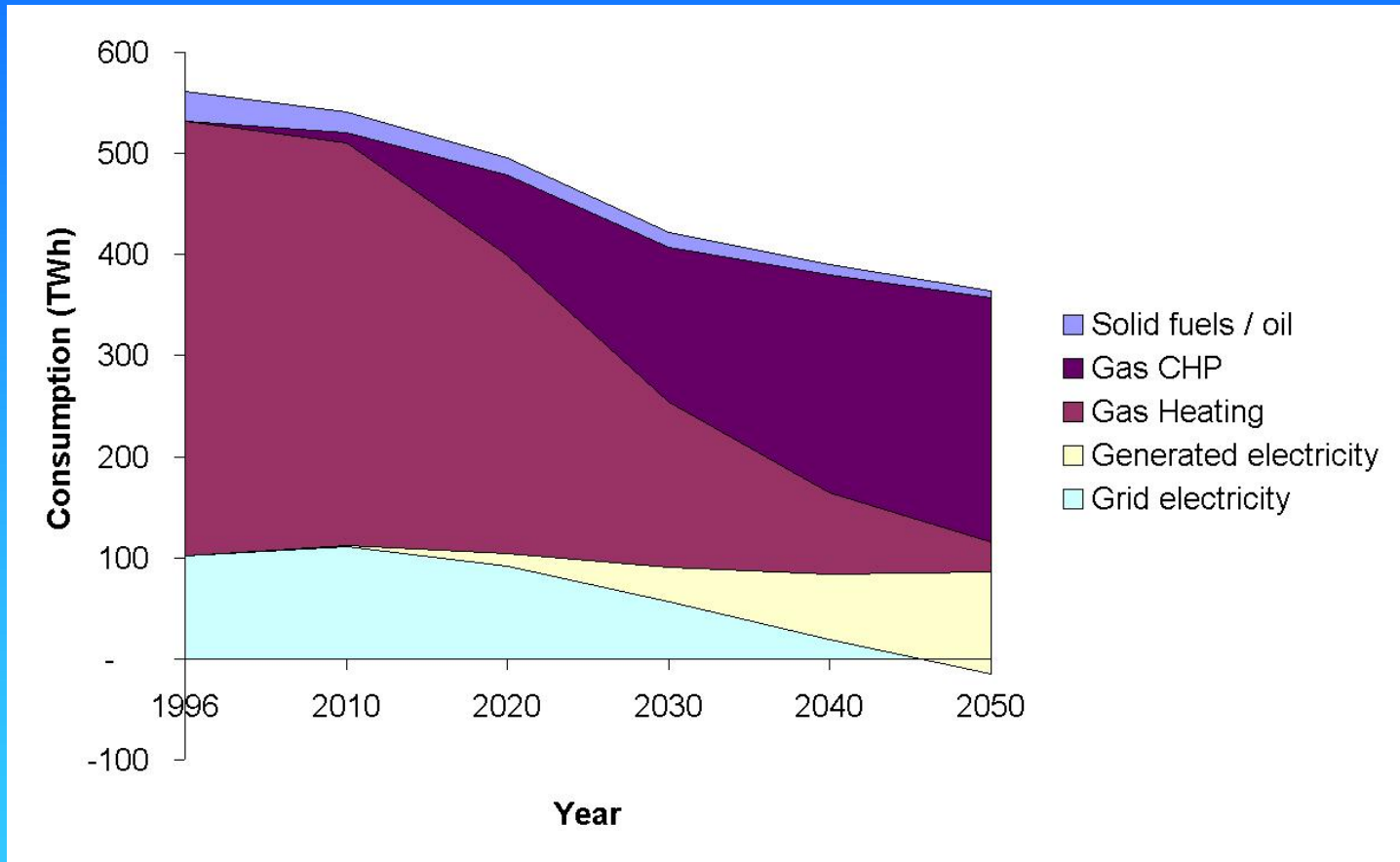


UK LZC electrical capacity (MW)			
by 2020	by 2030	by 2040	by 2050
12,097	25,286	40,707	55,642

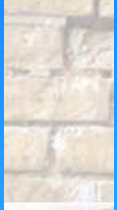
- Around 1/3<sup>rd</sup> of carbon savings from LZC
- Homes could contribute significant capacity and generation and be a net exporter by 2045
- Contribution to security and diversity
- Finance -more in the home, less on the grid
- Perhaps half of homes supplied by ESCOs?



