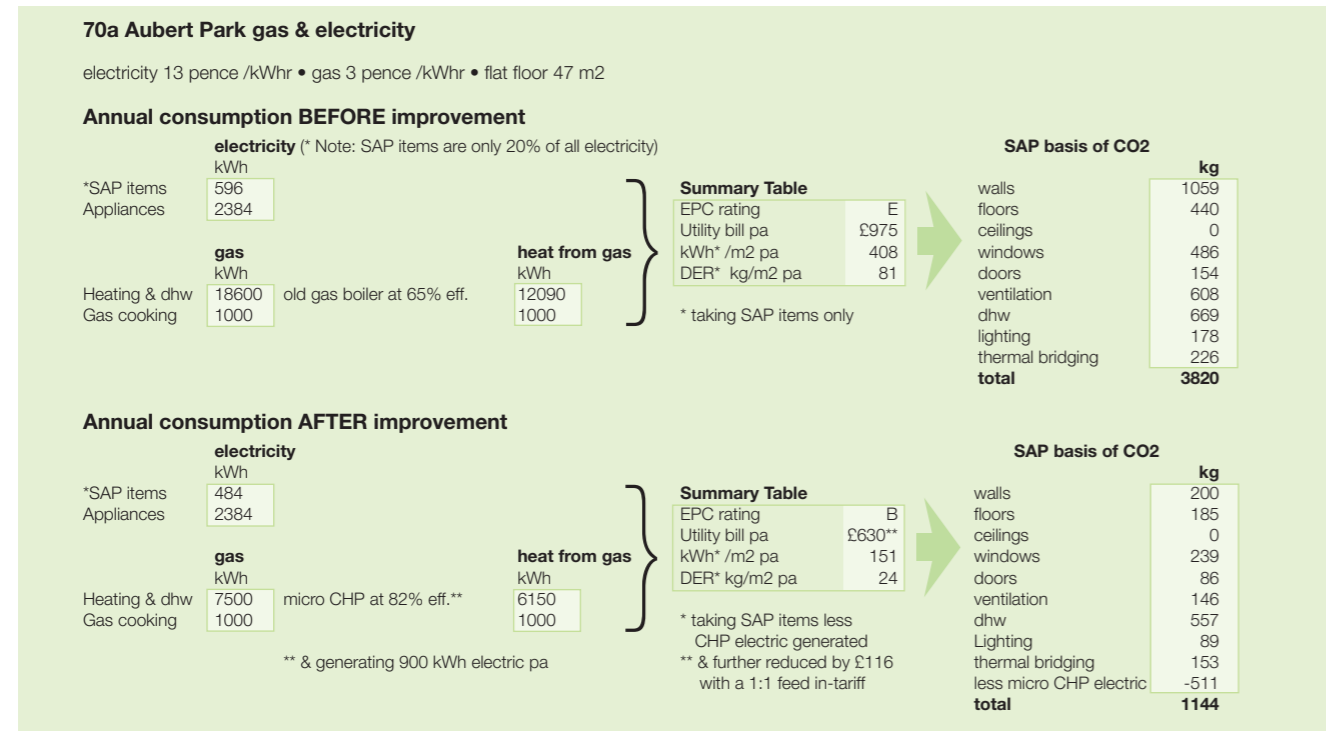


Utility bills

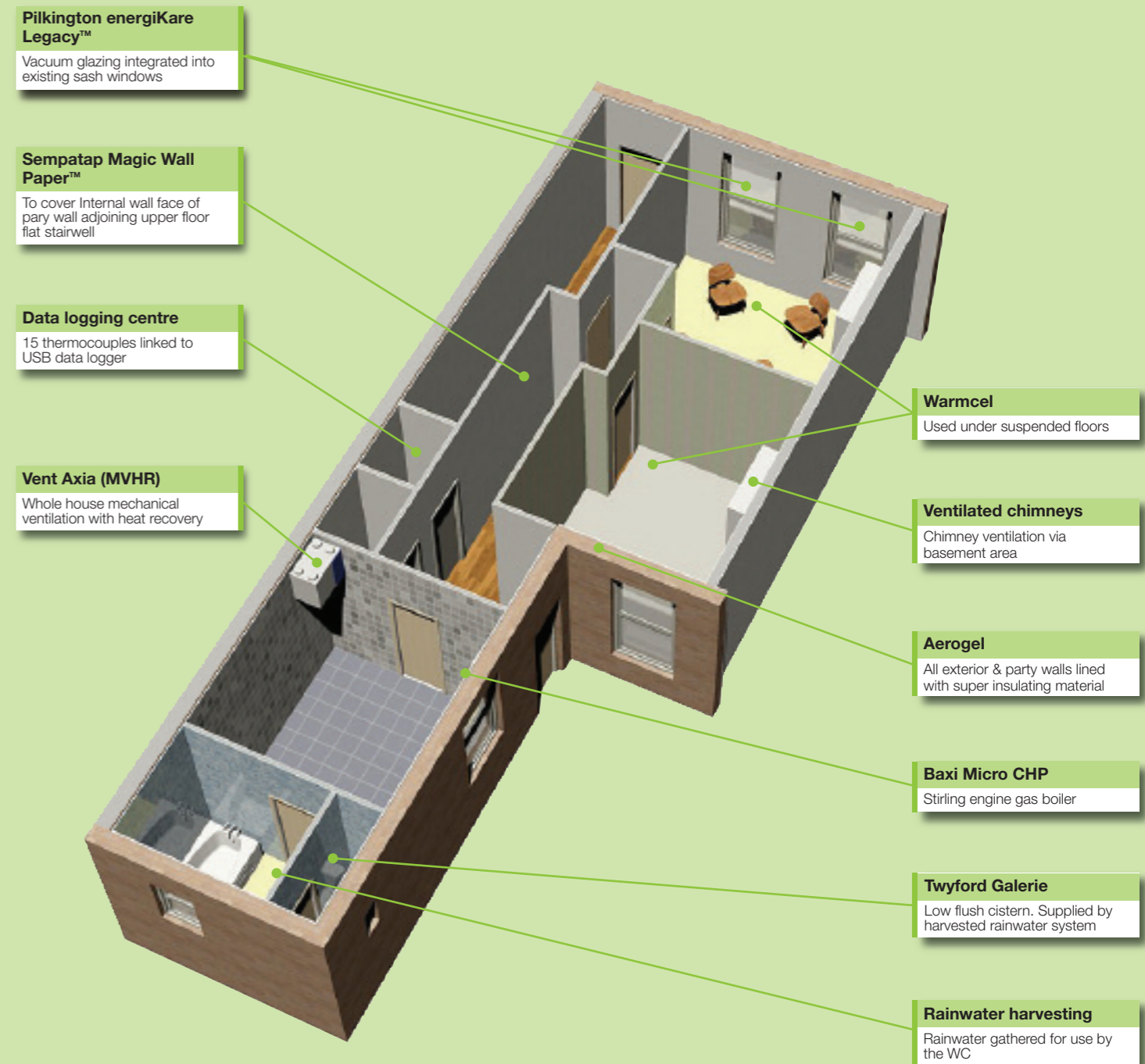
SAP enables us to calculate the theoretical before/after electricity & gas demand. SAP doesn't include appliances but from the Energy Savings Trust we can estimate them as being typically 80% of the electricity bill - and hence get the total utility consumptions



The residents' bills fall from £975 to about £630, but in addition with micro CHP we generate & return almost 900 kWhr to the grid. With a feed in-tariff of 1:1 this gives the resident a further £116 off their bill

Conclusions & Lessons learned

- A major eco refurbishment can be done along with Decent Homes by extending the work programme by approximately 5 days
- The measures (with the exception of 'floor insulation') we believe we can do with the tenant in residence
- Many lessons were learned in the cutting and fixing of Aerogel, and Off-site preparation of this insulation is essential to avoid dust issues
- Meeting the Part L1B demand of 0.35 U value when thermally improving a solid wall is a tough call
- Aerogel halves the internal intrusion of the insulation layer compared with traditional insulation materials thus maximising usable floor area
- Several measures (eg thermal bridging insulation) have no carbon saving under SAP and should therefore be avoided in strict "value carbon terms"
- Mechanical ventilation heat recovery is very expensive and saved little carbon
- If E rated fridge and washing machine are replaced by A rated, that saves a further 5% carbon at low cost.
- Substantial carbon saving (50%) can be achieved economically. But high savings become expensive. eg a 70% saving costs 3 x more than a 50% saving
- Carbon saving cost effectiveness of the different measures vary by a factor of 80:1 in performance from best to worse.



