Centre for Alternative Technology
Canolfan y Dechnoleg Amgen

Sustainable housing: past, present and future

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CROESO WELCOME

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M.Arch Sustainable Architecture

Research

RICS®

December 2020

Almshouses: a model of community housing for an ageing population







rics.org/research

https://www.rics.org/uk/news-insight/research/research-reports/almshouses-a-model-of-community-housing-for-an-ageing-population/

What we are going to cover

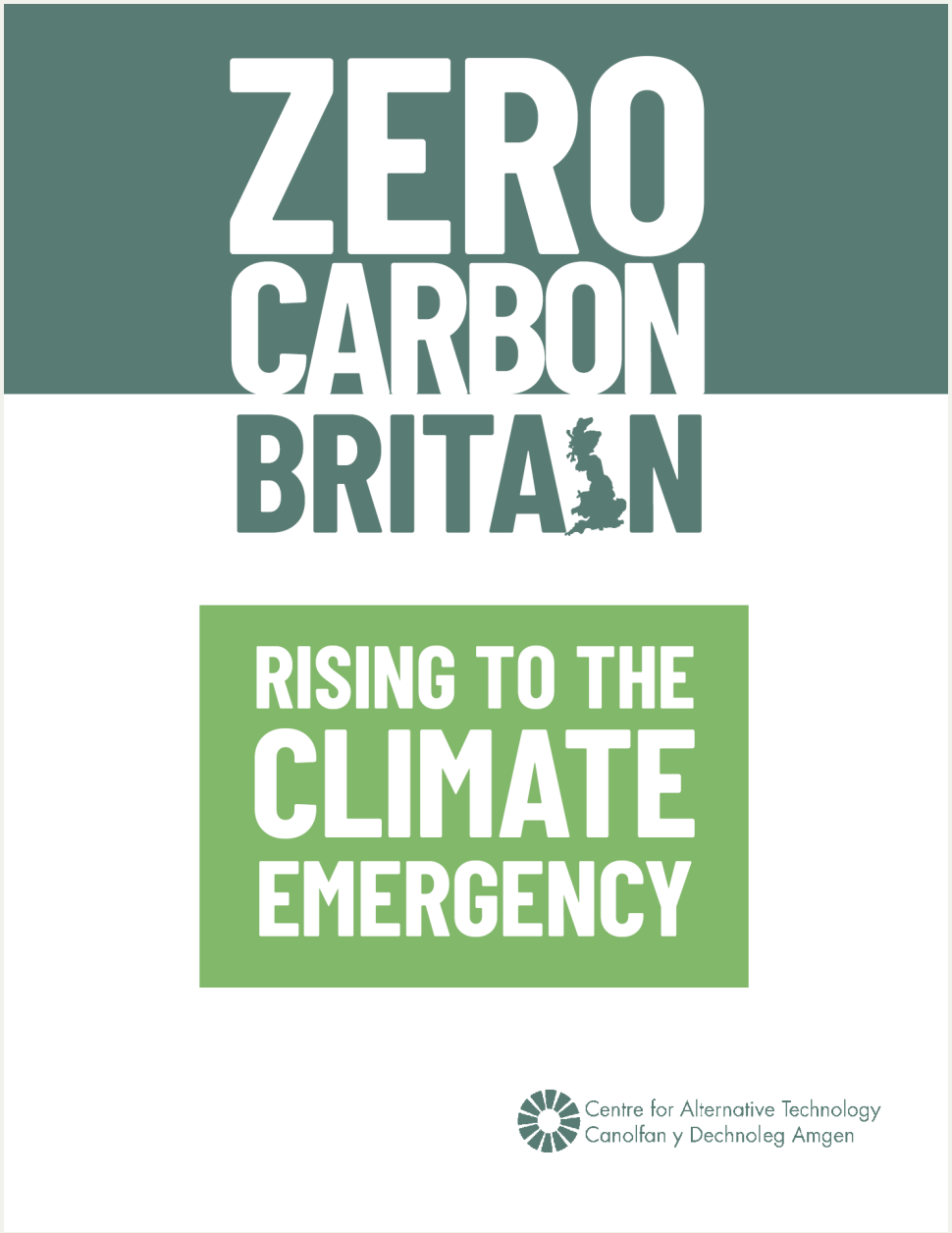
- Brief introduction and background
  - Research
  - Energy consumption
  - Carbon reduction
  - Fuel poverty
- Retrofit case studies
  - Glasgow
  - Community
  - 80% house
  - Four Walls
- Panel Discussion
- Q&A

Brief introduction and background

Research, Energy consumption, Carbon reduction, Fuel poverty

https://www.futuregenerations.wales/about-us/future-generations-act/

Brief introduction and background



https://cat.org.uk/info-resources/zero-carbon-britain/research-reports/zero-carbon-britain-rising-to-the-climate-emergency/