# Energy Consumption 40% House

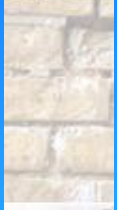
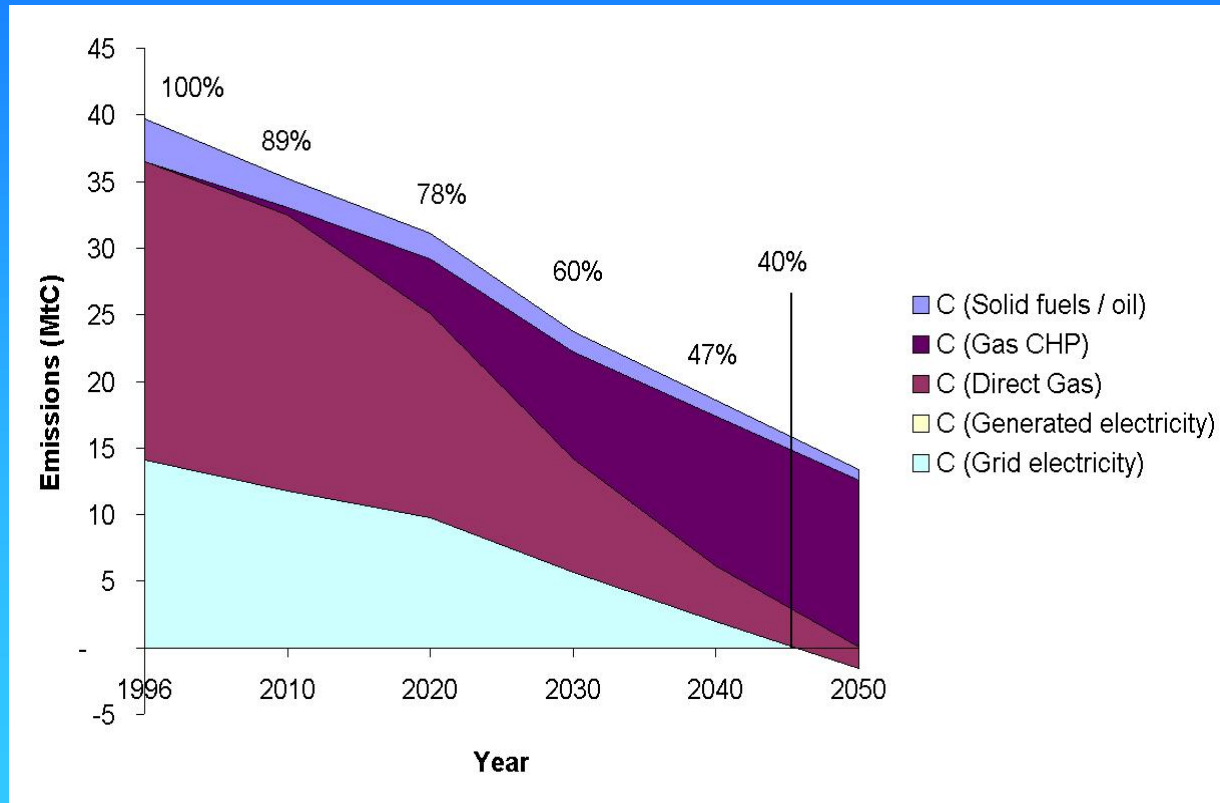


