Sava
MAKING BUILDINGS BETTER

Carbon Footprint and Path to Zero Carbon

Prepared for Sava Demo

December 2024

Abstract:

This report gives an overview of the current stock by means of a variety of data profiles like property age and primary heating fuel. The second section introduces plans to reach Band C by 2030 and subsequent measures to approach zero-carbon, weighing impact and cost effectiveness of improvements.

Contents

1. The Brief

Specific cases of current stock

Bespoke conditions

Custom charts requested

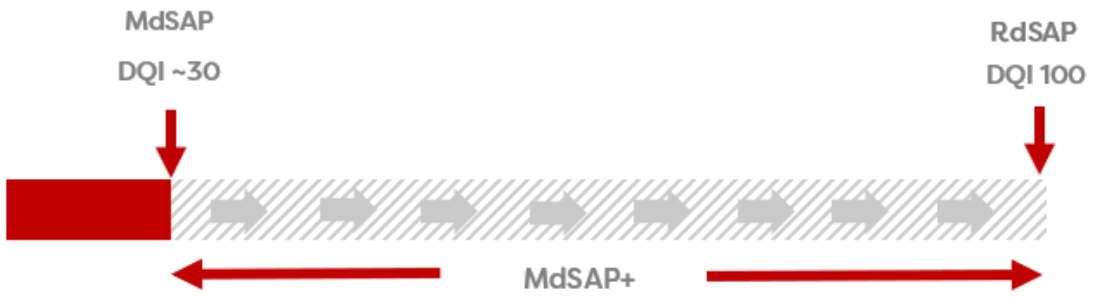
2. Current position

The charts and tables in this section show the stock characteristics and profile on 28th October 2024. The data used to create these charts and calculate results was uploaded into Sava Intelligent Energy by Sava Analytics.

The stock in Sava Intelligent Energy consists of 11,085 properties with an average Data Quality indicator of 68.7 and average SAP of 68.

There are 10,856 properties with a SAP rating result. 228 of the non-calculating properties have no detachment data and the remaining 1 has conflicting energy data.

The Data Quality Indicator (DQI) is a measure of the amount of data present for a property. A property with just the minimum dataset (MdSAP) required to produce a SAP rating would have a DQI around 30-35, an RdSAP EPC dataset would have a DQI of 100. Some data items have more impact on the SAP rating which is taken into account when the DQI is calculated.

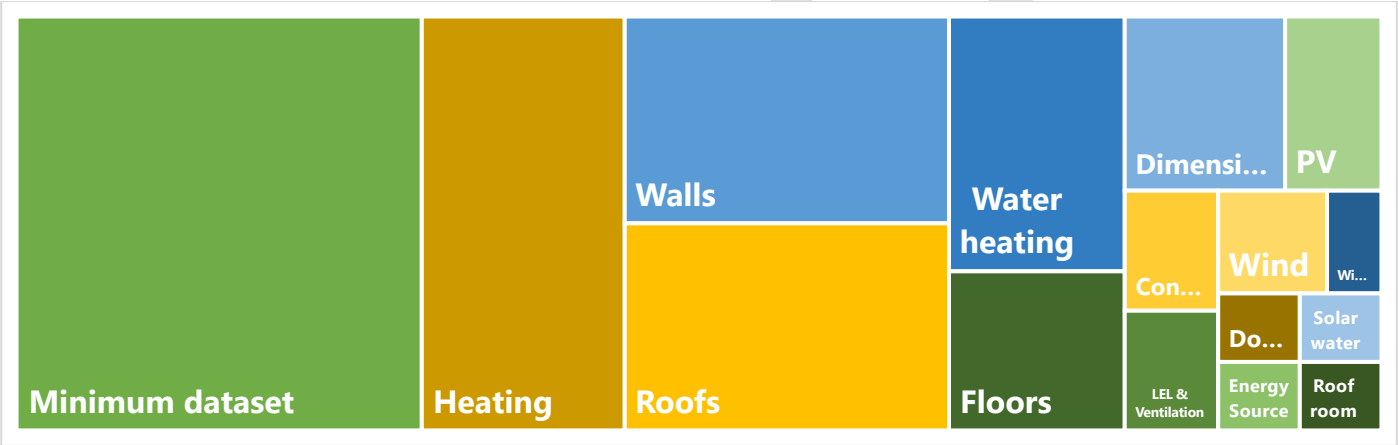


2.1 DQI Profile

The table below shows the DQI by property type for the Sava Demo stock. Properties with a DQI of 100 contain enough energy data to produce an EPC and it is likely these properties have a valid EPC. There are 222 (2% of processing properties) with a DQI of 100.

	< 40	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	100	Total
Bungalow				6	130	54	880	560	16		24	**1,670**
Flat			53	42	79	522	562	746	5		23	**2,032**
House		63	71	1,715	391	2,245	250	2,145	22	1	175	**7,078**
Maisonette				4	1	53	10	8				**76**
ND	228					1						**229**
Total	**228**	**63**	**124**	**1,767**	**601**	**2,875**	**1,702**	**3,459**	**43**	**1**	**222**	**11,085**

49% of the processing properties have a DQI under 70, this decreases the confidence in the outputs and recommendations in the Intelligent Energy plans.



As shown above, the property characteristics with the most impact on the DQI are heating, walls, roofs, and water heating. Within the processing properties for Sava Demo's stock, the most frequently missing high-impact data item is water heating with 7,260 . Recording more of these details would increase the confidence of the calculated SAP rating, and in some cases, increase the number of SAP points.