Brief introduction and background

Research, Energy consumption, Carbon reduction, Fuel poverty

"To meet its climate targets, the UK has an ambition to retrofit all homes to EPC band C standard by 2035. But only 29 per cent of homes today meet this standard, and the UK's current policy approach is nowhere near ambitious enough to tackle the remaining 71 per cent" p1

https://green-alliance.org.uk/resources/reinventing_retrofit.pdf

https://www.energiesprong.uk/projects/nottingham

Brief introduction and background

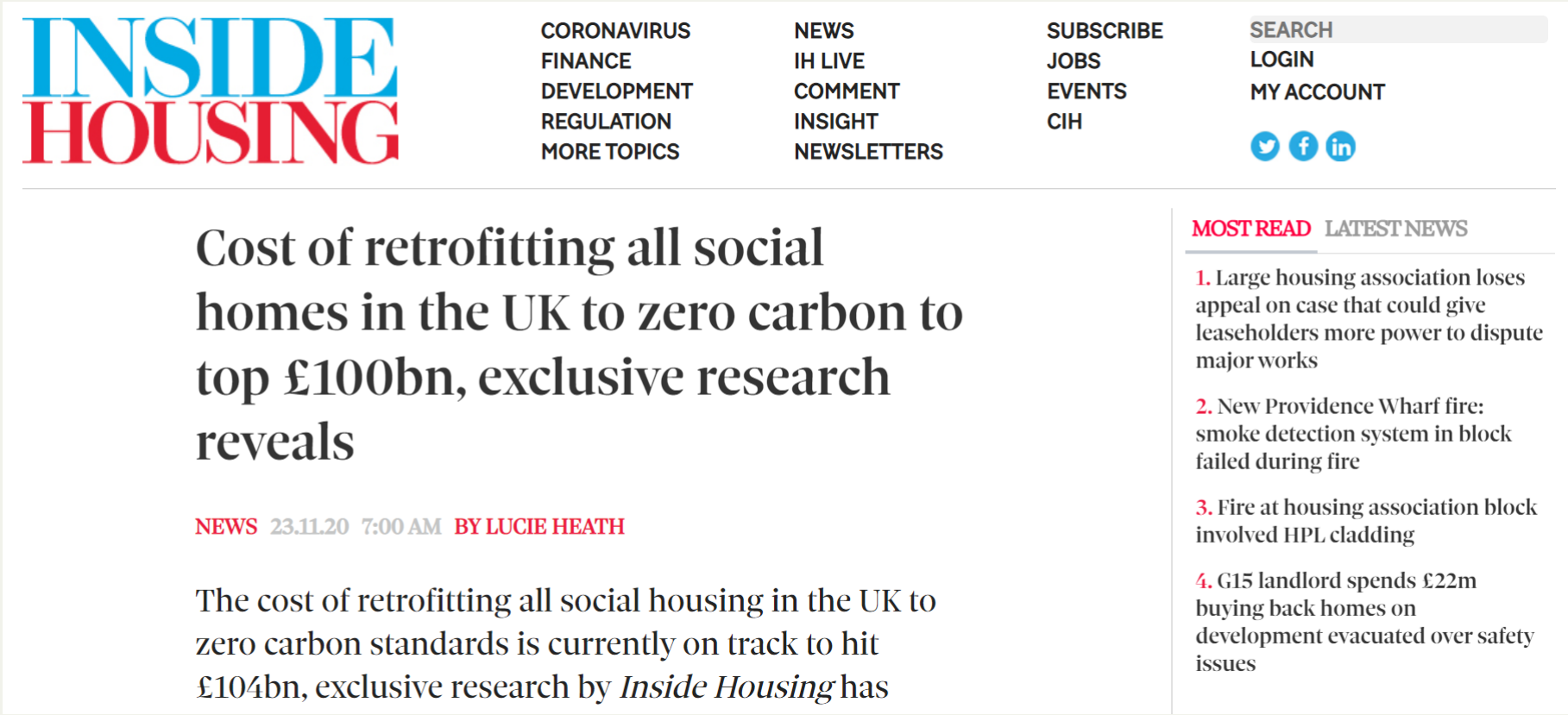
Research, Energy consumption, Carbon reduction, Fuel poverty

The Committee on Climate Change projects that to meet the fifth carbon budget, around 13MtCO_2 e of carbon savings will be needed from residential buildings by 2030.

https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf

Brief introduction and background

Research, Energy consumption, Carbon reduction, Fuel poverty



INSIDE HOUSING

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Cost of retrofitting all social homes in the UK to zero carbon to top £100bn, exclusive research reveals

