

The Challenge for Housing energy-efficient refurbishment



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Cambridge Architectural Research Limited



Structure of presentation

Context – an ageing building stock

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Case studies

Summary

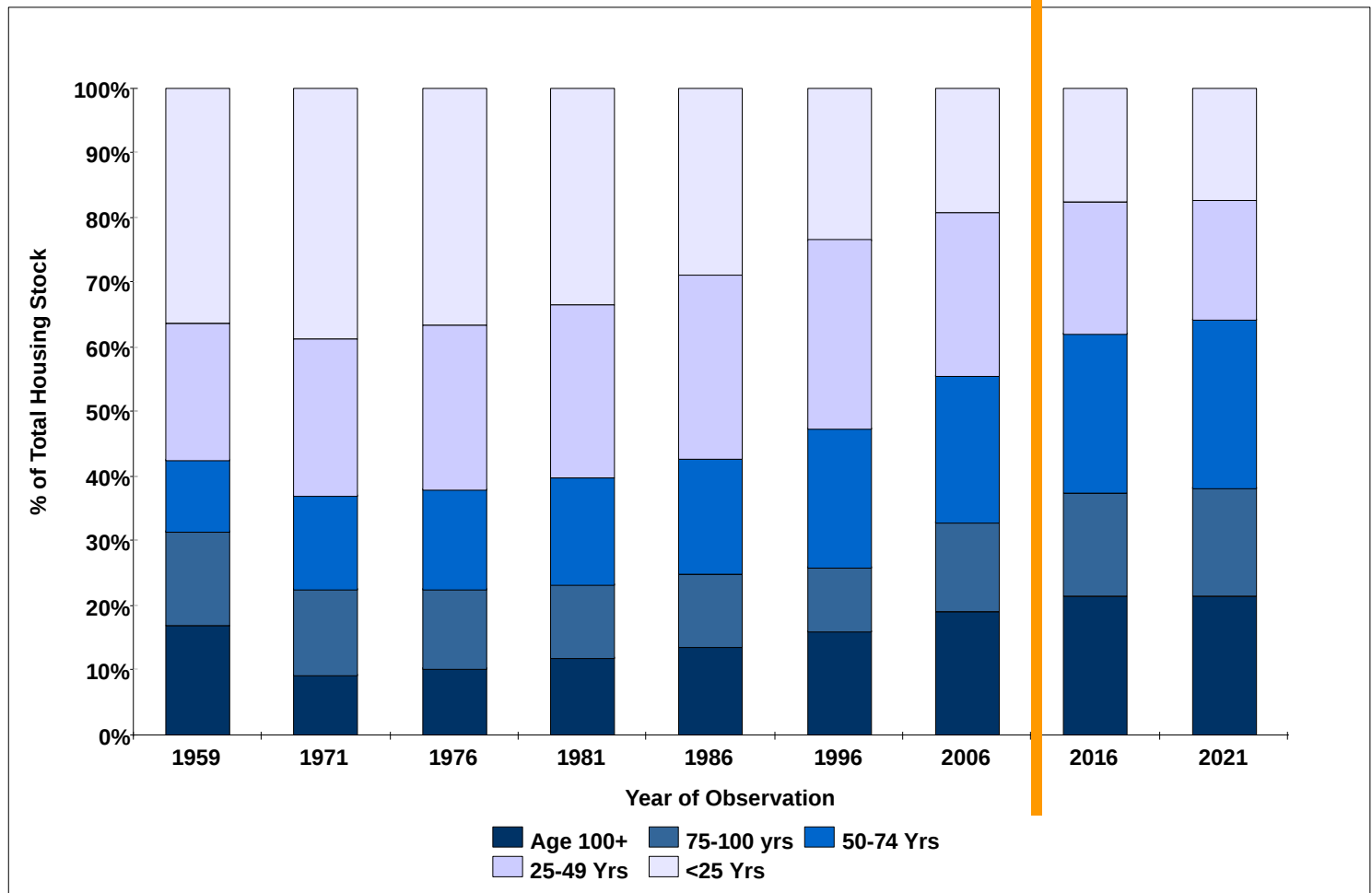
CAR





Context – an ageing building stock

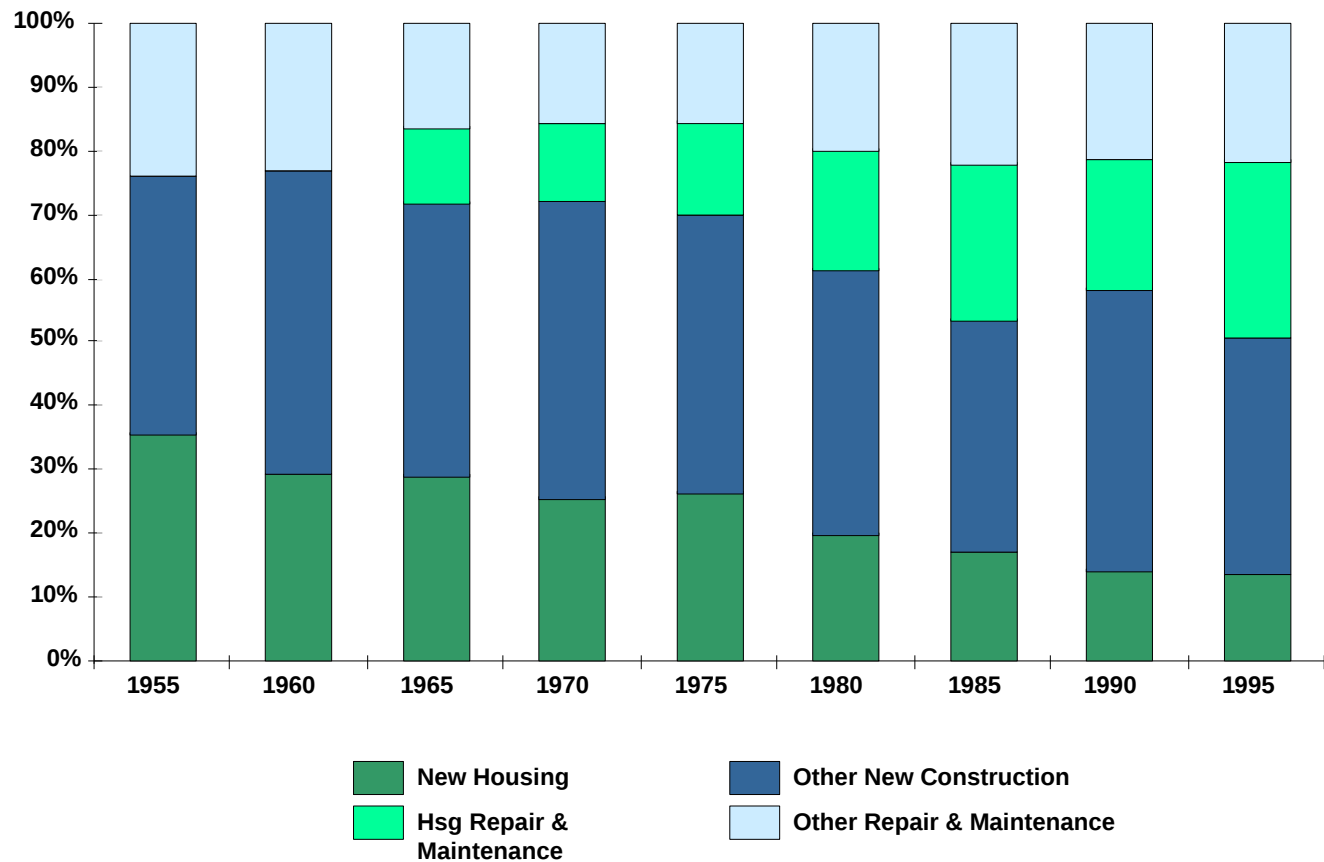
Age of UK housing stock by year of observation