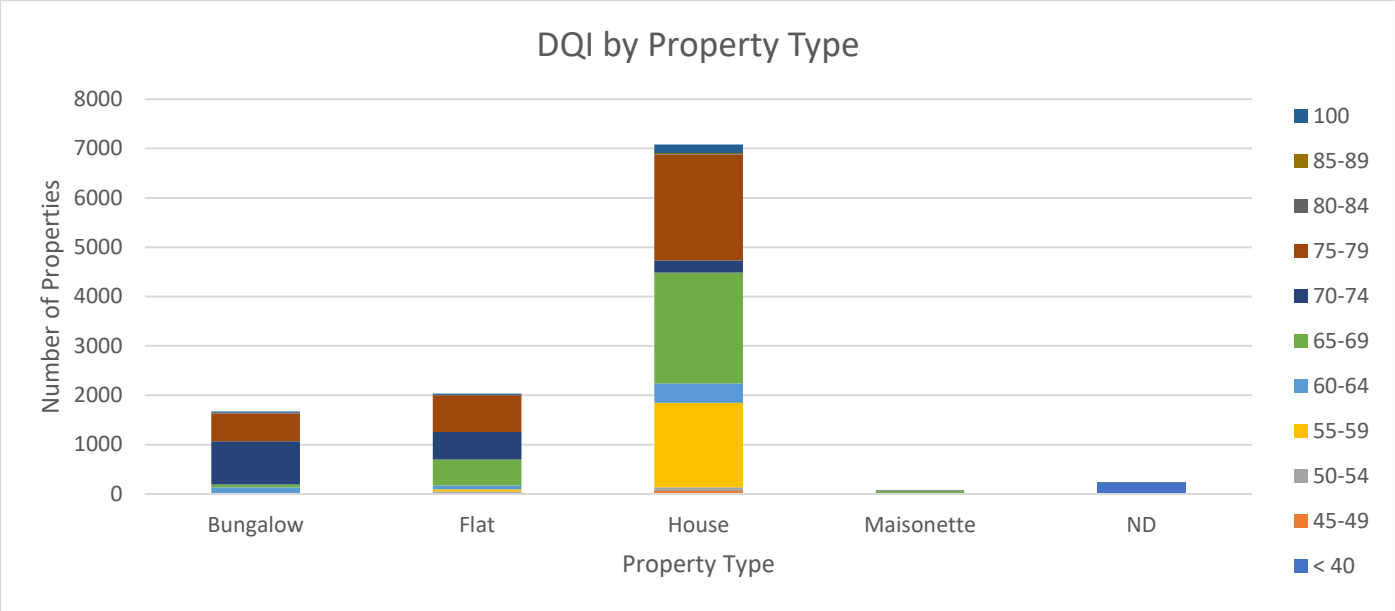


Figure 1 - DQI by Property Type

2.2 Age Profile

Over 60% of Sava Demo's properties, where the age band has been entered, are between 1930 and 1975. Just 7% are pre-1930, which are the most likely to have solid walls requiring internal or external insulation.

Due to updated policies, the 12% of properties built after 2002 will be totally double glazed, ensuring adequate thermal, safety and ventilation standards.

Other characteristics are also assumed from the age of the property, from number of extract fans to the thermal transmissions of roofs and floors when insulation thickness is not known.

	A (Pre 1900)	B (1900-1929)	C (1930-1949)	D (1950-1966)	E (1967-1975)	F (1976-1982)	G (1983-1990)	H (1991-1995)	I (1996-2002)	J (2003-2006)	K (2007-2011)	L (2012 +)	Total
Bungalow	5	7	213	590	339	135	79	38	89	59	49	67	**1,670**
Flat	20	74	17	318	496	330	237	140	74	37	62	227	**2,032**
House	15	636	947	2,757	889	418	163	256	203	122	232	440	**7,078**
Maisonette		1	1	29	16	1	2	4	4			18	**76**
ND		2	66	147	9	3	2						**229**
Total	**40**	**720**	**1,244**	**3,841**	**1,749**	**887**	**483**	**438**	**370**	**218**	**343**	**752**	11,085

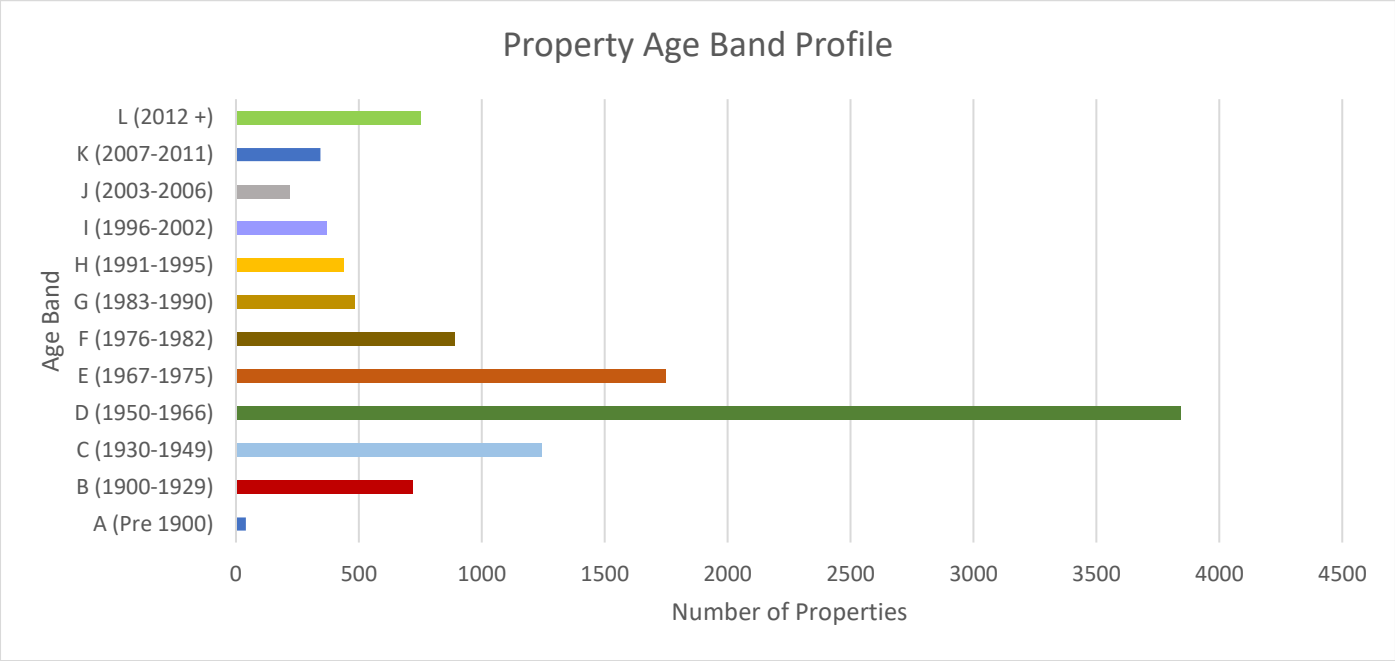


Figure 2 - Age band profile of the [Customer Name] stock

2.3 Property Type Profile

The property profile of Sava Demo broadly reflects the sector with a range across property types – with almost half houses and half flats/maisonettes. Property types can have an impact on programmes to reduce carbon emissions; for example, flats can be more difficult to reduce carbon emissions while bungalows are more expensive due to their large space heating demand per area.