NEWS 23.11.20 7:00 AM BY LUCIE HEATH

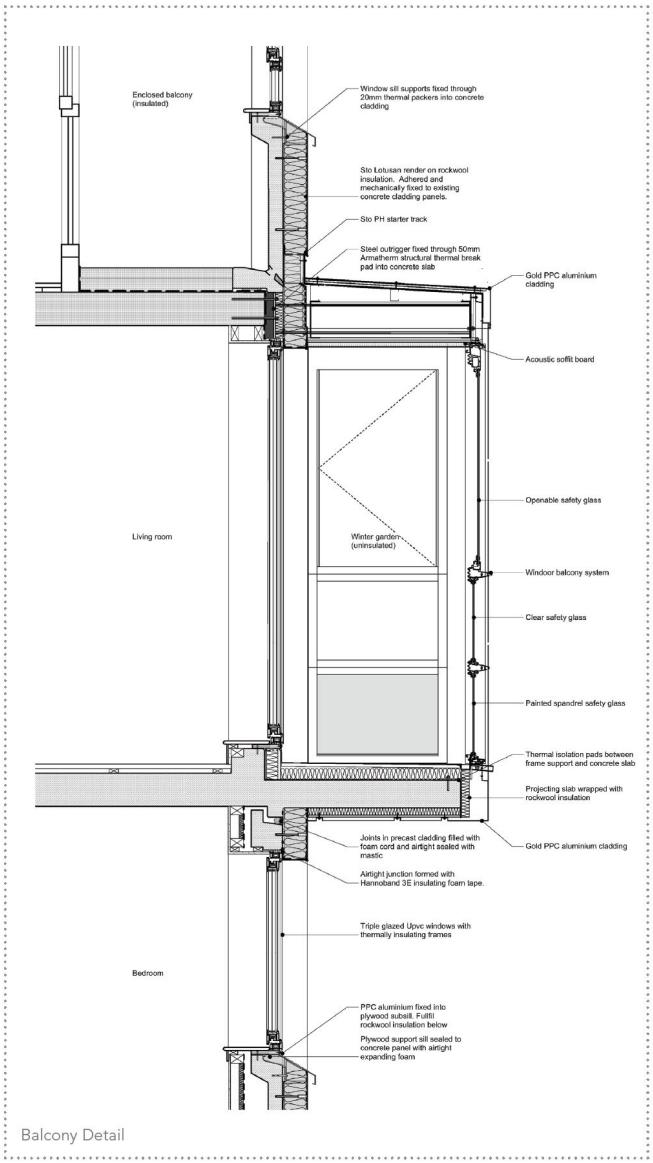
The cost of retrofitting all social housing in the UK to zero carbon standards is currently on track to hit £104bn, exclusive research by *Inside Housing* has

MOST READ LATEST NEWS

1. Large housing association loses appeal on case that could give leaseholders more power to dispute major works
2. New Providence Wharf fire: smoke detection system in block failed during fire
3. Fire at housing association block involved HPL cladding
4. G15 landlord spends £22m buying back homes on development evacuated over safety issues

https://www.insidehousing.co.uk/news/news/cost-of-retrofitting-all-social-homes-in-the-uk-to-zero-carbon-to-top-100bn-exclusive-research-reveals-68674

Glasgow – Woodside – Collective Architecture/QCHA



Balcony Detail

Annual CO_2 emissions $28kgCO_2/m^2$

Overall area-weighted U-value $0.36W/m^2k$

External render

Airtightness

[Passivhaus EnerPHit]

70% operational savings

Ongoing monitoring GSA

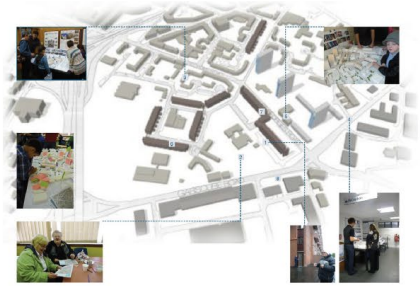
https://vimeo.com/418531581

Glasgow – Woodside – Collective Architecture/QCHA

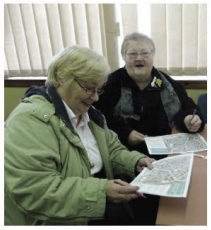
Community Consultations and Workshops.

Collective Architecture engaged with the local community at every stage of the design process, ensuring residents were always at the heart of the project. Queens Cross Housing Association also arranged for communication to be distributed in 32 different langauages, ensuring no exclusions or barriers were created.

The proposals have been developed in consultation with the Association's local Community Involvement Group and with the community as a whole



Map of Locations for Community Consultations



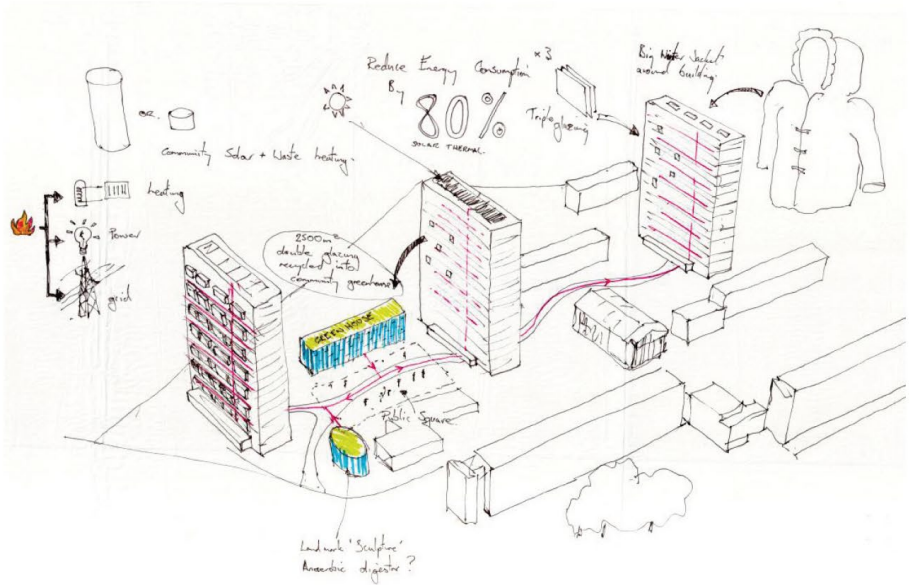
"This options appraisal explores the ambitions of people living in Woodside for their homes and their future. They want to transform their area from a post-industrial corridor between the city centre and the north to a desirable, high quality, vibrant and sustainable local community that draws people in and makes them want to stay."