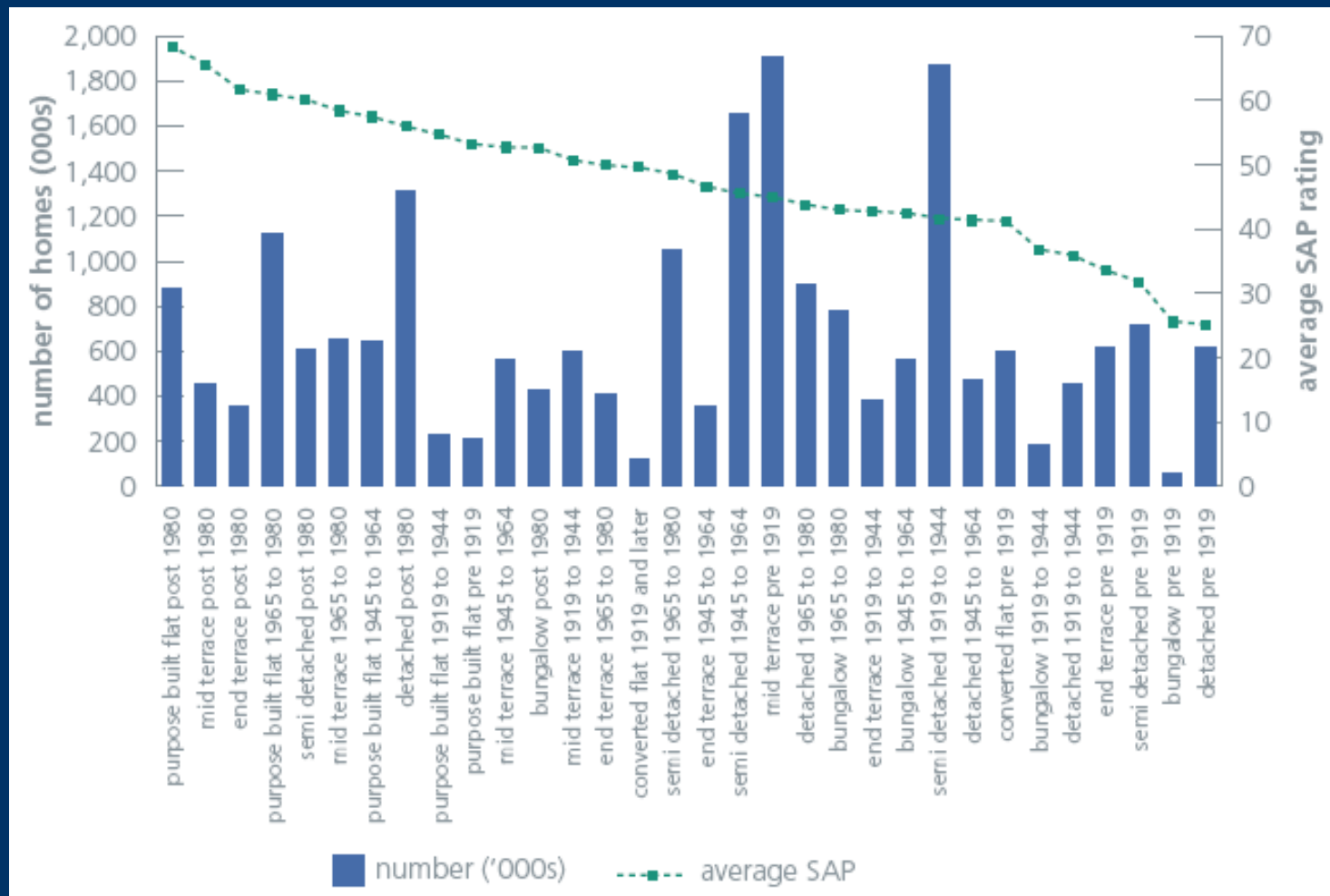




VALUE OF CONSTRUCTION OUTPUT - G.B.

