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Alex Hunt
Partner
Bright Green Homes

Domestic Eco-Renovation

local examples
financing and funding

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Who are we?

We have been conducting energy assessments, architectural services and eco-retrofits around Brighton & Hove since 2009

An Architect and Code for Sustainable Homes Assessor/Project Manager family business combine to make the planet a better place – one building at a time.

AECB building knowledge

THE Green REGISTER OF CONSTRUCTION PROFESSIONALS

FEDERATION OF MASTER BUILDERS Est. 1941 fmb.org.uk

TRUSTMARK Government Endorsed Quality

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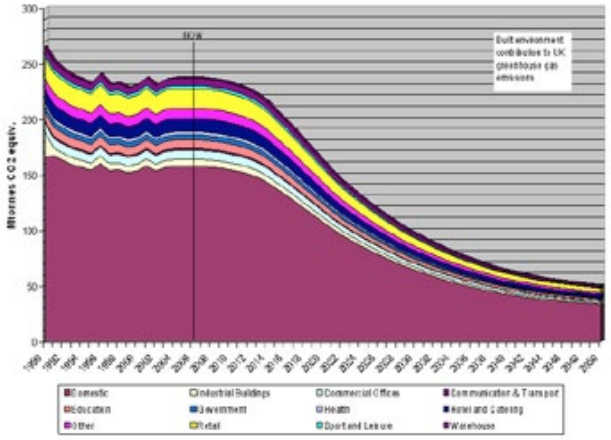
Climate Change & Regulation

- The 2008 Climate Change Act requires the UK to reduce its carbon emissions by 80% by 2050 against a 1990 baseline

- The average household in the UK produces over ten tons of carbon dioxide per year from energy use in the home, consumption of food and products and transport. Under the new target this will need to be 8 tons by 2020 and 2 tons by 2050



DCLG - contribution of residential sector to CO2 levels 1990 - 2050

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Energy Efficiency

- Why?
  - UK has targets to reach of 80% reduction in CO_2 by 2050
  - Approx. 35% of all carbon emissions from built environment
  - 27 million homes in UK, 7 million refurbishments by 2020 – 116,000 refurbishments a month!
  - The average home emits over 5 ½ tons of CO_2 into the atmosphere every year

5 ½ Tonnes? That's equivalent to 275,000 miles on a train - Or 11 times around the world!

What drives Eco - Renovation / Eco Refurb / Eco Retrofit / Sustainable Refurbishment

- Drivers
  - Climate Change
  - Energy Price increase
  - Regulation
  - Comfort
- Measurement
  - SAP
  - Passivhaus
  - Home Energy Masterplan

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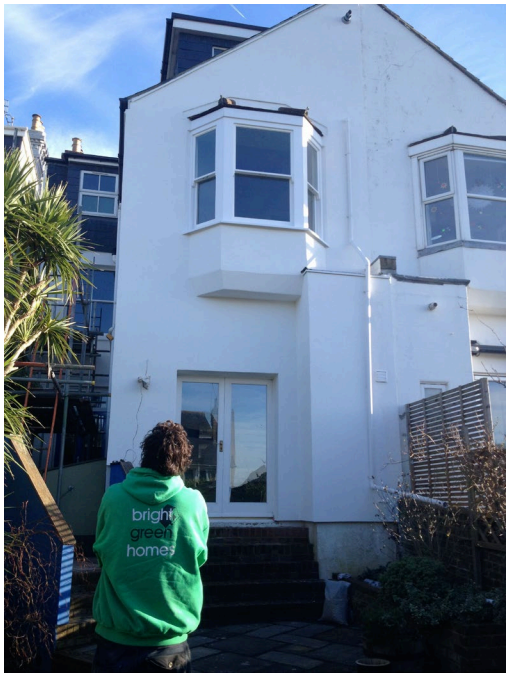
Examples of Privately funded Eco-renovations



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Key Steps

- Initial Measurement & Assessment
- Motivations for clients Eco-renovation
- Design Process
- Pricing
- Value Engineering
- Project Management
- Delivery

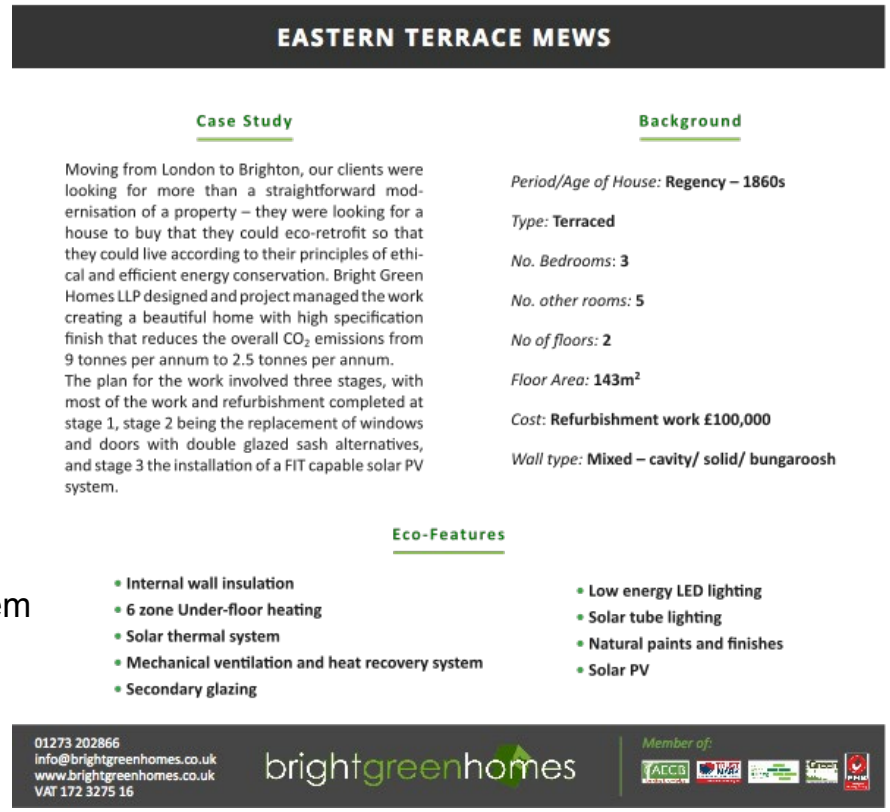
CASE STUDY 1:
Eastern Terrace Mews

Background

Period / Age of House: Regency 1860s
Type: Terraced
No. Bedrooms: 3
No. other rooms: 5
No. floors: 2
Floor Area: 143 m2
Cost: refurbishment work £100,000
Wall - mixed - cavity/solid/bungaroosh

Features

Internal wall insulation
6 zone Under-floor heating
a solar thermal system
a mechanical ventilation and heat recovery system
low energy LED lighting
solar tube lighting
natural paints and finishes



EASTERN TERRACE MEWS

Case Study

Moving from London to Brighton, our clients were looking for more than a straightforward modernisation of a property – they were looking for a house to buy that they could eco-retrofit so that they could live according to their principles of ethical and efficient energy conservation. Bright Green Homes LLP designed and project managed the work creating a beautiful home with high specification finish that reduces the overall CO_2 emissions from 9 tonnes per annum to 2.5 tonnes per annum.
The plan for the work involved three stages, with most of the work and refurbishment completed at stage 1, stage 2 being the replacement of windows and doors with double glazed sash alternatives, and stage 3 the installation of a FIT capable solar PV system.