Location

70a Aubert Park, Islington, N5 1TS

Property

Victorian ground floor terraced street property flat with 13" and 9" solid brick external walls and timber sash windows. 1 Bedroom with total floor area of 47m². Not in a conservation area but not suitable for external insulation.

Owners

LB Islington / HFI

Works

Decent Homes improvement by United House under the LBI PFI 2 scheme. Eco refurbishment leading to 70% carbon saving. Decent Homes & Eco work streams done in conjunction, but with void occupancy.

Description of the eco improvements

There was no proscribed carbon saving target, instead the focus was to maximise the carbon benefit for every £ spent. That meant extensive survey, detailed analysis of the data & careful selection of the improvement measures... a process we call 'Value Carbon'. In addition we featured some innovative materials & equipment and used them for the first time; though we also avoided those 'green toys' which gather headlines but have dubious effectiveness. '24 improvement measures' were eventually employed in the flat and the carbon saving assessments were based on SAP.

- 1 Boiler Baxi micro CHP Stirling engine gas boiler
- 2 Living room Warmcel Insulate under suspended floor
- 3 Living room Aerogel Insulate 13" Solid external wall
- 4 Living room Aerogel Insulate return party wall (thermal bridge)
- 5 Living room Aerogel insulate wall to common entrance hall
- 6 Living room Vacuum glazing of Sash windows
- 7 Bedroom Warmcel Insulate under suspended floor
- 8 Bedroom Aerogel insulate 13" Solid external wall
- 9 Bedroom Aerogel Insulate return party wall (thermal bridge)
- 10 Hall Warmcel Insulate under suspended floor
- 11 Hall Aerogel Insulate 9" Solid external wall
- 12 Hall Aerogel Insulate bedroom wall (thermal bridge)
- 13 Hall Magic Wallpaper Insulate partition to neighbour
- 14 Hall New door to garden, double glazed & draught stripped
- 15 Kitchen Aerogel Insulate 9" Solid external wall
- 16 Bathroom Aerogel Insulate 9" Solid external wall
- 17 Bathroom Aerogel Insulate party wall (Thermal bridge)
- 18 WC Aerogel Insulate 9" Solid external wall
- 19a Draught proof Reduce ventilation (chimneys)
- 19b Draught proof Reduce ventilation (doors, windows and cracks)
- 20 MVHR Mechanical ventilation heat recovery system
- 21 Lighting Low energy lighting throughout
- 22 Measure & calc BRE assessment, sensors/data logging, before/after AP & thermal image tests
- 23 Rain harvest Rain water harvesting system
- 24 WC low flush 2/4 litre pan, fed by rain water

Before



Claims Summary

24 eco improvement measures were made to this 'difficult to treat' Victorian social housing ground floor flat

	Before tonnes pa	After tonnes pa	Saving tonnes pa	Saving %age
Carbon pa	3.8	1.1	2.7	70%
Capital cost		£22k*		£8/kg pa
Tenants fuel bill pa	£975	£630		35%
dwelling EPC rating	E	B		

* but 50% carbon saving costs just £7k

- (i) **The first use of 'Value Carbon' assessment**
A United House method of eco-assessment measuring carbon saved against money spent - ensuring budgets are used to best effect. Carbon was assessed independently by BRE
 - (ii) **The first Decent Home contract to include full eco-refurbishment**
Property was void but 'tenant in-place' working practices have been learned, with a 5 day extension to Decent Homes programme now being possible
 - (iii) **The first Aerogel insulation to be fitted in London**
Twice as efficient as the best insulation used today
 - (iv) **The first Baxi microCHP unit in London**
The ultimate gas boiler, fuelled by gas & generates heat and electric. Power sold back to the grid.
 - (v) **The first housing refurbishment with Pilkington energiKare™ Legacy vacuum glazing**
Has appearance of single glazing, but 2 panes are separated by a vacuum of just 0.2mm - that's 1/100th of the normal double glazing gap with better insulation
- "This is the first time that sustainable practices have been combined with value engineering and the result is fantastic. It's a real exemplar in sustainable retrofitting and the fact that it can be achieved at a decent cost and on a large scale means that social housing providers are now leading the way in cutting carbon."* John Duggart, Chairman of the Sustainable Energy Academy

Value Carbon

In all 24 measures were assessed for their installed cost and for their carbon saving effectiveness. They were then ranked in a table in order of effectiveness. There is an 80:1 difference between the most & least effective measures; this clearly illustrates the green saying of 'get it right and save 70%, get it wrong and save 17%'

The best 6 measures give 50% carbon saving and cost £7k; the next 4 measures bring the cost to £9k and the saving to 60%; the next 8 take the cost to £22k and the saving to 70%.