40% House

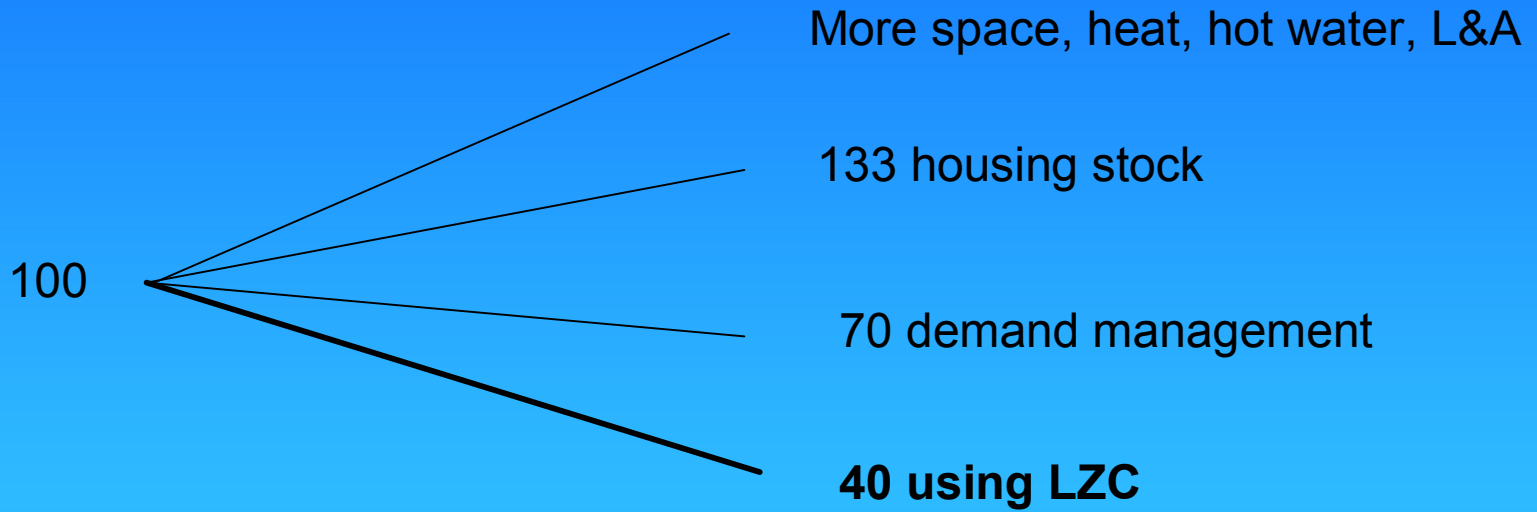


40% House

# Carbon Emissions 40% House



# 40% House summary



# Policy Needs – next 5 years

## Housing and environment strategy:

- Political leadership: who in Government?
- Refurbishment via property transactions/building regs
- Procurement for LEDs and VIPs
- Minimum standards for appliances
- Shading devices to avoid cooling
- LZC strategy for products and routes to market



# Policy needs 10 years

Housing and environment strategy:

- Targeted demolition
- Zero emission new build strategy: rolling building regulations and compliance
- From central generation to distributed generation
- Half of homes supplied via ESCOs?
- Either Tax or tradeable Personal Carbon Allowances



# What next?

- 40% House is equivalent to a scoping study
- Key findings need further exploration
- A range of more detailed work has started under Carbon Vision, UKERC, and SuperGen



# Carbon Vision Buildings



- Sponsored by EPSRC and Carbon Trust
  - Carb (UCL and de Montford) - non domestic stock model and consumer behaviour
  - Tarbase (Heriot Watt) – whole life costing of technologies to achieve 50% reduction
  - Building Market Transformation (Oxford) - policy scenarios
- All energy use, all buildings including non-domestic
- Objective a 50% reduction in 25 years, equivalent to 2% p.a. reduction -more demanding than 40% House
- 4 years, range of interim reports and seminars
- Working closely with stakeholders (eg via EEPH)

# Building Market Transformation

- All building energy to 2030, domestic and non-domestic
- Open access model
- Bottom up model: all end uses, thermal efficiency, appliances, and heat and electricity sources
- Socio-economic issues (behaviour, take-back, elasticity, economic decision-making)
- Policy focused with an emphasis on Building Regulations for new and existing stock



# UKERC Demand Reduction

- Demand Reduction theme
  - Market Transformation of appliances
  - Personal Carbon Allowances
  - Transport
- Meeting Place, eg G8 workshop



# SuperGen

- EPSRC Sponsored
- Highly Distributed Power Systems Consortium, Strathclyde, Loughborough, UNIST, Oxford, Heriot-Watt, Bath, Imperial
- Network implications of massively distributed generation by 2050
- Taking 40% House LZC scenario as a starting point



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