Shona Stephen
Chief Executive
Queens Cross Housing Association

Woodside Statistic (2012)

- 4000 residents (approx)
- Diverse range of Nationalities
- 32 languages
- Tenants consist of single people, families, asylum seekers, young people from the care system, those who have been homeless, elderly, disabled.
- Community has issues with high unemployment, poverty, isolaton, mental health and people with addictons
- High unemployment 38%
- Benefit dependency 63%
- Income deprived 53%
- Ranked in the bottom 5% of the worst areas of deprivation in Scotland
- Isolaton evident even though close to city centre

Woodside Multi-Storey Towers - before mid 1980's cosmetic external improvements.

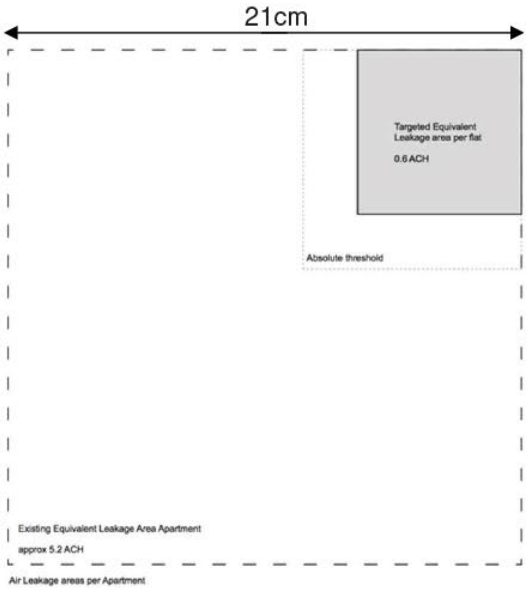


Early sketch detailing a local whole system approach, showing how super efficent buildings can reduce energy consumption

Glasgow – Woodside – Collective Architecture/QCHA

Existing Airtightness

The airtightness strategy was to make use of the existing precast concrete cladding. The square on the left represented with a dashed line indicative of the air tightness of a 3 bedroom flat prior to retrofitting. This is equivalent to having a permanent hole in your wall approximately 20cm x 20cm. To achieve the EnerPHit standard we need to get this down to atleast the size of a post it note.



Airtightness Target – 90% improvement

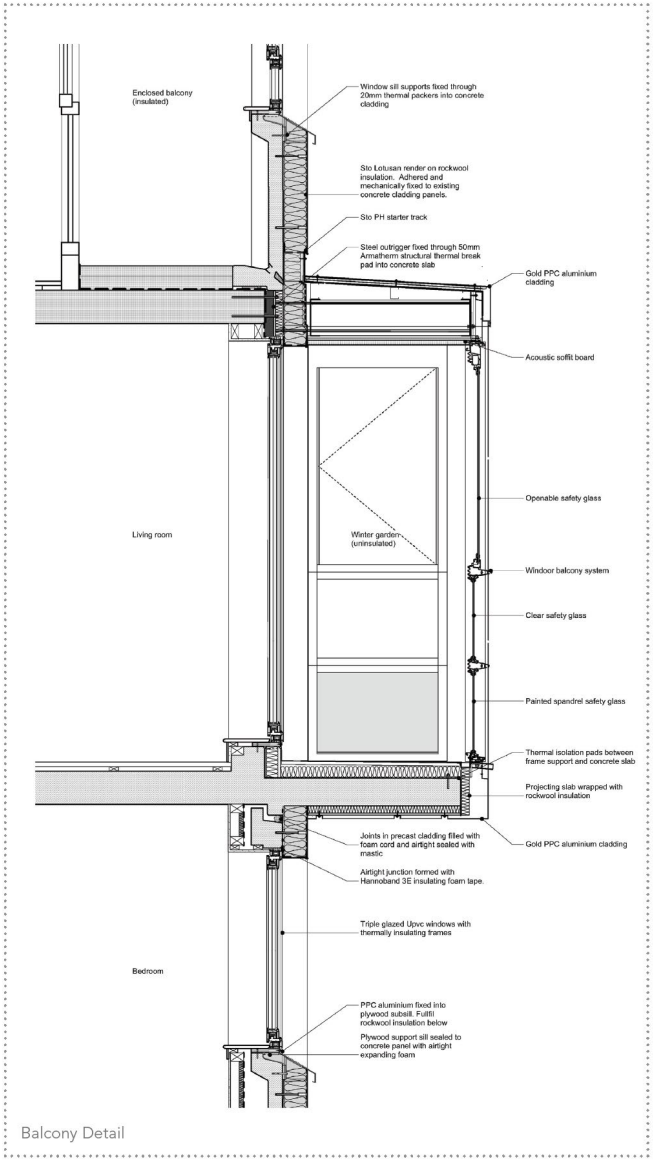
Glasgow – Woodside – Collective Architecture/QCHA

Progress Airtightness

The existing precast concrete cladding panels were considered sufficiently airtight to utilise for the airtight layer of the building. The gaps between the panels and the now redundant weep vents along with any redundant service penetrations were sealed with flexible sealant.