Background

Period/Age of House: **Regency – 1860s**

Type: **Terraced**

No. Bedrooms: **3**

No. other rooms: **5**

No of floors: **2**

Floor Area: **143m²**

Cost: **Refurbishment work £100,000**

Wall type: **Mixed – cavity/ solid/ bungaroosh**

Eco-Features

- Internal wall insulation
- 6 zone Under-floor heating
- Solar thermal system
- Mechanical ventilation and heat recovery system
- Secondary glazing
- Low energy LED lighting
- Solar tube lighting
- Natural paints and finishes
- Solar PV

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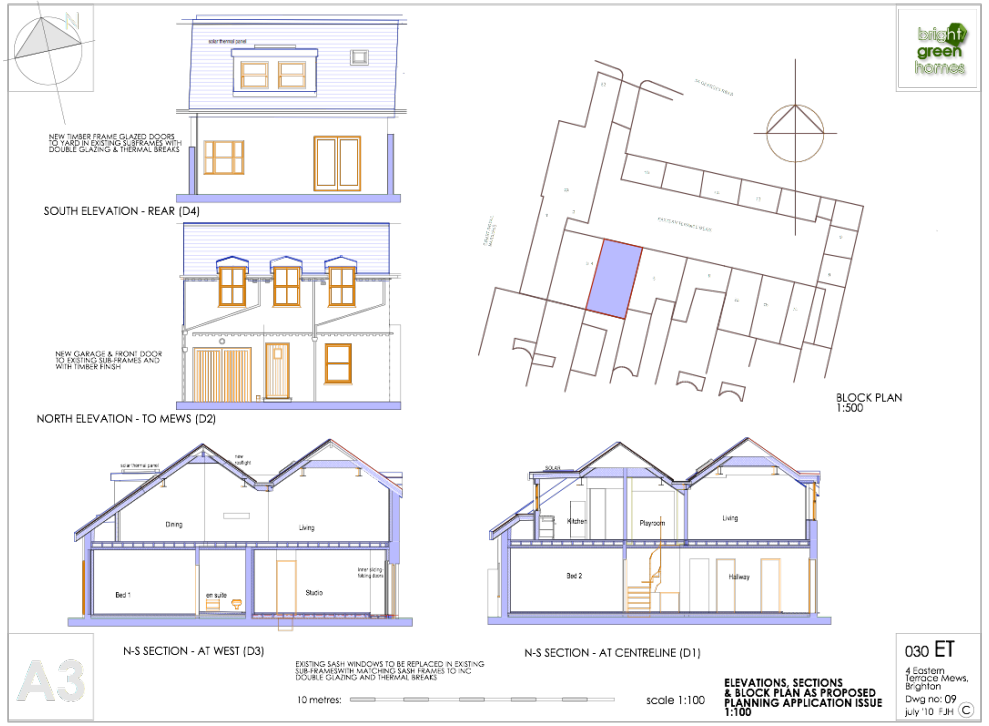
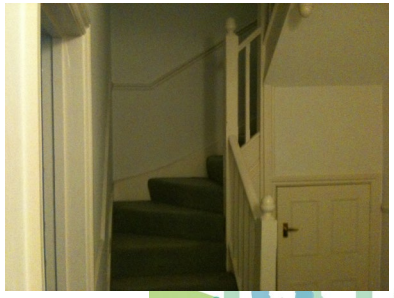
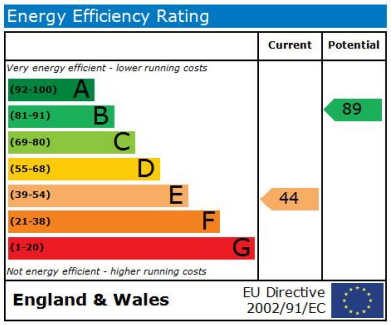
CASE STUDY 1:
Eastern Terrace Mews

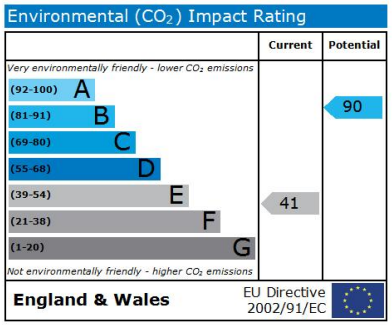
Stage 1 - Assessment & Design

- Site Visit
- As Existing Drawings
- U value Calculations
- SAP Calculations
- Home Energy Report
- Planning Application
- Heritage Statement





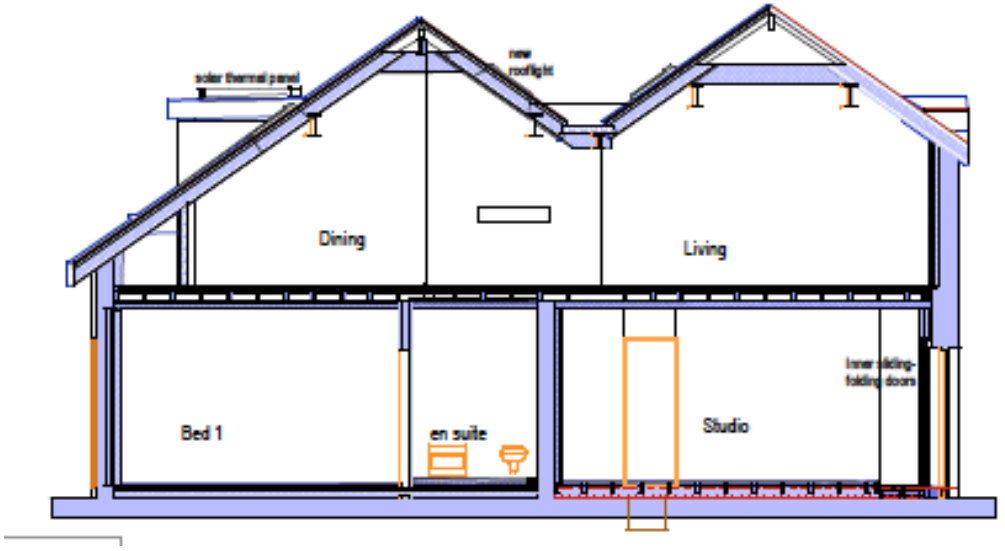




CASE STUDY 1:
Eastern Terrace Mews

Challenges

- Internal Insulation
- Multiple Roof types
- Floor Heights & UF heating
- Party Wall & awkward spaces
- Logistics
- Integrating systems



CASE STUDY 1:
Eastern Terrace Mews

Wall Insulation

Specific Challenges:

- Detailing around windows
- Demolition of original?
- Scheduling with other works
- Man Made / Natural materials?

Success:

External walls have a double skin of 50mm Celotex cross-battened to reduce thermal bridging over existing 40mm XPS which was retained to reduce waste: Airtightness barrier - plasterboard and skim finish.

U value: **0.19W/m^{2}K**

CASE STUDY 1:
Eastern Terrace Mews

Roof Insulation

Specific Challenges:

- Detailing around windows
- Retaining existing character
- Head heights in places
- Man Made / Natural materials?

Success:

Roof skeilings have 50mm Celotex between rafters with 100mm under rafters with an airtightness layer of Intello Plus and plasterboard and skim throughout.

U value: 0.15W/m^{2}K

CASE STUDY 1:
Eastern Terrace Mews

Floor Insulation
First floor

Specific Challenges:

- Defective existing joists
- Services
- UF heating allowance
- Protecting after fitting

Success:

Separating floor has new suspended ceiling with 100mm of Earthwool acoustic insulation to reduce noise between floors and 30mm Celotex between joists above to form support for new underfloor heating system.

CASE STUDY 1:
Eastern Terrace Mews

Floor Insulation
Ground floor

Specific Challenges:

- Head heights/Lintels
- Insulation value
- Changes to sub surface
- Drainage Inspection

Success:

Groundfloor retained the existing XPS insulation over slab, to reduce waste with 30mm added Celotex between battens to support new underfloor heating system.

U value: 0.22W/m^{2}K

CASE STUDY 1:
Eastern Terrace Mews

Party Wall & Awkward Spaces

Specific Challenges:

- Insulating the party wall without removing the existing structure (cost/waste)
- Alternative materials - value

CASE STUDY 1:
Eastern Terrace Mews

Logistics

Specific Challenges:

- Managing Waste
- Managing Trades
- Managing Parking
- Managing Neighbours

CASE STUDY 1:
Eastern Terrace Mews

Integrating Systems

Specific Challenges:

- Airtightness & insulation details
- Solar Thermal & Plumbing
- MVHR
- Underfloor Heating & Bamboo floor

CASE STUDY 1:
Eastern Terrace Mews - SUCCESS!