The remaining 7 measures do nothing for carbon saving but increase the cost to £30k

Value Carbon analysis of the 24 eco improvement measures at 70a Aubert Park

Improvements ranked as 'Value Carbon' (best to worst)

		Cumulative cost & effects of the improvements					
		£installed cost	kg saved pa	% CO2 saved pa	kWh saved pa	fuel bill saving pa	EPC (initially E)
Lighting	Low energy lighting throughout						D
Draught proof	Windows & sealing cracks/gaps					£50	D
Draught proof	Ventilate chimney to basement	£1,000		10%			C
Hall	Aerogel Insulate 9" Solid external wall				2000		C
Boiler	Baxi microCHP (inc 10yr maintenance)		1750	50%		£200*	C
WC	Aerogel Insulate 9" Solid external wall	£7,000					C
Bathroom	Aerogel Insulate 9" Solid external wall						C
Kitchen	Aerogel Insulate 9" Solid external wall		2100		8000		C
Living room	Vacuum glazing of Sash windows					£275	B
Living room	Aerogel Insulate 13" Solid external wall	£9,000		60%	9000		B
Living room	Aerogel insulate wall to common entrance hall					£300	B
Hall	New door to garden, double glazed & draught stripped	£10,000					B
Bedroom	Aerogel insulate 13" Solid external wall						B
Living room	Warmcel Insulate under suspended floor	£13,000	2500	65%			B
Bedroom	Warmcel Insulate under suspended floor						B
Hall	Warmcel Insulate under suspended floor						B
Hall	Magic Wallpaper Insulate partition to neighbour						B
MVHR	Heat recovery ventilation (inc 10yr maintenance)	£22,500	2670	70%	11000	£350	B
Living room	Aerogel Insulate return party wall (Thermal bridge)						B
Bedroom	Aerogel Insulate return party wall (Thermal bridge)						B
Hall	Aerogel Insulate bedroom wall (Thermal bridge)	£24,000					B
Bathroom	Aerogel Insulate party wall (Thermal bridge)						B
Measure & calc	BRE assess, sensors/datalog, before/after AP & thermal image tests	£29,000					B
Rain harvest	Rain water harvesting system						B
WC low flush	2/4 litre pan, fed by rain water	£30,000	2670	70%	11000	£350	B

* with no £ allowance for returned electric to the grid

Additional supplementary improvements

		Cost & effect of individual improvements				
		£installed cost	kg saved pa	% saved pa	kWh saved pa	fuel bill saving pa
White goods	Replacing an E rated washer with an A rated washer	£354	97	3%	230	£30**
White goods	Replacing an E rated fridge with an A rated fridge	£472	76	2%	180	£23**
Draught sealing	Reducing the Air Permeability (AP) by 1 point	£300	12	0.4%	82	£3
Changing habits	Tenants reducing their room temp by 1C	£0	130	3%	670	£20
Changing habits	Tenants reducing their hot water use by 10%	£0	33	1%	170	£5

** Data from EST website <http://www.energysavingtrust.org.uk/calculator/checklist>

Measurement & Instrumentation

The carbon savings were calculated using SAP and verified by BRE. Manufacturers' data was used to quantify the savings potential of the micro CHP.

Thermal image photographs and air permeability tests (AP) were done on the flat before the work started; and they were done again afterward. Also 15 thermocouples are embedded in the dwelling linked to a data logger to gather performance data.

The rain water system is metered to establish how much harvested water is used compared with potable water for toilet flushing.

After

Electricity generated and exported from the micro CHP are measured. All electricity, gas and water consumption readings will be taken monthly once fully occupied.

Rain water gathering

Rain water is collected, via a leaf filter, from a down pipe into a gathering tank. An adjacent mains water tank ensures the gathering tank maintains a minimum level for adequate supply to the WC.

Surplus rainwater from the gathering tank fills an external rainwater butt.