Property Type	Total
Bungalow	1,670
Flat/Maisonette	2,108
Detached house	1,224
End-Terrace house	972
Mid-terrace house	1,512
Semi-detached house	3,371
Not Defined	228
Total	**11,085**

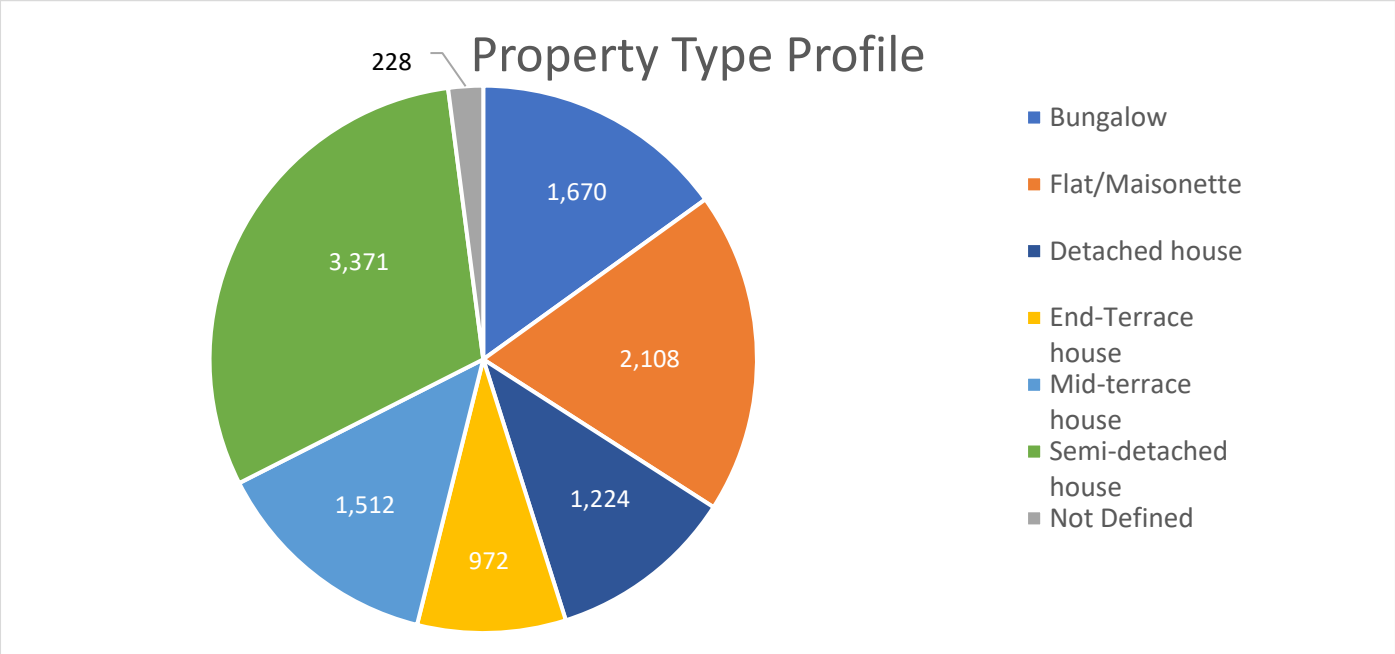


Figure 3 - Property type profile of the [Customer Name] stock

2.4 Heating Fuel Profile

The majority of the Sava Demo stock is heated by mains gas and of the 10,222 heated by mains gas, only five do not have the main heating system as 'Boiler'. Four of these are a warm air system while one is a gas-fired room heater.

Nearly all, 93%, of the electrically heated properties have either a wet heat pump system or storage heaters. The remaining 41 properties are split over electric boilers, warm air systems, electric underfloor heating, air-based heat pumps, or electric room heaters. Over 90% of the properties using electric storage heaters and electric room heaters are EPC Band D or below. All 10 of the EPC Band G properties use electricity as their primary space heating fuel.

The community heating schemes within the Sava Demo stock are displaying a higher average SAP score. However, this is not due to the community heating; these properties are majority new-build flats with filled cavity wall insulation and 100% multi-glazing, so are high energy efficiency unrelated to the space heating.

Fuel	Count	Average SAP
Community (mains gas)	191	73
Community (non-gas)	21	78
Electricity	588	59
Mains gas	10,222	68
Solid fuel	11	58
LPG	7	52
Oil	44	60
Not defined*	1	36
Whole stock	**11,085**	**68**

**This one property has been recorded as "No Heating System Present". In RdSAP, this will infer electric room heaters. Observing neighbouring properties, all have boilers fuelled by mains gas, this may merit some investigation to increase accuracy.*

2.5 SAP Rating Profile

The average SAP rating in these tables uses the SAP rating calculated using the latest RdSAP calculation engine (RdSAP 9.94) from the data that has been uploaded to Intelligent Energy.

Over 54% of the calculating stock is currently Band C or above, and 39% are in Band D.

	NC	A (92 plus)	B (81-91)	C (69-80)	D (55-68)	E (39-54)	F (21-38)	G (1-20)	Average
Bungalow		1	16	929	663	58	3		**68**
Flat		1	127	1,705	193	6			**74**
House	229		41	3,031	3,325	595	76	10	**66**
Maisonette			4	59	11	2			**73**
Total	**229**	**2**	**188**	**5,724**	**4,192**	**661**	**79**	**10**	