Airtightness jointing – Precast panels

Glasgow – Woodside – Collective Architecture/QCHA



Balcony Detail

Annual CO2 emissions 28kgCO2/m²

Overall area-weighted U-value 0.36W/m²k

External render

Airtightness

[Passivhaus EnerPHit]

70% operational savings

Ongoing monitoring GSA

https://vimeo.com/418531581

Community

https://retrofitworks.co.uk/community-groups/

https://www.warmworks.co.uk/

https://arbedambyth.wales/eng/home.html

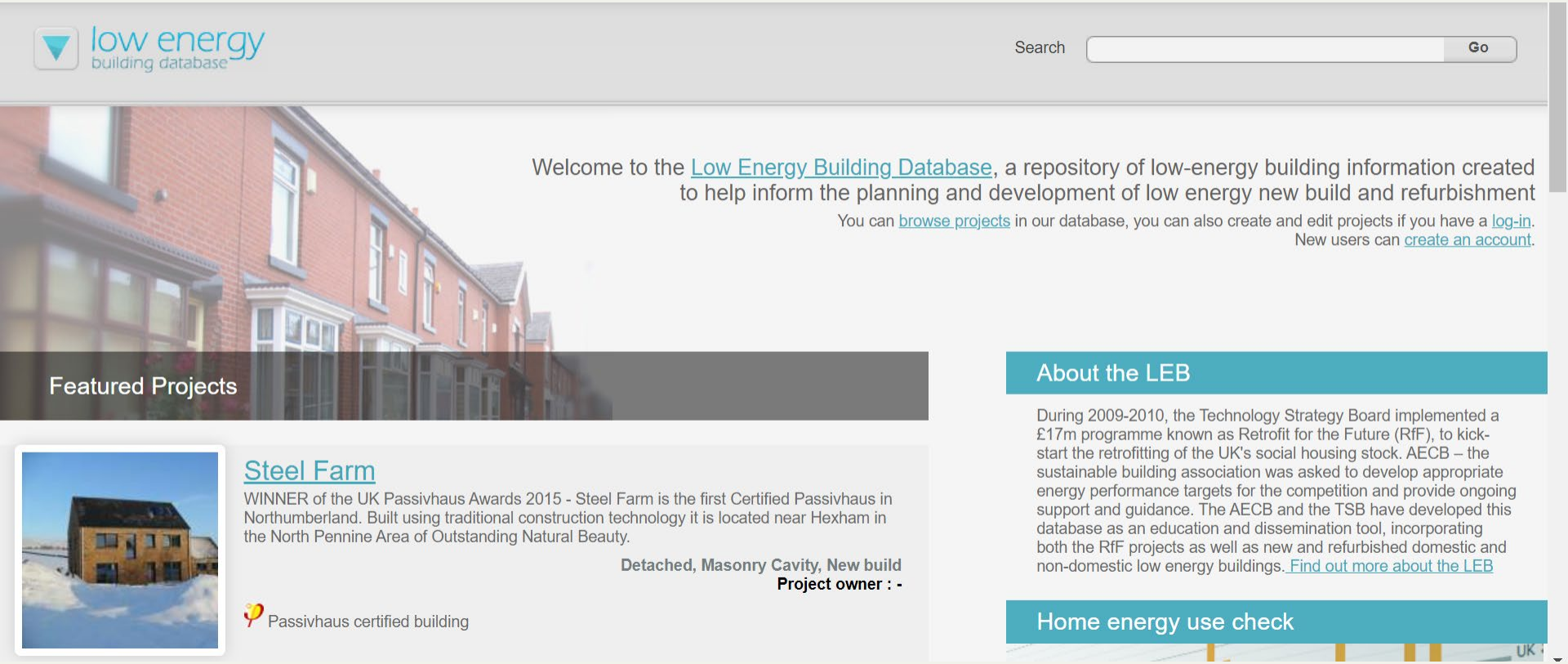
https://www.futureproof.uk.net/

https://carbon.coop/

Community

https://www.energiesprong.uk/projects/nottingham

Community

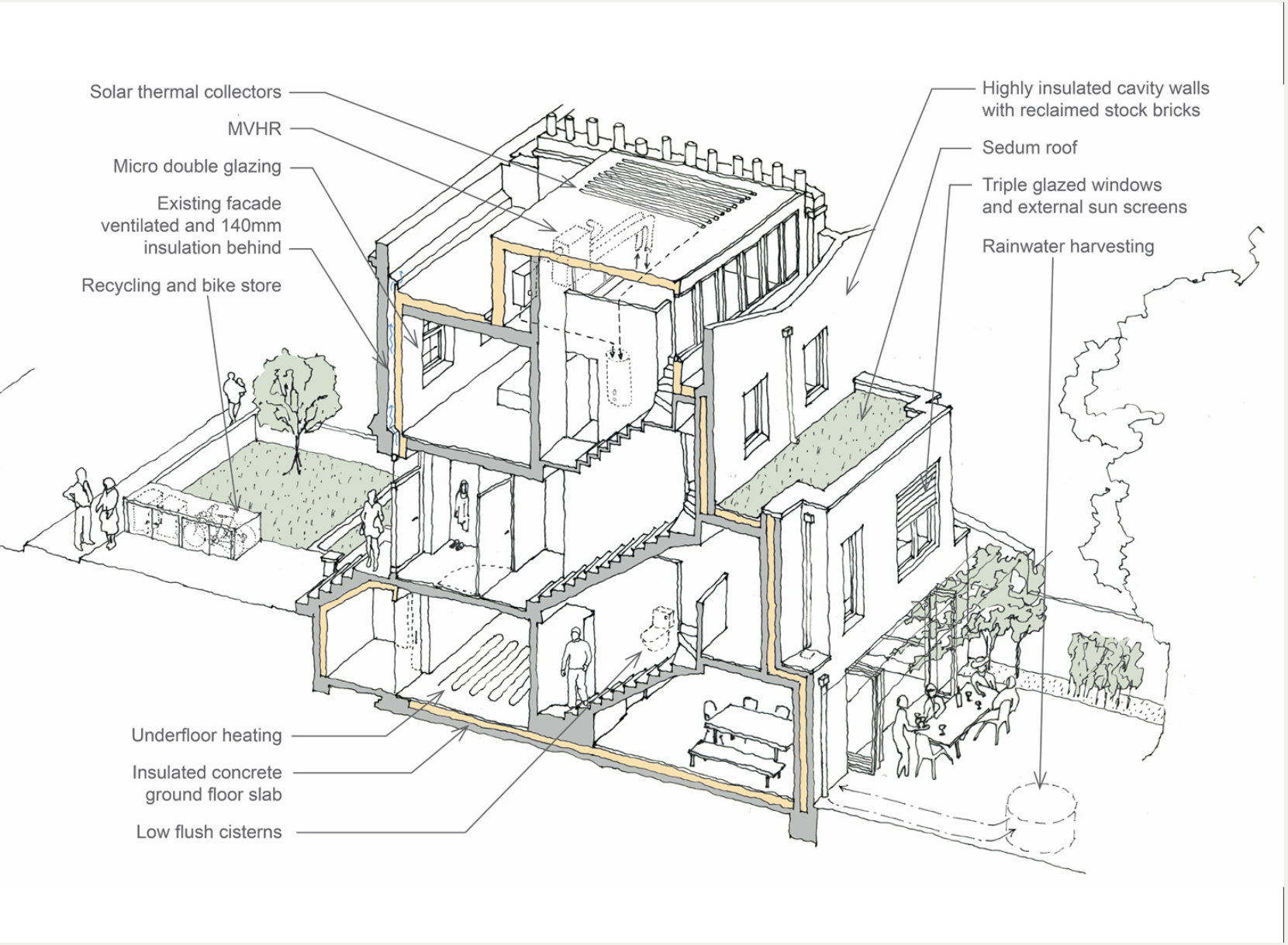


https://www.lowenergybuildings.org.uk/

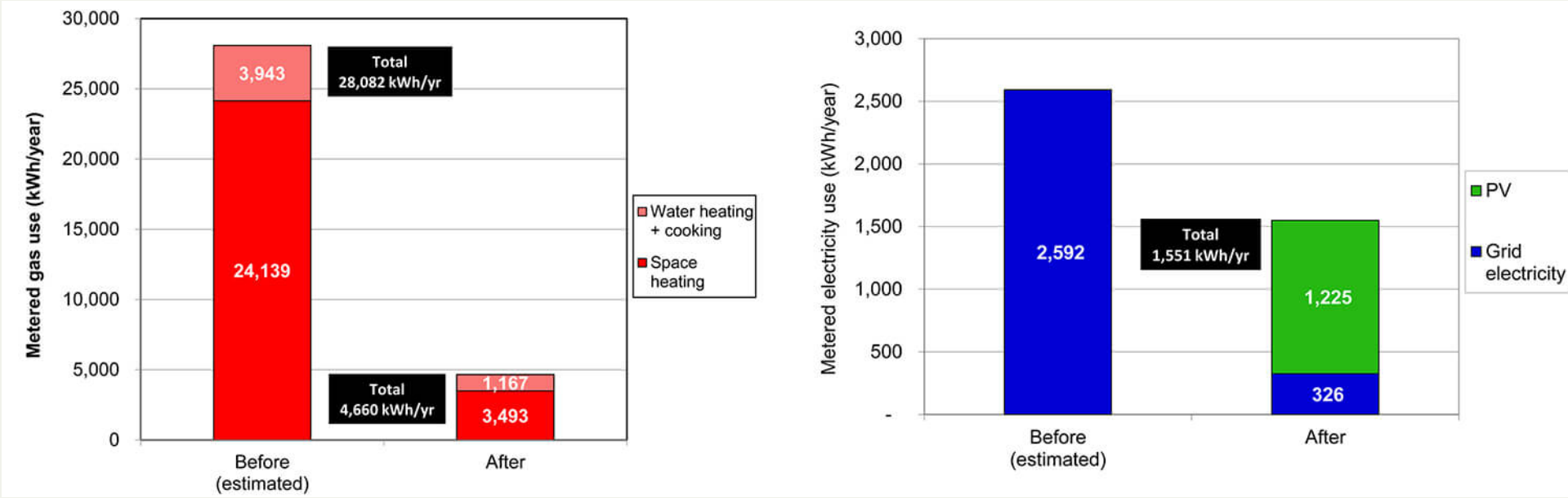
Community

http://www.prewettbizley.com/-built-projectretrofit-for-the-future-house-index

80% House – Prewett Bizley Architects



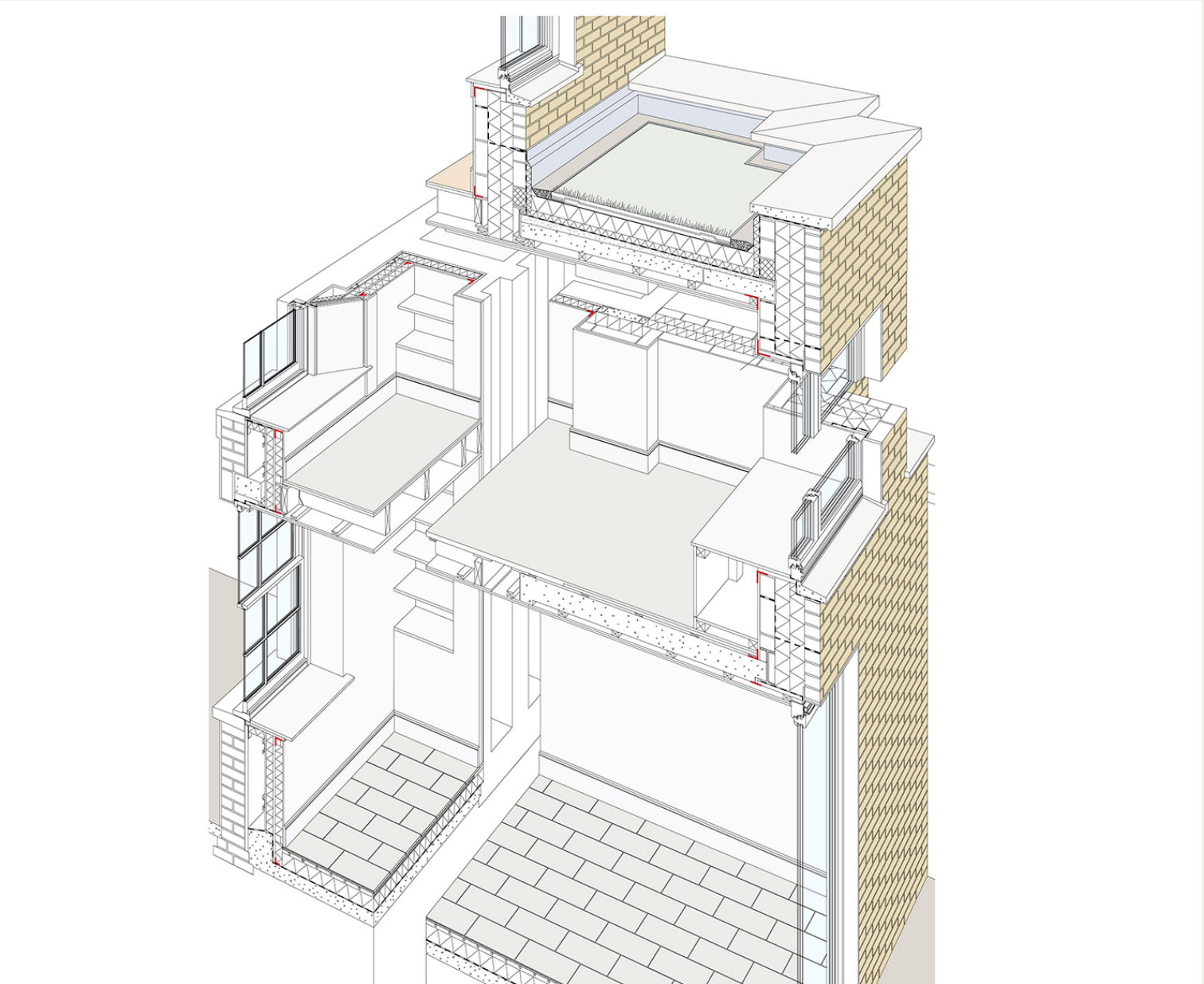
80% House – Prewett Bizley Architects



The house achieves an 80% reduction in CO_2 emissions, primarily by incorporating high levels of insulation and achieving an air tightness of 1.1 ach @ 50 Pa, very close to the EnerPHit. Fresh air is supplied by an MVHR (mechanical ventilation heat recovery) system. A photovoltaic array on the roof with a 1000 kWh/a output provides a little over half the annual electricity requirement.