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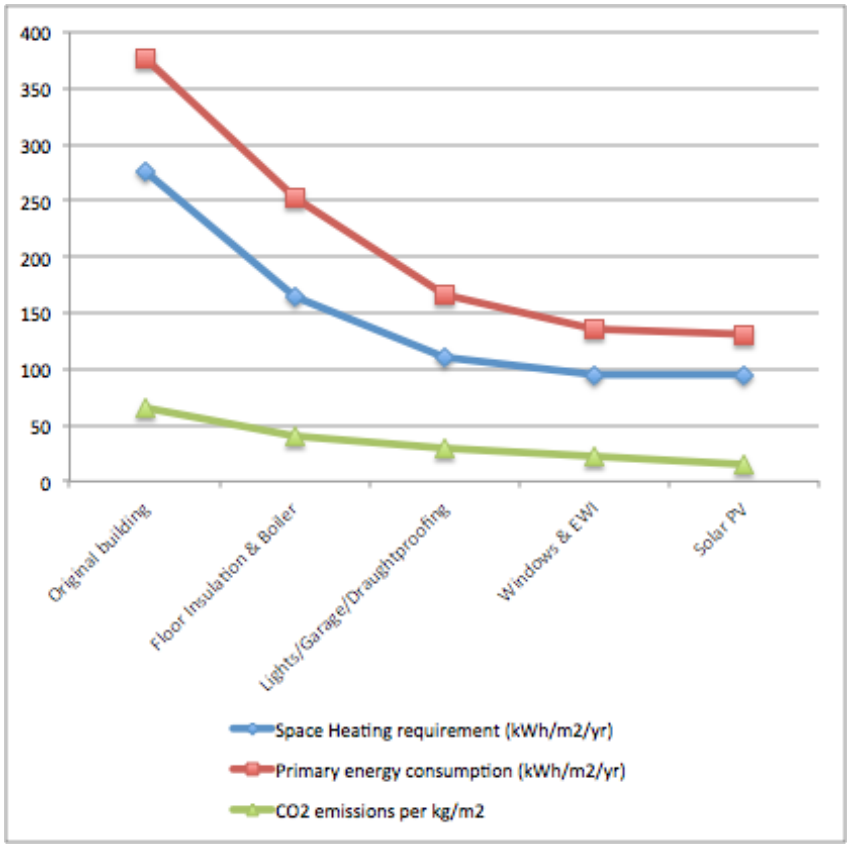
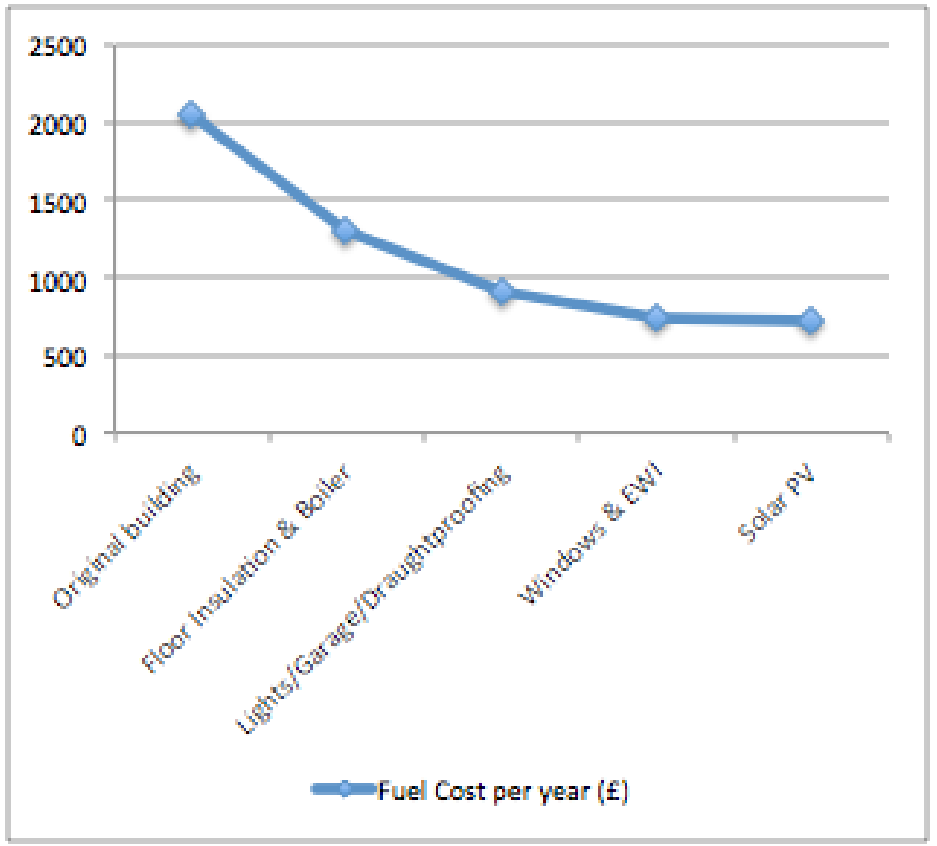
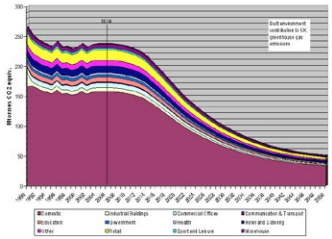
CASE STUDY 1:
Eastern Terrace Mews

Results







CASE STUDY 2: Elms Lea Avenue

Background

Period / Age of House: Post war 1950s
Type: Detached
No. Bedrooms: 4
No. other rooms: 4
No. floors: 2
Floor Area: 168 m2
Cost: refurbishment work £120,000
Extension £60,000
Wall - mixed - cavity/solid

Features

External wall insulation
3 zone Under-floor heating
a solar thermal system
4kWp Solar PV
low energy LED lighting
Wood burning stove
natural paints and finishes

ELMS LEA AVENUE

Case Study

Moving to a new home in Brighton our clients were looking for a project that had a good basic layout, opportunity to convert an existing garage into a self contained extension for an elderly relative and plenty of opportunity to improve the 'eco' credentials of the house. Bright Green Homes LLP were involved from the beginning with the energy assessment and design of the new house, right through to the full renovation work and building the extension. The original 1950s house was an F rated property using nearly 49,000kWh of energy a year – nearly 10 tonnes of CO_2 every year. Once all of the measures were installed this was reduced by 80% to 2.3 tonnes per annum.

Background

Period/Age of House: **Post War 1950s**

No. Bedrooms: **3**

No. other rooms: **4**

No. of floors: **2**

Floor Area: **168m²**

Cost: **Refurbishment Work £120,000**

Extension Work £60,000

Wall type: **Mixed – cavity/ solid**

Eco-Features

- Cork External Wall Insulation & Timber cladding
- Triple Glazed Windows & Doors
- 3 zone under Floor Heating
- High Efficiency Gas Condensing Boiler
- Solar Thermal System
- 4kWp Solar PV
- Low Energy LED lighting throughout
- Wood Burning Stove
- Recycled Paint

