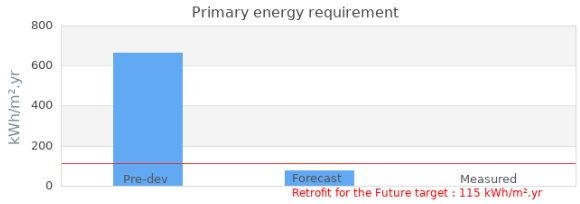
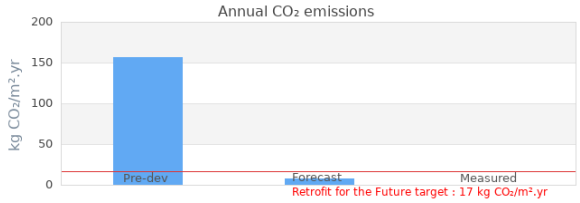
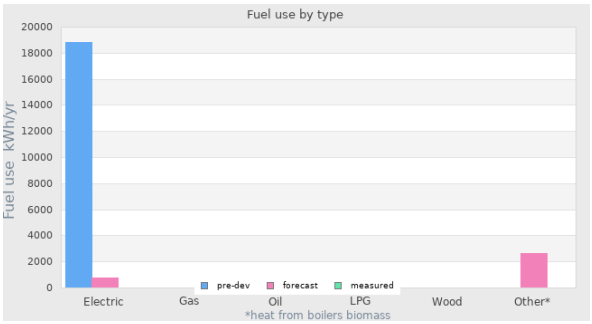
https://www.lowenergybuildings.org.uk/

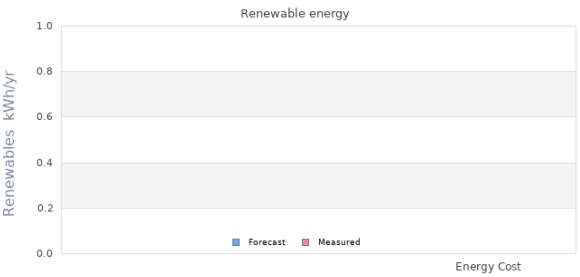
Project name Barbrook PassivHaus Retrofit

Project summary Retrofit 2 semi-detached properties to PassivHaus standard.









Project Description

Projected build start date	01 Apr 2010
Projected date of occupation	01 Sep 2010
Project stage	Under construction
Project location	Barbrook, Devon, England
Energy target	Retrofit for the Future
Build type	Refurbishment
Building sector	Public Residential
Property type	Semi-Detached
Existing external wall construction	Other
Existing external wall additional information	Poured concrete, reinforced steel, asbestos pannelling on exteri
Existing party wall construction	Solid
Floor area	71 m²

Floor area calculation method	SAP

Project team

Organisation	Energy Action Devon
Project lead	Sophie Phillips
Client	North Devon Homes
Architect	Clive Jones Ltd
Mechanical & electrical consultant(s)	TBC
Energy consultant(s)	Phase 1: Rob McLeod, BRE, Phase 2: Sally Johns, WARM
Structural engineer	Gavin Jones and Curtins
Quantity surveyor	Rod Burton, Pick Everard (in Phase 1)
Other consultant	
Contractor	Richardson

Design strategies

Planned occupancy	2-3 people, out to work or school for part of the day on weekdays.
Space heating strategy	Mini-district heating system from single external wood pellet boiler connected to two 300l thermal stores - one in each dwelling. Mechanical heat recovery ventilation, with post heating coil from solar thermal. Distribution system TBC at detailed design stage.
Water heating strategy	3m2 evacuated tube solar thermal for summer. Wood pellet boiler for winter. Electric immersion back up.
Fuel strategy	Site is not connected to mains gas network. Wood pellets, solar thermal and mains electricity.
Renewable energy generation strategy	The properties back onto the West Lyn river, where there is potential for hydro. However, North Devon Homes do not own a long enough stretch for this to be viable. Lynton Community Development Trust is well underway with the development of a much larger scheme which we intend to support. When operational NDH will purchase electricity from the new ESCo. The East/West alignment and shady valley floor location mean both wind and PV are unfeasible. We are using the small area of south facing hip roof for solar thermal.