http://www.prewettbizley.com/built-project-80-house-index

80% House – Prewett Bizley Architects



80% House – Prewett Bizley Architects

http://www.prewettbizley.com/built-project-80-house-index

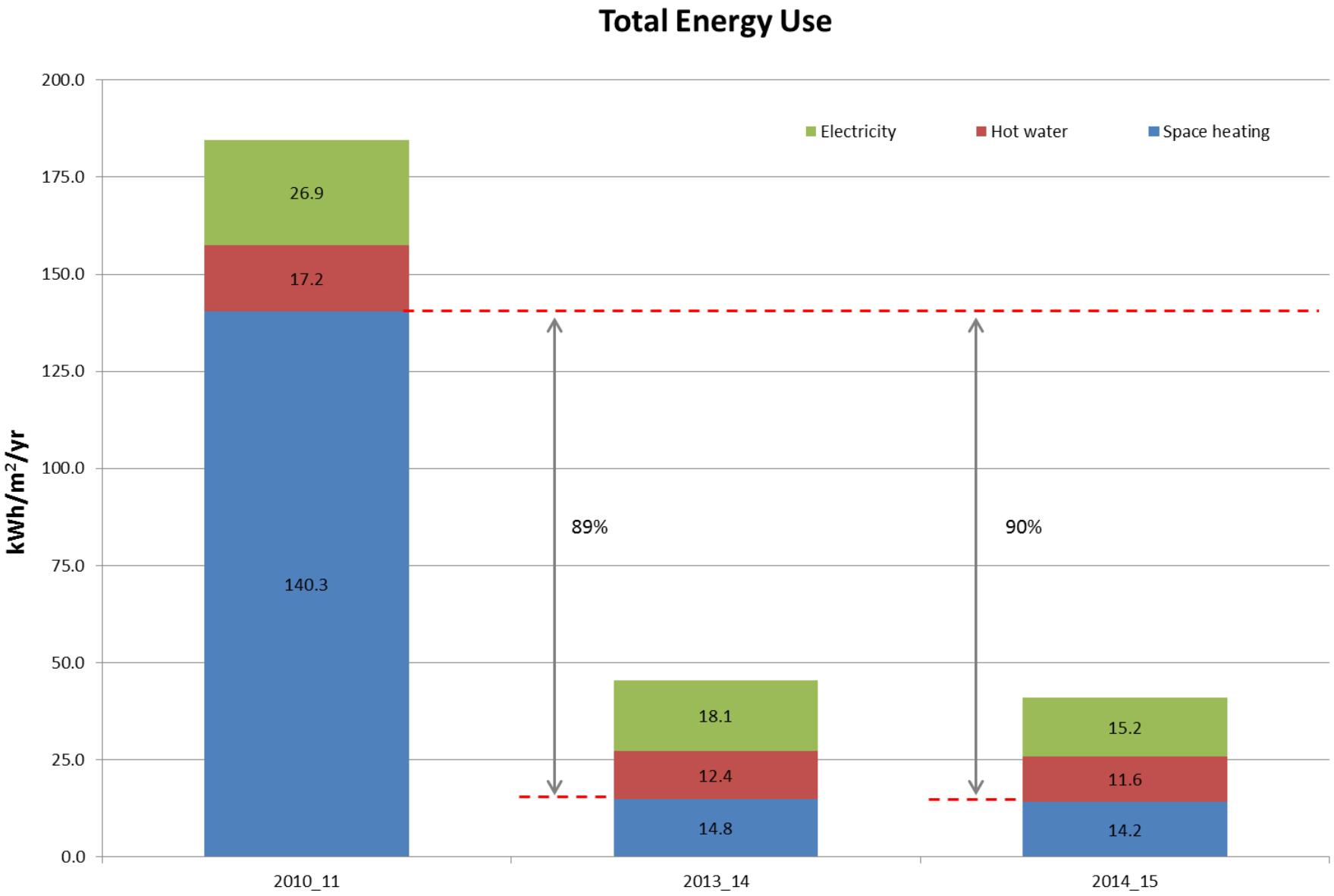
Four Walls

- Built in 1962
- Construction:
  - masonry cavity walls
  - timber roof with concrete tiles
  - mix of floor types, including suspended timber and cast in-situ concrete
- Insulation:
  - none, except 50mm glass fibre to loft

Four Walls

- Thermal bridge ‘features’ included:
  - concrete gutters
  - concrete balcony
  - external concrete access stairs
- Previous improvements:
  - replacement of most windows with uPVC double glazing
  - replacement boiler to an A-rated unit

Four Walls


Total Energy Use
Electricity
Hot water
Space heating
kWh/m²/yr
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
26.9
17.2
140.3
89%
90%
18.1
12.4
14.8
15.2
11.6
14.2
2010_11
2013_14
2014_15

Four Walls

External Wall Insulation

second layer of insulation overlaps timber sub-frame for windows

2 layers of 60mm modified resin insulation boards.

Bonded arrangement with second layer offset to overlap joints & gaps

Four Walls

External Wall Insulation

http://www.fourwalls-uk.com/

Calculated wall U-values:

Existing - original
1.42 W/m^2.K

Existing – improved
0.12 W/m^2.K

Extension
0.14 W/m^2.K

Timber infill
0.09 W/m^2.K

In-situ measured wall U-values:

Extension
0.135 W/m^2.K

Four Walls

http://www.fourwalls-uk.com/

DISCUSSION

KATE WATSON & IAN MAWDITT

Q & A

https://cat.org.uk/events/eco-refurbishment/

https://cat.org.uk/info-resources/free-information-service/eco-renovation/eco-retrofit/

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