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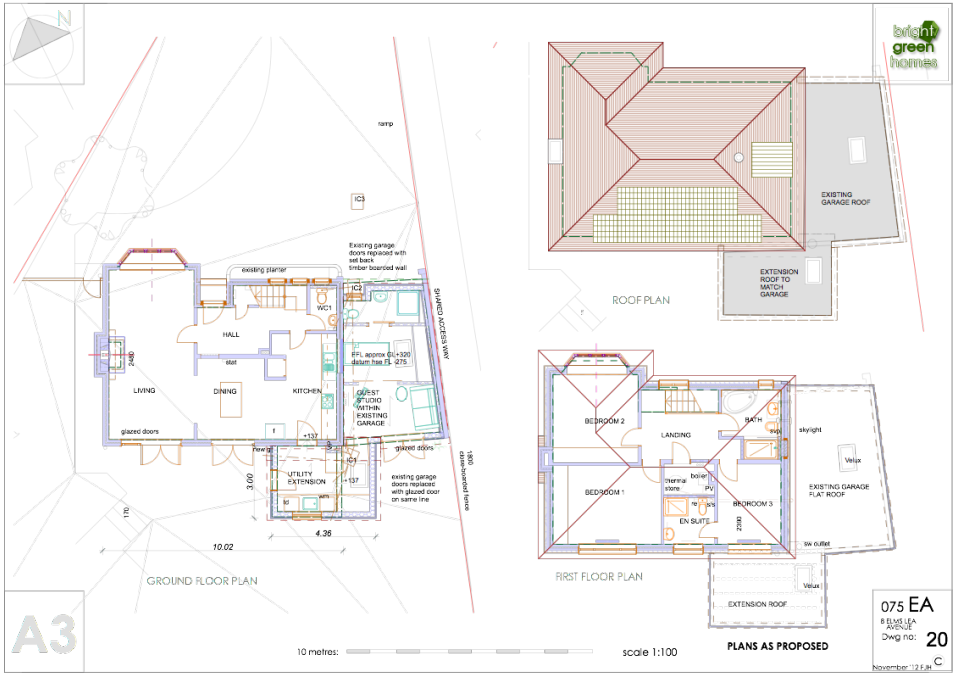
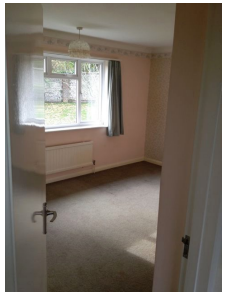
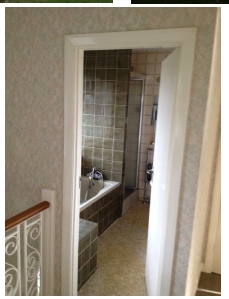
CASE STUDY 2:
Elms Lea Avenue

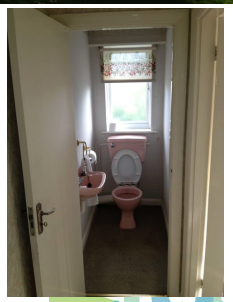
Stage 1 - Assessment & Design

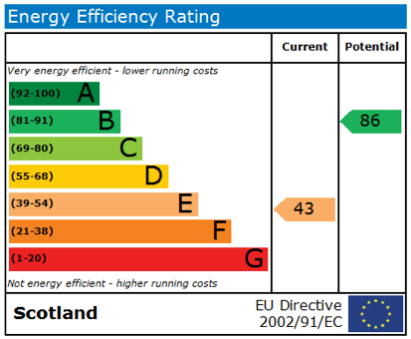
- Site Visit
- As Existing Drawings
- U value Calculations
- SAP Calculations
- Home Energy Report
- Planning Application
- Re-Application!!

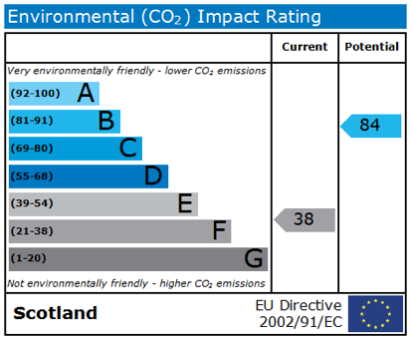












CASE STUDY 2: Elms Lea Avenue

Stage 1 - Home Energy Plan

This is equivalent to an annual requirement for space heating and hot water of: *47,889kWh*

And Electricity Requirement: *1,098kWh*

This is equivalent to a *predicted* **annual fuel bill:** *£2,047.26*

Scenario	Energy Efficiency Measure	SAP Rating	EI Rating	CO2 kg/yr	% saving on CO2 emissions
	Base case	43	38	10,049	0%
1	New boiler	59	52	7,070	30%
2	Insulation & underfloor heating	64	58	6,156	39%
3	Low Energy Lighting	64	58	6,156	39%
4	Converting Garage	70	67	4,905	51%
5	Draughtproofing	72	70	4,478	55%
6	New windows	74	72	4,098	59%
7	Solar Thermal	75	73	3,968	61%
8	External Wall Insulation	77	75	3,643	64%
9	Solar PV	86	84	2,305	77%

CASE STUDY 2:
Elms Lea Avenue

Challenges

- Underfloor Heating
- External Wall Insulation
- Integrated Renewables
- Airtightness/ Draughtproofing
- Triple Glazed Windows & Doors
- Planning/Neighbours/Parking/Storage

CASE STUDY 2:
Elms Lea Avenue

Floor Insulation & UF Heating

Specific Challenges:

- Rebuilding Floor
- Underfloor Heating system
- Floating floor

Success:

Rebuilding the groundfloor with 2 layers of 100mm Ecowool & Insummate to support new underfloor heating system.

U value: 0.16W/m^{2}K

CASE STUDY 2:
Elms Lea Avenue

External Wall Insulation

Specific Challenges:

- Integrating CWI & EWI
- Window details
- Minimising thermal bridging

Success:

Ecobead CWI & Cork external wall insulation in 2 layers cross battened to reduce thermal bridging

U value: 0.24W/m^{2}K

CASE STUDY 2:
Elms Lea Avenue

Renewables

Specific Challenges:

- maximising South facing roof - remove chimney
- Seagulls!
- Creating a Plant room
- Balancing Solar Thermal & heating system

Success:

Integrating a 4kWP Solar PV, Solar thermal system and new system boiler

CASE STUDY 2:
Elms Lea Avenue

Airtightness/ Draughtproofing

Specific Challenges:

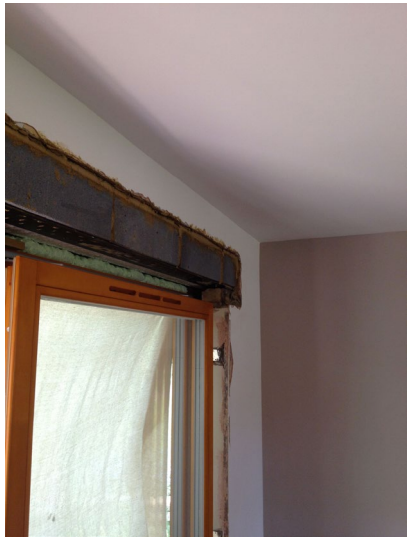
- Airtightness in leaky old building
- Joists/Windows/Plugs/weak spots
- Taping the FF ceiling and PVA/Plaster as barrier
- Old vs. New

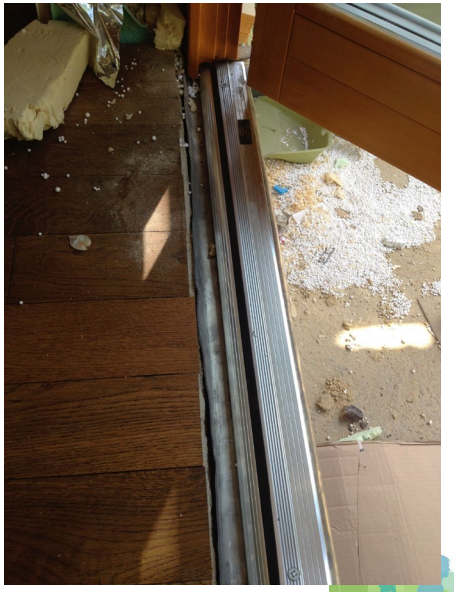
CASE STUDY 2:
Elms Lea Avenue

Triple Glazed Windows/ Doors

Specific Challenges:

- Long Lead Times
- Bulky Storage
- Weight
- Small errors can lead to large problems