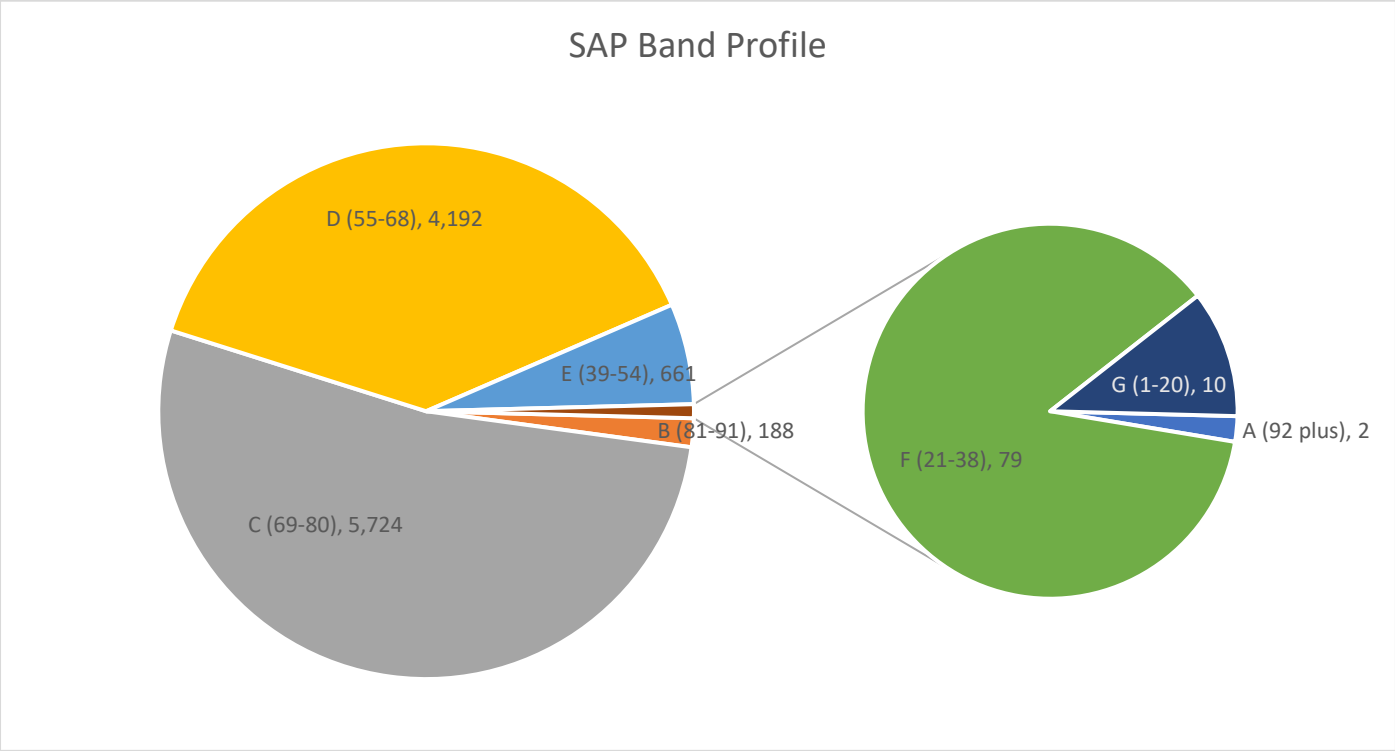


Figure 4 - SAP Band profile of the [Customer Name] stock

2.6 SAP Band D Profile

There are XXX (21%) properties currently in SAP Band D. Nearly half of the properties in Band D are within 2 SAP points of an EPC band C. Some of these properties may move to a Band C with additional data as there are 25 properties with a DQI below 65.

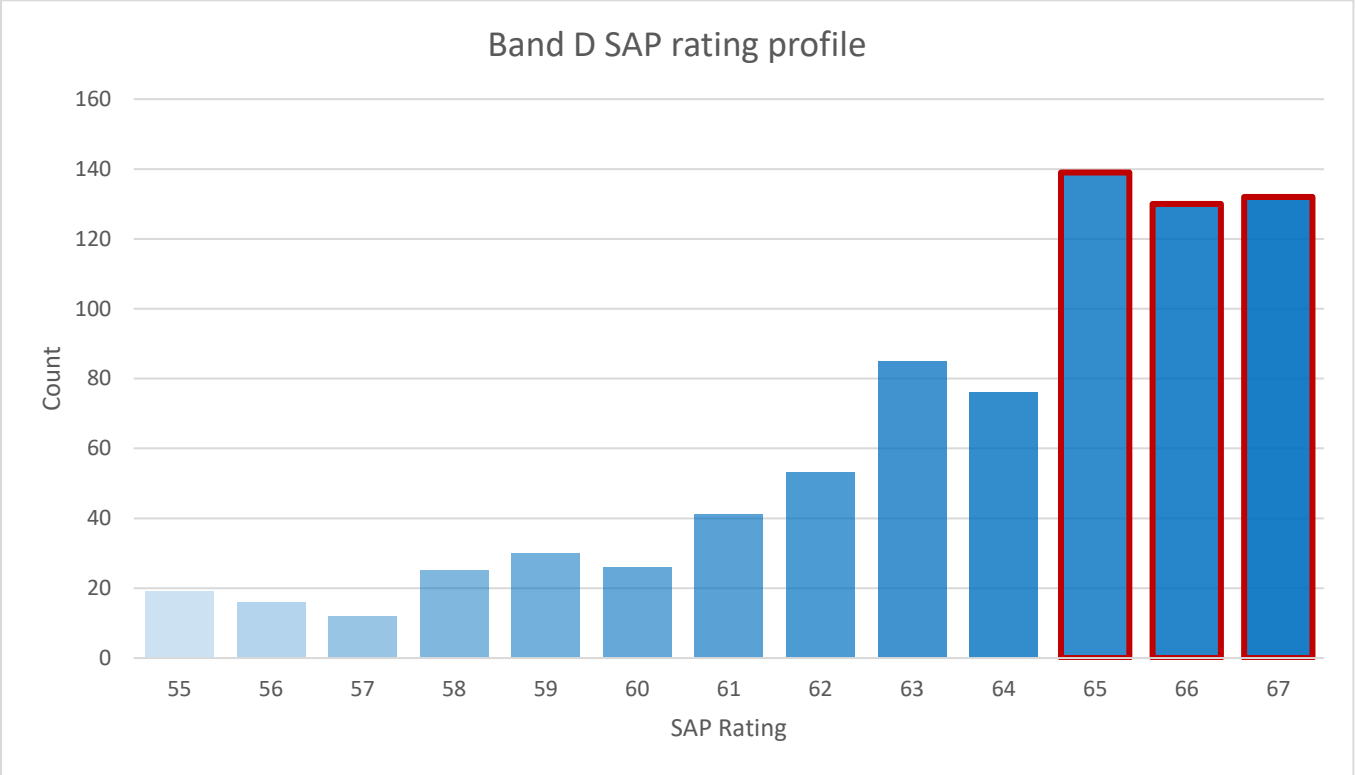


Figure 5 - SAP Band D SAP ratings

2.7 Baseline Carbon Footprint

The carbon emissions in these tables are the resultant CO_2 emissions using the latest RdSAP calculation engine (RdSAP 9.94) from the data that has been uploaded to Intelligent Energy.