Relative Importance of Components





Average SAP and size of stock by housing type and age combined

Source: EHCS 2005



- ✧ the UK building stock is ageing rapidly
- ✧ it is one of the oldest in Europe
- ✧ refurb is now the dominant activity of the construction sector – particularly in housing
- ✧ many low-hanging fruit remain to be picked

	solid walls	insulated cavity walls	insulated roofs	insulated floors	double glazing
Netherlands	4	57	>71	43	80-85
UK	31	28	72-95	no data...??	71



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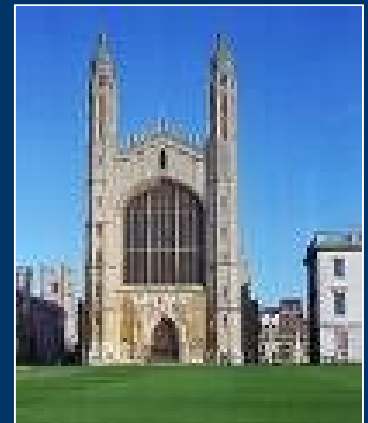
Cambridge Architectural Research Ltd.

CAR was established in 1987 by academics working at Cambridge University in order to carry out commercial research and consultancy in the built environment.

Our work encompasses the following areas:

- Risk
- Design and use
- Structures
- Energy and environment

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Energy and environment projects

- ✧ Research and policy-related studies
 - urban issues
 - collaborative projects sponsored by the EU
 - reports for UK government clients
- ✧ Consulting on specific building schemes
 - many high-profile newbuild projects in the UK, Europe, Australia, China
 - refurbishment of existing buildings, and links to conservation issues



Policy-related projects in the UK

✧ Climate Lite

- energy assessment tool for sketch designs, developed with the Building Research Establishment

✧ DemSCOT

- analysis technique to assess impact of different policy options to reduce carbon output of Scottish housing stock.

Client: Scottish Housing Executive

✧ Policy impact assessment for UK

- application of this technique to the UK building stock.

Client: Department for Energy and Climate Change





Case studies

An aerial photograph of a city, likely London, with a prominent red building highlighted in the center. The image is partially obscured by a dark blue vertical bar on the left side of the slide.

Retrofit for the Future

The programme was initiated in 2009 by the Technology Strategy Board, part of BIS (UK central government).

It was organized as a competition for funding carbon-efficient upgrades to social housing, with a view to large scale rollout.

CAR is a member of two of the 90+ successful teams:

- Project A Bedfordshire
- Project B Suffolk

Project A

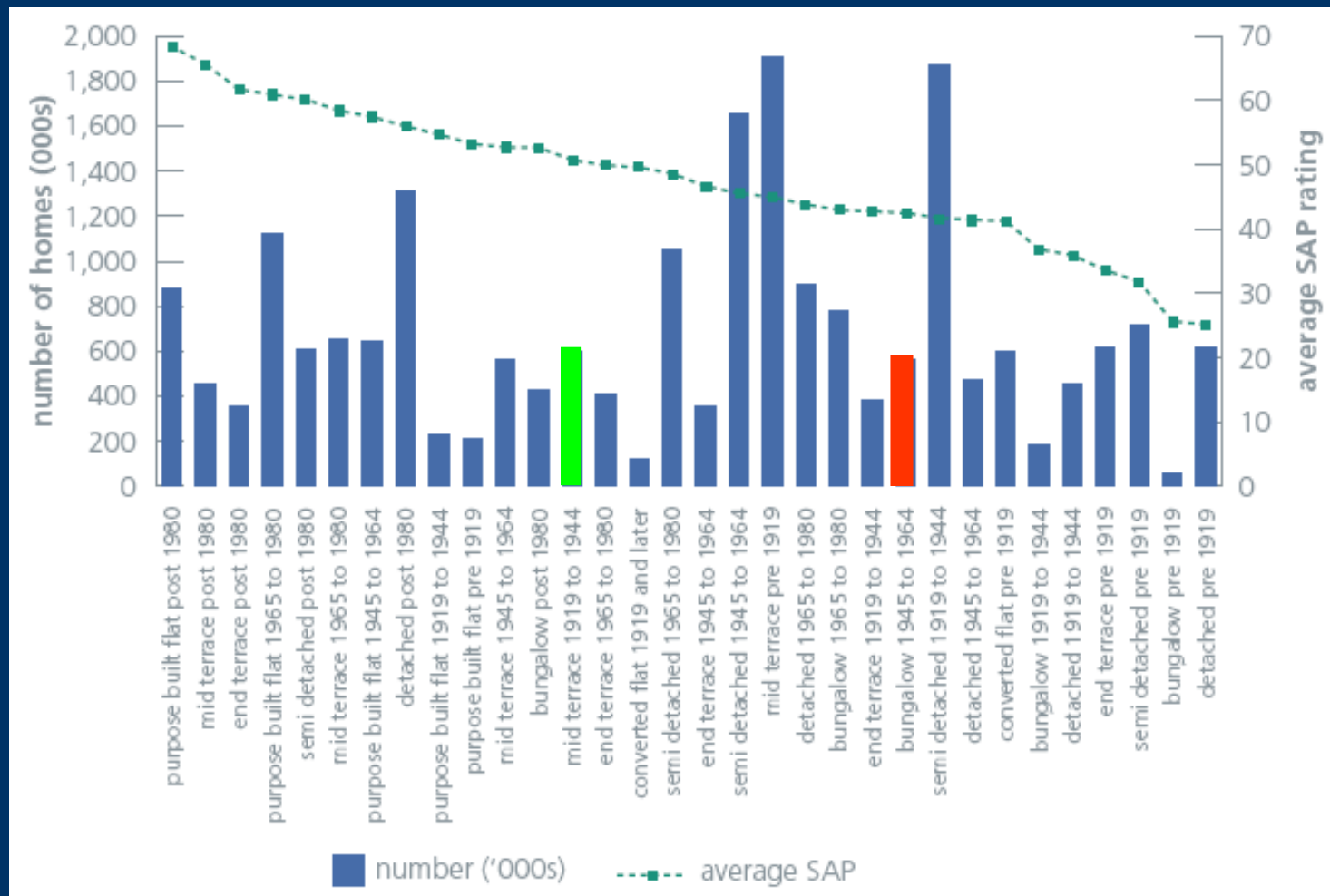
- 1 house
- 1-story, 1 bedroom
- mid-terrace
- 1960s
- Brick-block walls with cavity insulation
- Electric storage heaters



Project B

- 2 houses
- 2-story, 2 bedroom
- mid-terrace
- Inter-war
- Brick-brick walls with cavity insulation
- Electric storage heaters





Average SAP and size of stock by housing type and age combined

Source: EHCS 2005

Example:



	Option	Assumptions	Cost/unit £	CO ₂ /m ² .yr kg
	Base case	As existing		84.42
A	Low carbon package	Reduced wall area; wall, loft and slab perimeter insulation; replacement low-e dg windows; PV; solar dhw; ASHP; improved electrical appliances; changed user behaviour	38,662	15.07
	Low cost package	Loft insulation; draught proofing; changed user behaviour	2,272	56.61
B	Low tenant disruption package	Loft and slab perimeter insulation; replacement low-e dg windows; PV; solar dhw; ASHP; improved electrical appliances; changed user behaviour	26,689	17.16

Changing user behaviour

- § Working with individual tenants
- § Giving input to design of control systems
- § Running workshops for wider tenant groups



An aerial photograph of a city, likely London, showing a dense urban landscape with numerous buildings and green spaces. A prominent red building is highlighted with a red square, indicating a specific point of interest or a building of significance in the context of the presentation.

Summary

plenty of opportunity for improving carbon emission performance of existing buildings

there are periodic opportunities to improve energy and carbon performance as elements are upgraded

A range of technical possibilities – choice often depends on non-technical factors

Measures to assist behavioural change are vital



Thank you!

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