CASE STUDY 2:
Elms Lea Avenue

Planning/Neighbours /Parking/Storage

Specific Challenges:

- Planning restrictions
- Where to put Stuff!
- Quiet Residential Areas
- Weather

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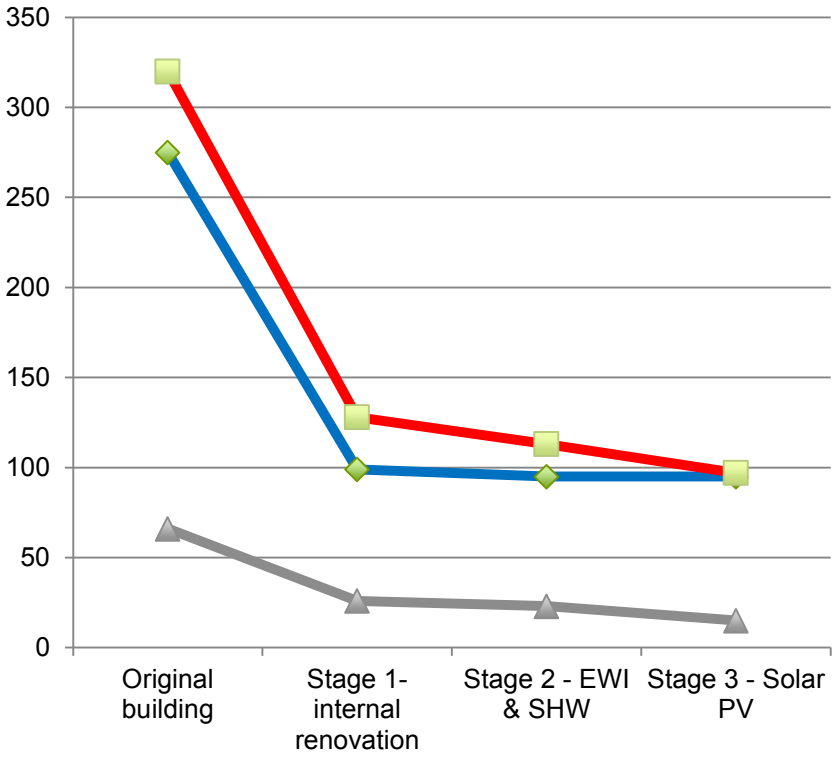
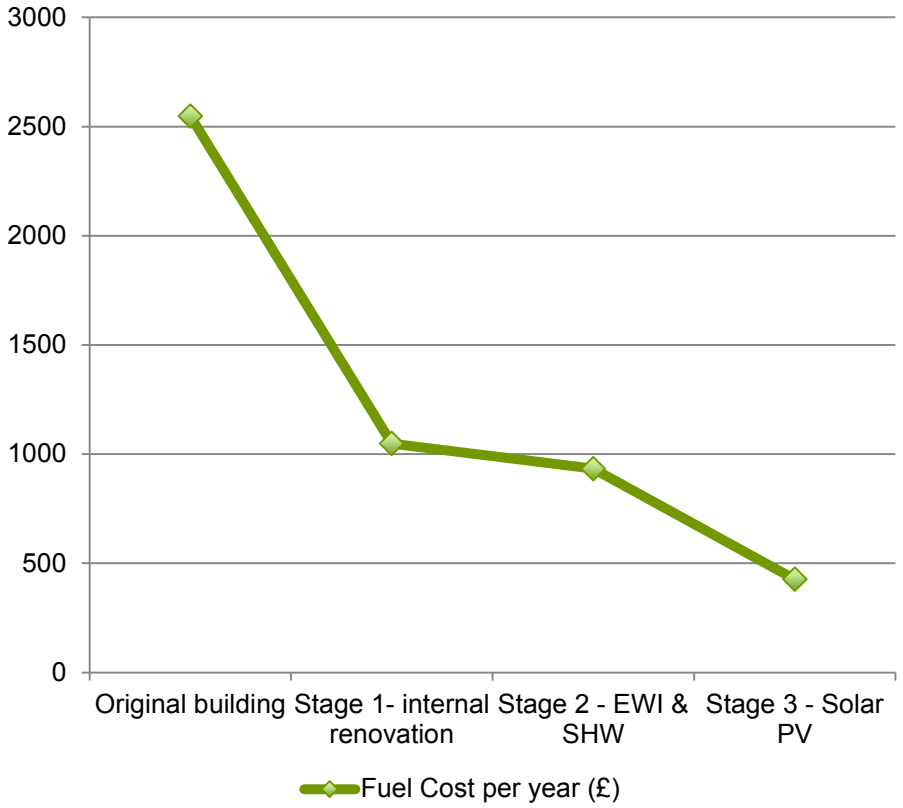
CASE STUDY 2:
Elms Lea Avenue - SUCCESS!

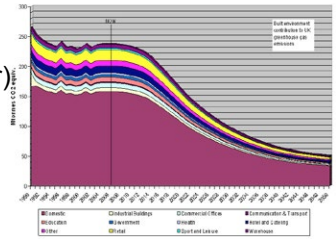
CASE STUDY 2:
Elms Lea Avenue

Results





Space Heating requirement (kWh/m2/yr)
Primary energy consumption (kWh/m2/yr)
CO2 emissions per m2



Market Values & Energy

	Purchase price	Money Spent	Value (2016)*	% increase in value	PE before (kWh/m2)	PE after (kWh/m2)
Eastern Terrace Mews (2011)	£499,950	£100,000	£1,027,000	85.4%	326.58	52.73
Elms Lea Avenue (2012)	£625,000	£180,000	£1,085,339	44.9%	320.73	95.87
The Plough (2015)	£475,000	£200,000	£804,646	27.3%	tbc	tbc
Bishopstone Drive (2016)	£392,000	£100,000	£567,615	19.3%	265.46	55.8

* These figures are from Zoopla.co.uk after refining their initial estimates to include the renovation work

Average year on year increases = 8%

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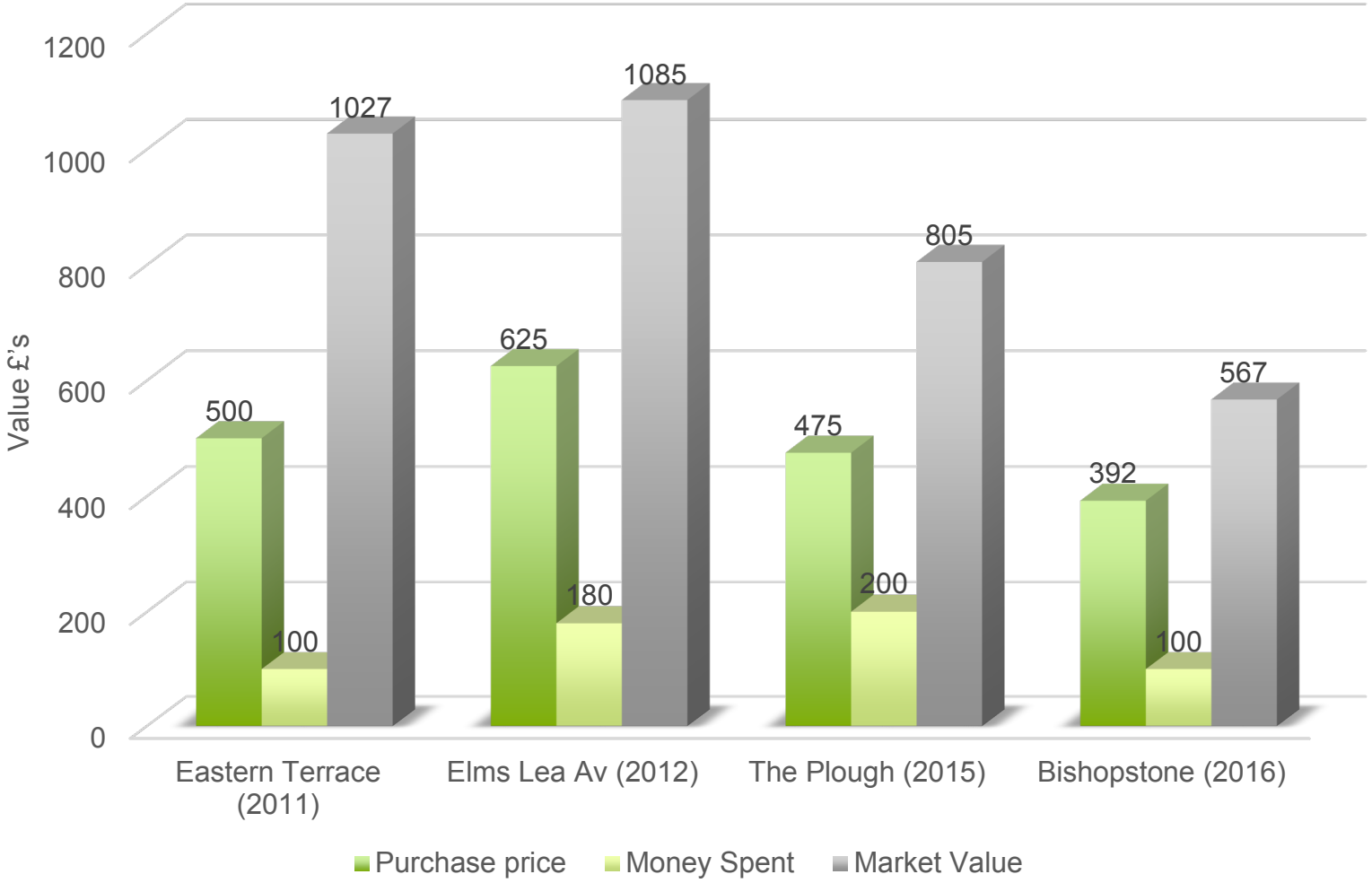
Property Value