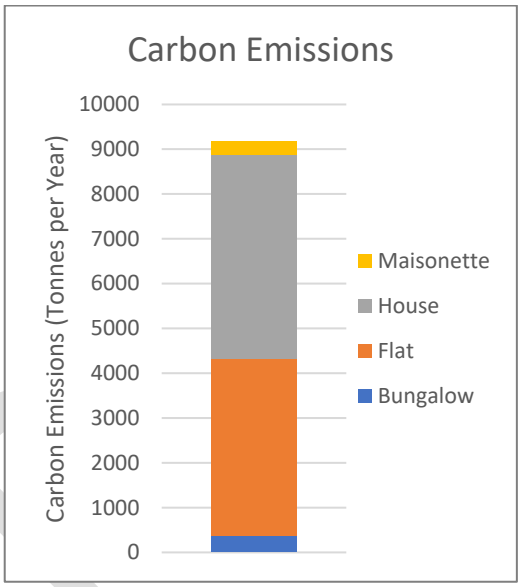
The total regulated carbon emissions for the processing properties in the [Customer Name] stock is **X,XXX tonnes per year** with an average carbon emissions per property of **X.X tonnes per year**. The UK average carbon emissions[1]

[1]https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/energyefficiencyofhousinginenglandandwales/2020-09-23

for houses in 2019 is 4 tonnes per year and for flats 2.3 tonnes per year. [Customer Name] average carbon emission across the stock is considerably better than the UK averages.

The XXX bungalows have the lowest average carbon emissions, as 174 (71%) of the bungalows have PV, this will have an impact on the SAP rating and carbon emissions.

	Property Count	Total Carbon Emissions (t/yr)	Average Carbon Emissions (t/yr)
Bungalow	246	357	1.5
Flat	2091		
House	1667	4538	2.7
Maisonette	118	306	2.6
Whole Stock			

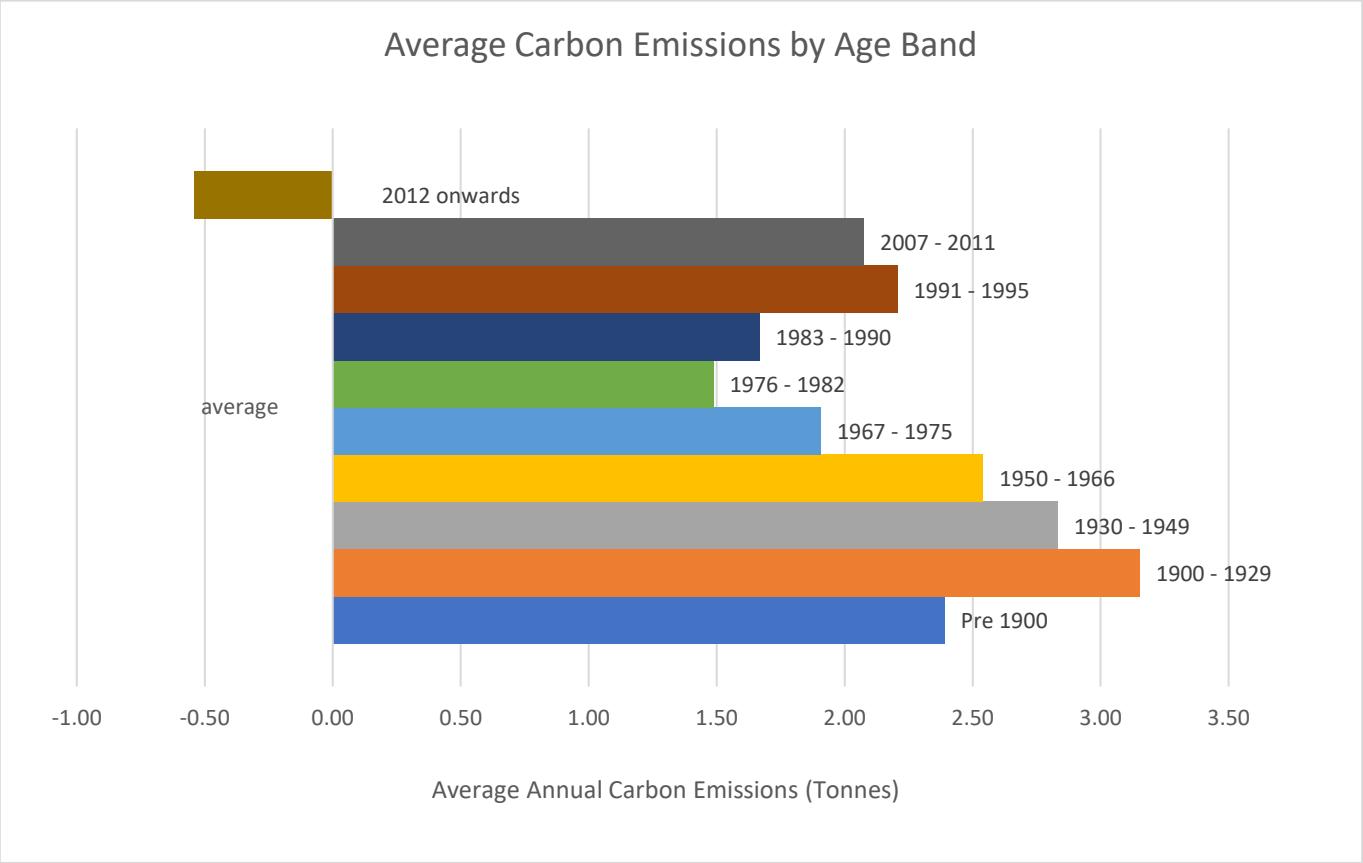


The carbon emissions age profile of the stock illustrates that the older properties are those currently producing the most carbon. This is not unexpected as older properties will have been built to lower building regulations standard.

	Property Count	Total Carbon Emissions (t/yr)	Average Carbon Emissions (t/yr)
Pre 1900	6	14	2.4
1900 - 1929			3.2
1930 - 1949	407	1153	2.8
1950 - 1966	1468		
1967 - 1975	826	1576	1.9
1976 - 1982	526	783	1.5
1983 - 1990			1.7

1991 - 1995	45	99	2.2
2007 - 2011	8	17	2.1
2012 onwards*	56	-30	-0.5
Whole Stock			

**the majority of these properties are flats that have 3kWp of PV.*



The type of heating system and fuel has a big impact on the carbon emissions of a dwelling. The table below illustrates this with the average carbon emissions for properties where there is no central heating, and only room heaters are present, is more than double that of properties with a mains gas boiler.