Passive solar strategy	Limited oppotrunities for passive solar due to site location and orientation. New triple glazed roof lights, front and back on both dwellings, were planned but after modelling in PHPP we have decided against these.
Space cooling strategy	Natural ventilation during cooling season. MVHR otherwise. Existing poured concrete walls retained within thermal envelope as thermal store to smooth temperature fluctuations.
Daylighting strategy	Maximise daylight, very limited because of East/West alignment and heavy overshading from steep wooded valley sides. Kitchens achieve a minimum average daylight factor of at least 2%. Living rooms to achieve average daylight factor of at least 1.5%. Use mirrored tiles in in window surrounds in kitchen and bathroom. Deep external wall insulation system has also reduced daylight.
Ventilation strategy	High efficiency MVHR system with post air heating coil. Openable windows (summer)
Airtightness strategy	External airtight barrier created by parging the external walls to below ground level and lining this continuous airtight barrier with 18mm tape sealed OSB. Over existing roof structure 1 m3/m2 .hr @q50 (design target)
Strategy for minimising thermal bridges	Complete overinsulation of existing structure to create thermal bridge free design, including new roof construction. Junctions assessed using PHPP include: Ground floor junction, external corner, party wall, party roof, party floor, eaves, verge, window jamb, head and sill, door jamb, head and threshold.
Modelling strategy	Whole house modelling undertaken using SAP 2005 and PHPP 2007, to include local weather data, interstitial condensation analysis.
Insulation strategy	Externally fit 300mm Warmcel 500 insulation in new OSB frame (U-value of 0.13 W/m2K). Create new warm roof structure incorporating 350mm Warmcel 500 (U-value of 0.1 W/m2K). Excavate existing ground floor slab and replace to include 220mm XPS board. Perimeter insulation to 1m depth.

Other relevant retrofit strategies	MVHR extract air drying rooms in both houses to obviate the need for tumble driers. To use locally sourced labour and sustainable materials wherever possible - Eg Warmcel 500, FSC OSB etc. To allow tenants input in interior design decisions, and engage them in the entire build process. To heat meter the tenants individually and evaluate this approach to billing where North Devon Homes becomes the ESCo, to assess this is light of the RHI from April 2011. To use the site as a training and demonstration site wherever possible to build new skills and partnerships, Eg invite other housing providers to site to watch installation and network with contractors, deliver training to contractors and potential new specialist suppliers etc.
Other information (constraints or opportunities influencing project design or outcomes)	Site is within Exmoor National Park, fortunately the planning authority are forward thinking and have been very supportive and interested in this proposal. Site has limited external space, minimal south facing roof, at the bottom of a steep sided, wooded valley. Site is not connected to mains gas and lack of opportunities to generate electricity on site mean we will need to purchase mains electricity until the Lynton Community Hydro ESCo is operational.

Energy use

Fuel use by type (kWh/yr)

Fuel	previous	forecast	measured
Electric	18830	798	
Gas			
Oil			
LPG		462	
Wood			
heat from boilers biomass		2668	

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m².yr)	157	9	-
Primary energy requirement (kWh/m².yr)	663	77	-

Renewable energy (kWh/yr)

Renewables technology	forecast	measured
-		
-		
Energy consumed by generation		

Airtightness (m³/m².hr @ 50 Pascals)

	Date of test	**Test result**
Pre-development airtightness	24 Mar 2010	8.5
Final airtightness	22 Jul 2011	0.93

Annual space heat demand (kWh/m².yr)

	Pre-development	forecast	measured
Space heat demand	-	12.9	-

Whole house energy calculation method	SAP Extension for Whole House
Other energy calculation method	
Predicted annual heating load	-
Other energy target(s)	

Building services

Occupancy	NULL
Space heating	NULL
Hot water	NULL
Ventilation	NULL
Controls	NULL
Cooking	NULL
Lighting	NULL
Appliances	NULL
Renewables	NULL
Strategy for minimising thermal bridges	NULL

Building construction

Storeys	
Volume	
Thermal fabric area	
Roof description	NULL
Roof U-value	0.00W/m² K
Walls description	NULL
Walls U-value	0.00W/m² K
Party walls description	NULL

Party walls U-value	0.00W/m² K
Floor description	NULL
Floor U-value	0.00W/m² K
Glazed doors description	NULL
Glazed doors U-value	0.00W/m² K
Opaque doors description	NULL
Opaque doors U-value	0.00W/m² K
Windows description	NULL
Windows U-value	0.00W/m² K
Windows energy transmittance (G-value)	
Windows light transmittance	
Rooflights description	NULL
Rooflights light transmittance	
Rooflights U-value	0.00W/m² K

Project images