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SUMMARY
PRIVATE FINANCE

- Clear CO2 savings to be made
- Clearly reduced running costs for domestic energy bills
- A complicated process
- Many moving parts
- Drivers are NOT energy efficiency on its own
- Effective project management is key
- Substantial Financial Rewards

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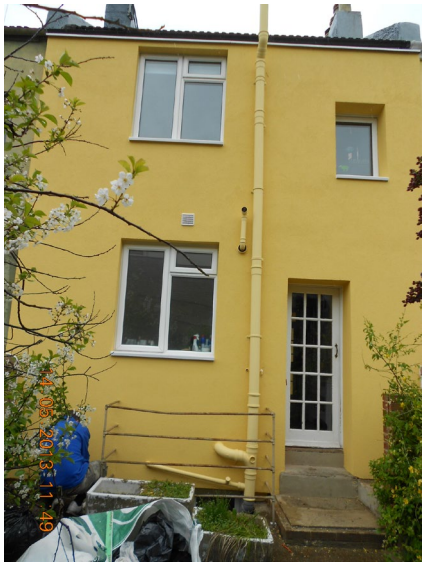
Examples of Publicly funded Eco-renovations

The Green Building Partnership

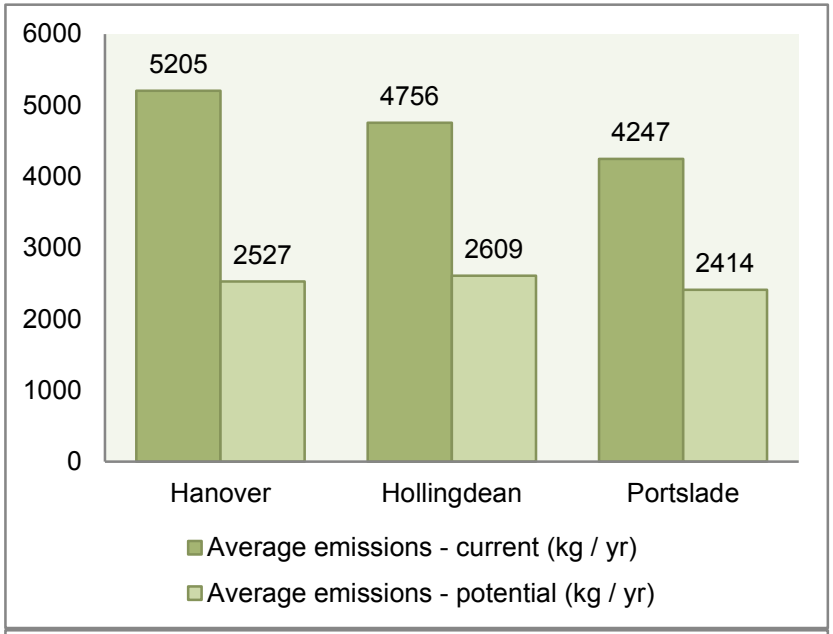


Low Energy Assessment Fund 2012

Funded by DECC Feb/Mar 2012 - £60k

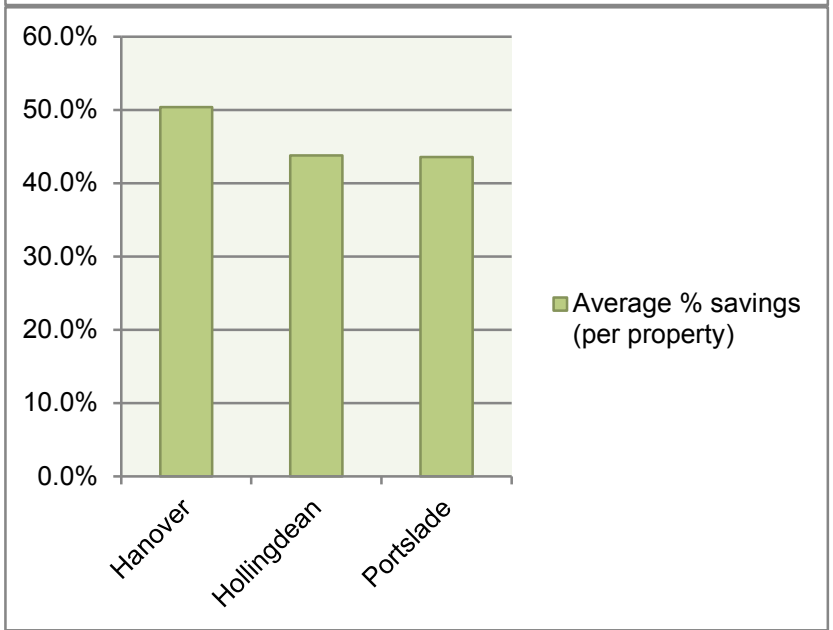
150 Home Energy Assessments

- Hanover
- Portslade
- Hollingdean
- Working with B&H 10:10 and the Brighton Energy Cooperative



CO_2 emissions before and after

- This showed that on average the houses in each of the areas would be suitable for substantial improvements to their homes



% reduction in CO_2

- On average the homes could reduce their CO_2 emissions by >40%.
- This is also equivalent to an annual fuel cost reduction of >40%.