	Property Count	Total Carbon Emissions (t/y)	Average Carbon Emissions (t/yr)
Boiler	3148		
Community heating		573	1.2
Heat pump (wet)	15	27	1.8

Room heaters	17	87	
Storage heating	467		3.2
Warm air	2	6	2.9
No heating system	1	3	3.1
Whole Stock			

3. Improvement Planning

This section presents data from the Intelligent Energy planning functionality. Improvement plans in Intelligent Energy allow the setting of a target either SAP or Carbon. The available measures are then used to calculate the most cost-effective way to reach the target.

Unlike the EPC recommendations there are no criteria backstops for when an improvement would be included. For example, if a property already has 50mm of external wall insulation, the EPC will not output a recommendation for additional EWI, while Intelligent Energy Improvement Plans will assess the impact and cost effectiveness of adding more EWI.

The criteria and specification for the improvements have been included at the end of this document.

The cost effectiveness uses the target metric, i.e., for SAP target this would be £/SAP point and for carbon target £/kg.

The charts and tables in this section were created using [Customer Name] dataset in IE on [Date].

Two plans were calculated using the [Customer Name] processing data of XXXX properties.

- **Band C Plan (XX properties)**
  - *Properties*: EPC band D, E, F & G
  - *Measures*: All available measures
  - *Target*: EPC band C
- **Zero Carbon Plan (XX properties)**
  - *Properties*: Whole stock (processing only)
  - Measures: All available measures
  - *Target*: 100% carbon emissions reduction

The plans described follow two principles; "**fabric first**" and "**lowest regrets**". A 'fabric first' approach involves maximising the performance of the components and materials that make up the building fabric itself, before considering the improvement of heating or renewables to the building. A fabric first method can reduce the overall costs of the improvements while also reducing the need for maintenance during the building's life.

The Band C Plan is in fact a subset of the zero-carbon plan, this has been done to follow the "lowest regrets" principle. More significant improvements may be recommended than necessary to make Band C in some cases to protect against causing future improvements to be necessary to reach zero carbon targets. For example, 270mm of loft insulation may be needed to reach Band C, and 400mm to reach zero carbon in the future. To avoid repeat visits and unnecessary costs, the Band C plan will recommend the 400mm loft insulation improvement.

Some properties will not be able to reach Band C within feasible costs due to custom reasons.

The capital costs shown in the "Improvement Costs" sections within the following plans use the costs available in Intelligent Energy. These originate from research into published costs from BEIS, EST and other commercial sources. More specific descriptions of the calculations and sources are described in the Improvement Guide Appendix at the end of this document.

3.1 Band C Plan

This plan sets the target at EPC Band C (SAP rating 69+) and all properties were able to reach Band C.

The final SAP rating of these properties ranges from 69-98.

The plan results in XXX tonnes reduction in the CO_2 emissions of the [Customer Name] stock.

The current [Customer Name] average SAP rating, across the 4122 calculating properties is 73, the average SAP rating across these properties if all the improvements are applied would be 75.

The headline cost for this plan is £1.1 million.