Actual savings in Hanover

Aggregated data for CO2 emissions per house		
Average emissions - current	5,205	kg / yr
Average emissions - potential	2,527	kg / yr
Average savings	2,678	kg / yr

Aggregated data for total CO2 emissions savings		
Total savings (all properties)	133,888	kg / yr
Average savings (per property)	2,678	kg / yr
Average % savings (per property)	50.4%	

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Green Deal Pioneer Places Project 2013

Green Deal Pioneer Places

Funded by DECC Feb/Mar 2013 - £250k

DEPARTMENT OF ENERGY & CLIMATE CHANGE

- 100 Green Deal Energy Assessments across Brighton & Hove

- Up to £10,000 of energy efficiency improvements on 10 homes in B&H
  - Including EWI/IWI
  - Boiler changes
  - Heating controls
  - Loft insulation
  - LED lights

Brighton & Hove City Council

10:10 BRIGHTON AND HOVE

LOW CARBON TRUST

EWI / IWI

Installed EWI in Gardner Street, Southampton Street, Cuthbert Road, Brewer Street & IWI/EWI hybrid on Newport Road

Loft Insulation, New boiler

The ‘smaller jobs’ new loft insulation, new boiler, LEDs – Mile Oak Road, Crayford Road, Uplands Road, Livingstone House

New Products

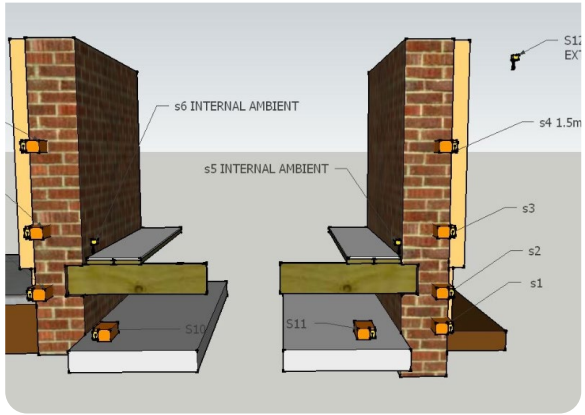
Using cutting edge products such as Loftzone, Alpha Intec & Baxi Gas Flue Saver boilers, LEDs etc.

Floors

Strategically placed moisture monitors in 2 of the properties to determine results of insulation on moisture levels in floor joists

External Wall Insulation

Monitoring what is happening in the masonry walls behind the EWI



Overall Understanding

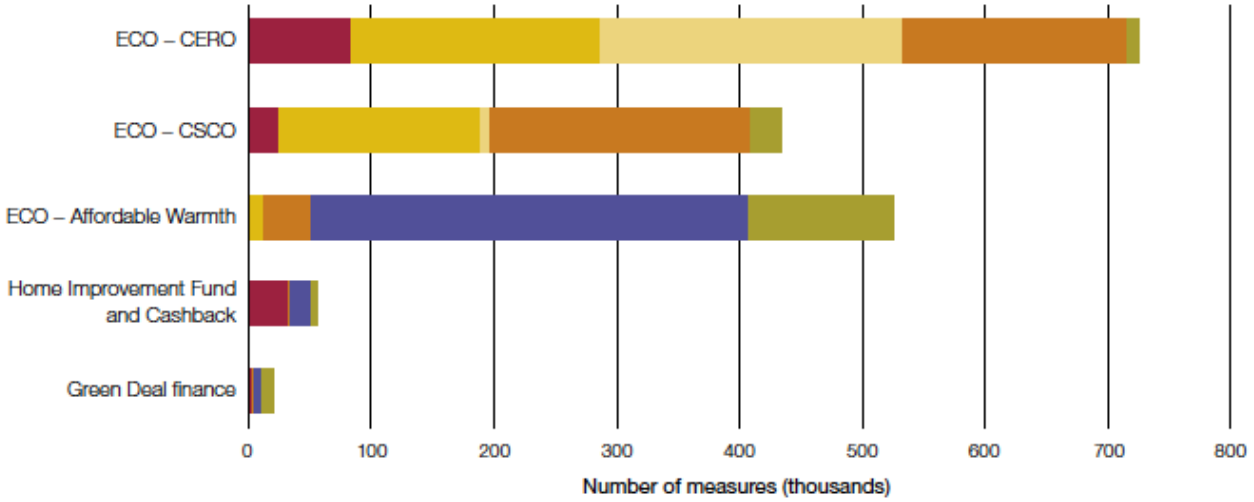
Placing monitors all over the building

PUBLIC FUNDING RESULTS

Figure 10

Total measures installed under ECO and Green Deal by 31 December 2015, by scheme

ECO accounts for the vast majority of measures installed



Note

1 Green Deal finance potentially overlapped with ECO and the Home Improvement Fund, so Green Deal finance measures cannot be added to the other schemes' measures without double counting.

Source: Department of Energy & Climate Change

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- Green Deal, CERO, CERT, CESP, CSCO, AW, ECO etc.
- The Green Deal was abandoned late 2015 after spending £240million
- Green Deal cost the taxpayer £17,000 per plan
- ECO costs
  - CERO £2.41 billion
  - CSCO £0.6 billion
  - AW £1.11 billion
  - Admin £4 million
  - TOTAL £4.14 billion
  - Delivered negligible CO_2 savings!

All figures from NAO – Green Deal & Energy Company Obligation report – April 2016

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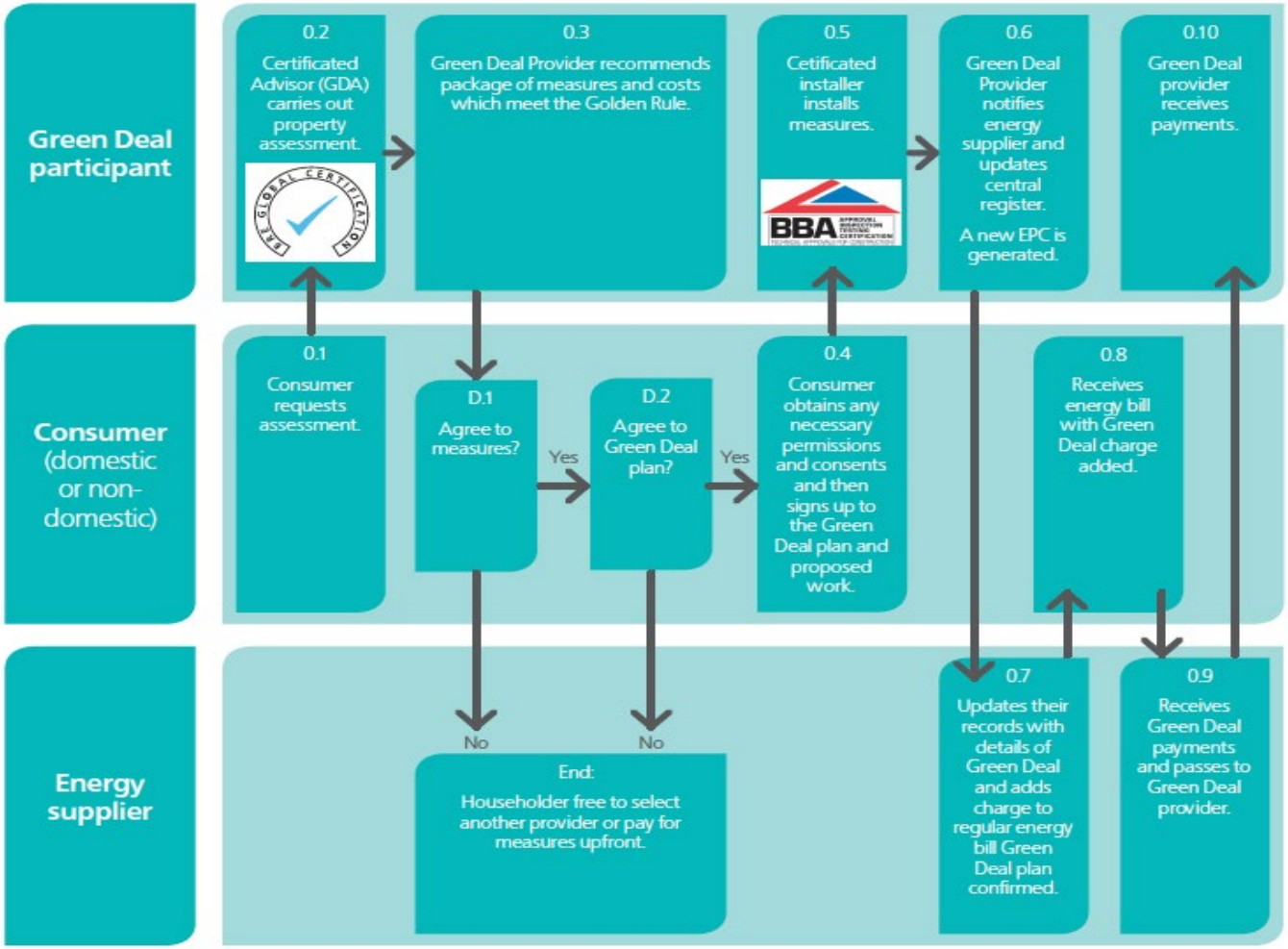
Too complex ?

Customer journey through the Green Deal

(Source DECC: The Green Deal - A summary of the Government's proposals)



Summary

Private Finance

- 80% CO_2 reductions are possible
- It has significant impact on value of house
- It requires significant upfront investment
- It's not achieved in isolation
- Project management is key
- Complex process

Public Finance

- 40% CO_2 reductions are achievable
- Huge advantages for people on lower incomes
- It doesn't have to cost huge amounts of money (£10-20k)
- Householder more able to afford rent/mortgage
- Complex process

What Next

- Energy Efficiency in the home can be expensive
- It can have significant impacts on CO2 emissions
- It can work well with quality tradespeople
- Government scheme clearly failed
- Mass roll out STILL needed…
- BREXIT?

Alternatives?

RetrofitWorks

- RetrofitWorks is a ‘not for private profit’ co-operative, matching communities & homeowners who want to retrofit their homes, with local, quality assured SME assessors and installers.

Brighton & Hove Energy Services (BHESCo)

- a not-for-profit social enterprise bringing together the community of Brighton and Hove to develop renewable energy projects, improve energy efficiency, reduce fuel bills and tackle fuel poverty

Brighton Energy Cooperative Community Fund

- Open for any organisation in the Brighton and Hove, East or West Sussex areas to support either renewable electricity generation or to implement energy efficiency measures, supported by donors & income from community owned solar.

What to do for Mr. & Mrs. Smith? Homeowners, Employed, Good income?

- Make it simple?
- Make it accessible?
- A straightforward solution they can pay for themselves?
- Reduce red tape?
- Incentives?
- People don’t improve energy efficiency in isolation?
  - Moving house, extension, loft conversion, internal decorations, new kitchen, new bathroom etc. etc.

UK Renovation Market & VAT receipts

- In 2014 Total UK renovation market = £14 billion
- 35% of people buy a property that needs renovation to save money!
- On average people spend £33,000 and 12% spend >£50,000
- VAT spent on renovation/yr = approx. £2.8 billion?

1. FT online Aug 2014
2. Propertywire – Feb 2016

VAT in construction

- You may be able to charge the reduced rate of 5% for some types of work if it meets certain conditions, including:

- You can charge the reduced rate of VAT on work you do to install qualifying energy-saving products, and certain grant-funded heating and security equipment for people over 60 or on benefits.

- You can also charge the reduced rate for extra work you need to do as part of the installation. But you must charge the standard rate of 20% on all work if the installation is just part of another, bigger job.

  - **Example** You have to cut a new hatch in the ceiling to install loft insulation. Because you needed to do this as part of the insulation, you can charge reduced-rate VAT.

  - **Example** You replace a roof with a new, insulated one. Because the insulation is just part of a bigger job, you have to charge the standard rate of 20% on the whole job.

Straight forward and easy to understand?

- You pay the reduced rate of 5% for:
  - controls for central heating and hot water systems
  - draught insulation, eg around windows and doors
  - insulation on walls, floors, ceilings, lofts, etc
  - solar panels
  - wind turbines
  - water turbines
  - ground-source heat pumps
  - air-source heat pumps
  - micro combined heat and power units
  - wood-fuelled boilers

BUT – VAT Notice 708/6

- 2.1 - The reduced rate applies to the installation of certain specified energy-saving materials (see paragraph 2.5) in, or in the curtilage of residential accommodation (see paragraph 2.16).
  - The reduced rate applies whether or not the installation is grant-funded and includes the price of the goods themselves.
  - If you supply energy-saving materials without installing them, your supply is standard-rated.
- 2.3 - Although the installation of energy savings materials is reduced rated, it is normal for other goods and services to be provided at the same time. 2.3.4 - Where you are undertaking more than one job at the same premises, the VAT liability will depend upon the circumstances. For example, if you are contracted to build an extension and, as part of the same contract, required to fit thermostatic valves to all the radiators in the house, then this is a single standard rated supply of construction services.
- However, if you have a contract to building an extension and some time after the work has commenced, the homeowner separately asks you to install thermostatic valves, this is then a separate supply and reduced rated.

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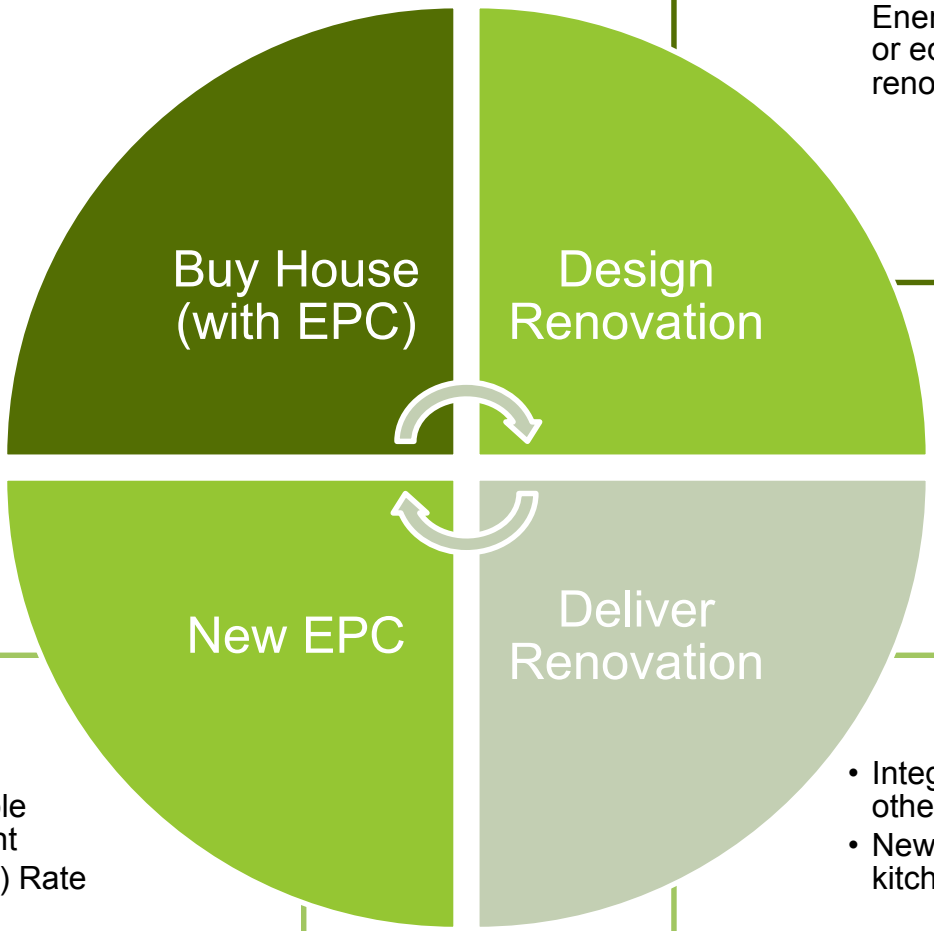

- include Home Energy Masterplan or equivalent Deliver renovation

- EPC shows demonstrable improvement
- Zero (10%?) Rate VAT
- Contractor bills client NO (or 10%) VAT

- Integrate retrofit with other work
- New bathroom, kitchen, extension

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- Keep it simple! Use an existing system?
- Assessment before and after renovation (jobs/quality?)
- Self advertising – or spend a small amount marketing
- Open up potential for £3.5 billion market
- Small builders included in process & makes VAT registered builder (quality?) competitive with small 2 man teams
- Clients get a home renovated, and more energy efficient – and maybe even costs them less!

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Thanks for listening

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