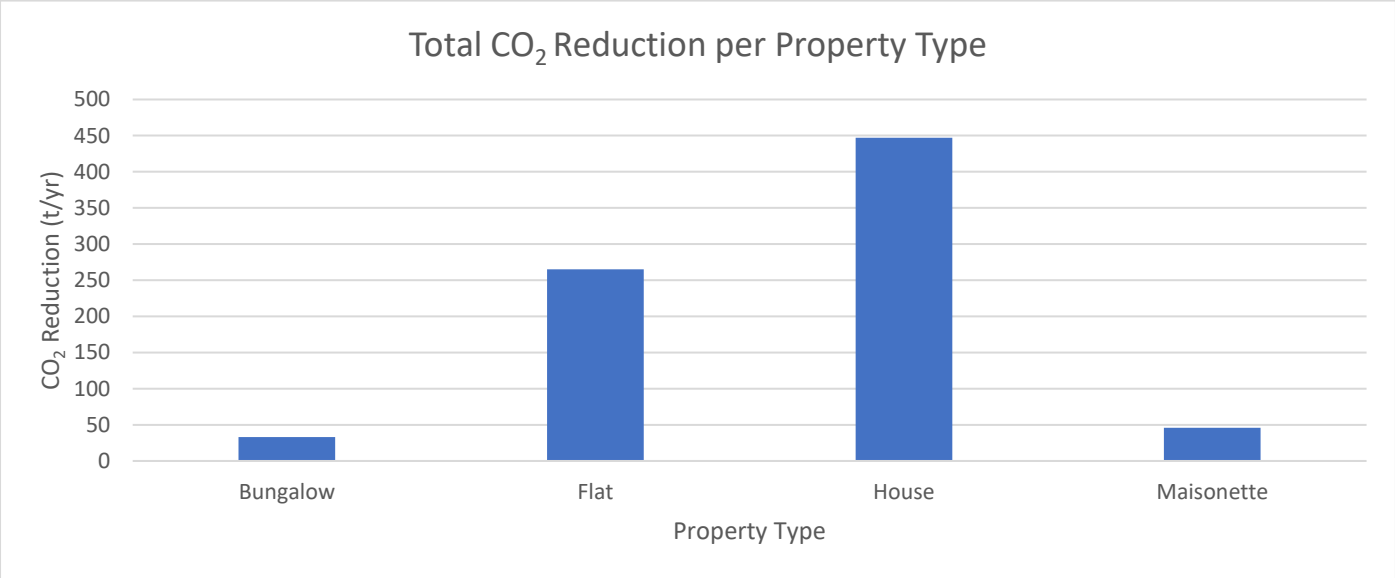
More Info

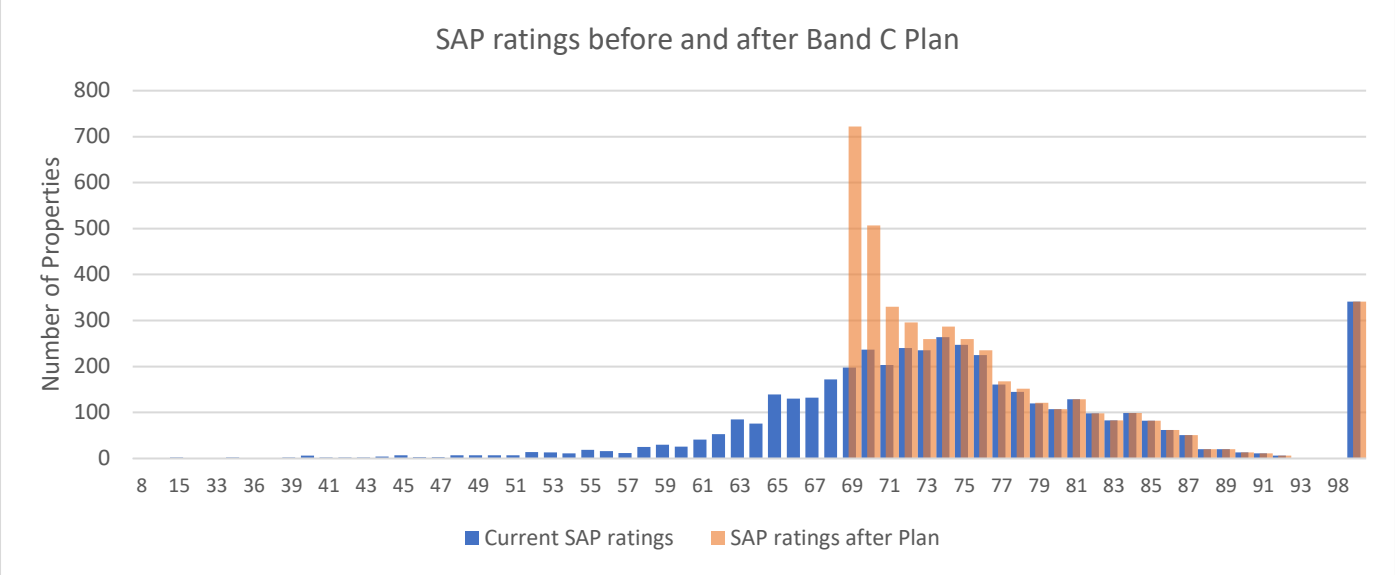
CO2 (tonnes per year) before and after Band C Plan:

Property Type	Initial CO_2 (t/yr)	Final CO_2 (t/yr)	CO_2 reduction (t/yr)	Average CO_2 reduction (t/yr)
Bungalow	190	156	33	0.46
Flat		868	265	0.74
House	2,132	1,685	447	0.77
Maisonette	169	123	46	0.90
Total	**3,624**			

Total Carbon Emissions After Band C Plan

X,385 tonnes per year



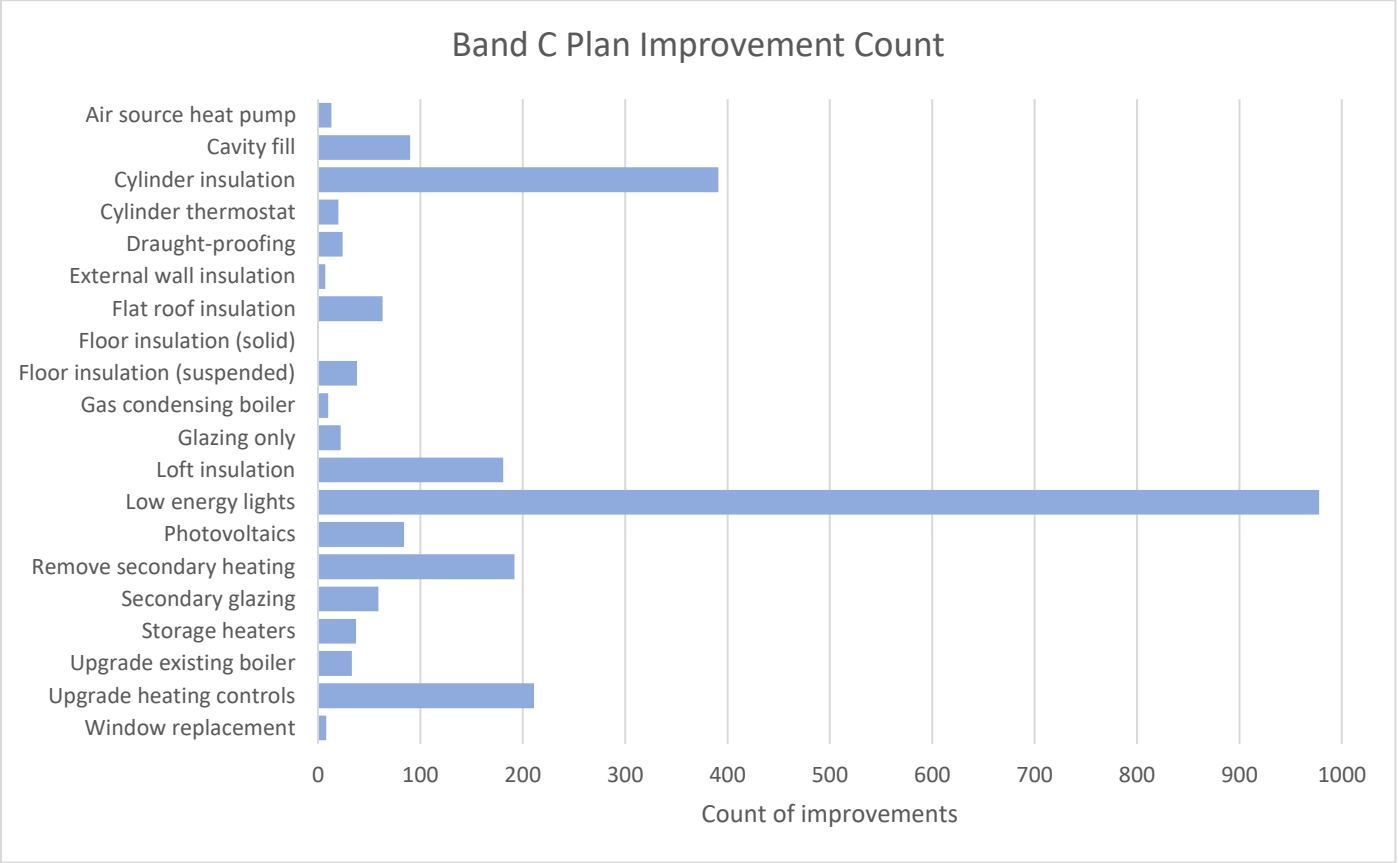


Band C Plan - Improvement Count:

Measures	Count					
Improvement	**Bungalow**	**Flat**	**House**	**Maisonette**	**Total**	**CO_2 reduction (t/yr)**
Air source heat pump		11			13	35.7
Cavity fill	7	36		2	90	40.9
Cylinder insulation	22	138		23	391	61.4
Cylinder thermostat		3			20	4.8
Draught-proofing	1	3		2	24	2.8
External wall insulation		6		1	7	2.7
Flat roof insulation	2	47		13	63	117.8
Floor insulation (solid ground floor)		1			1	0.2
Floor insulation (suspended floor)	9	8	21		38	
Gas condensing boiler		5	4	1	10	
Glazing only improvement		21		1	22	
Loft insulation		23	140	2	181	
Low energy lights		314	546	51	978	
Photovoltaics[a]			77		84	
Remove secondary heating		37	132	7	192	
Secondary glazing		43	9	5	59	
Storage heaters[b]		28	4	4	37	
Upgrade existing boiler		6	20	4	33	
Upgrade heating controls (wet system)		38	140	18	211	
Window replacement		8			8	2.5
Total						

a. *PV Measure is not currently applied to flats or maisonettes*

b. *Band C is a SAP (cost based target) the storage heater measure improves the SAP but often results in an increase in CO_2 emissions*

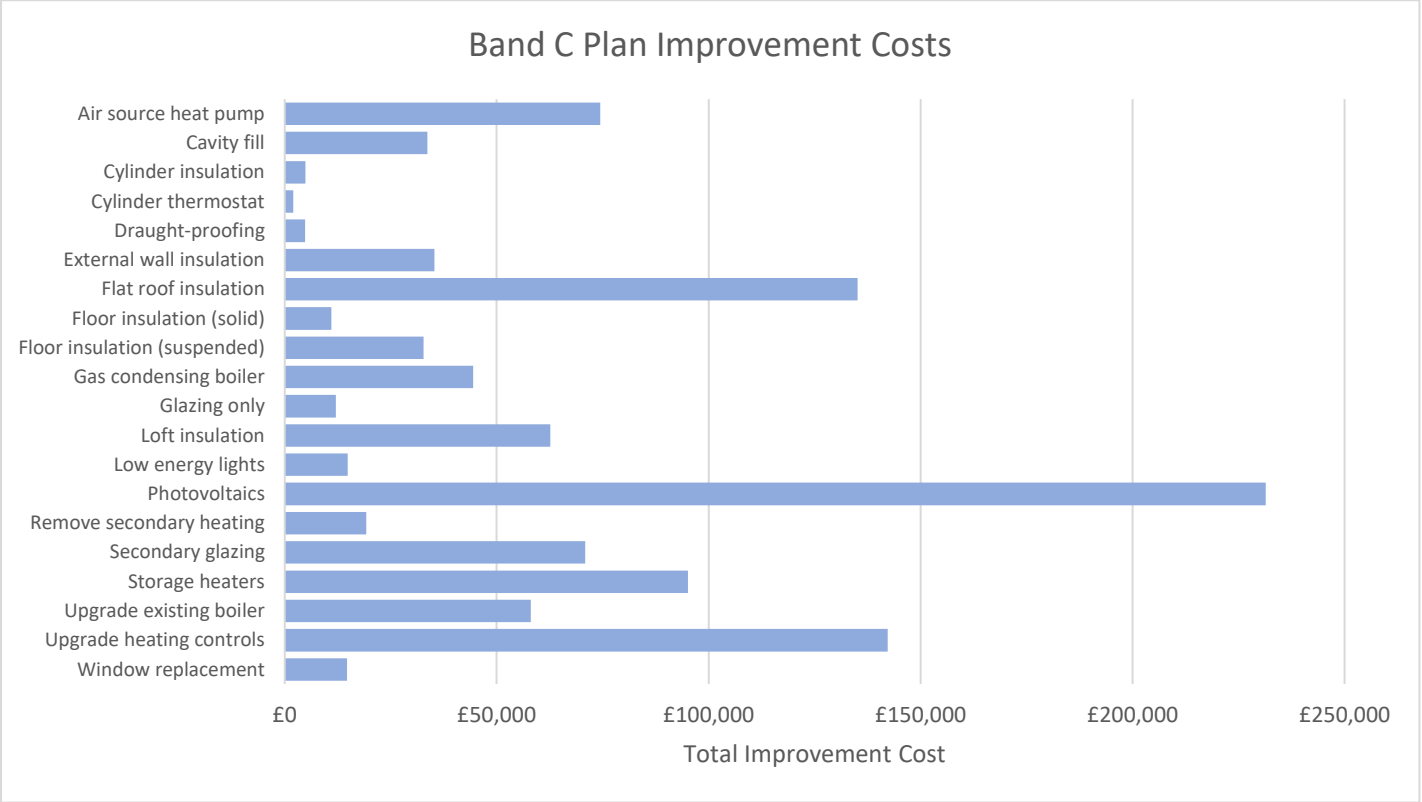

Band C Plan Improvement Count
Air source heat pump
Cavity fill
Cylinder insulation
Cylinder thermostat
Draught-proofing
External wall insulation
Flat roof insulation
Floor insulation (solid)
Floor insulation (suspended)
Gas condensing boiler
Glazing only
Loft insulation
Low energy lights
Photovoltaics
Remove secondary heating
Secondary glazing
Storage heaters
Upgrade existing boiler
Upgrade heating controls
Window replacement
0
100
200
300
400
500
600
700
800
900
1000
Count of improvements

Band C Plan – Improvement Costs:

Measures	Costs				Total cost	Average measure cost
Improvement	**Bungalow**	**Flat**	**House**	**Maisonette**		
Air source heat pump		£62,072	£12,327		£74,399	£5,723
Cavity fill	£2,540	£11,867	£18,186	£1,034	£33,627	£374
Cylinder insulation	£267		£2,535	£286	£4,889	£13
Cylinder thermostat			£1,700		£2,000	£100
Draught-proofing	£200		£3,600	£400	£4,800	£200
External wall insulation				£6,233	£35,285	
Flat roof insulation	£214		£70	£20,839	£135,109	
Floor insulation (solid floor)					£11,034	
Floor insulation (suspended)	£8,750		£17,173			
Gas condensing boiler			£19,548	£5,189		
Glazing only improvement				£1,012		
Loft insulation	£4,888		£50,661	£502		
Low energy lights	£870		£9,198	£854		
Photovoltaics[a]	£18,650		£212,770			
Remove secondary heating	£1,600	£3,700	£13,200	£700		
Secondary glazing	£1,769	£45,639	£15,019	£8,487	£70,914	
Storage heaters	£1,712	£63,812	£15,920	£13,652	£95,096	£2,570
Upgrade existing boiler	£5,026	£9,844	£36,342	£6,803	£58,015	£1,758
Upgrade heating controls	£11,559	£23,305	£93,729	£13,607	£142,200	£674
Window replacement		£14,669			£14,669	£1,834
Total				**£79,597**		

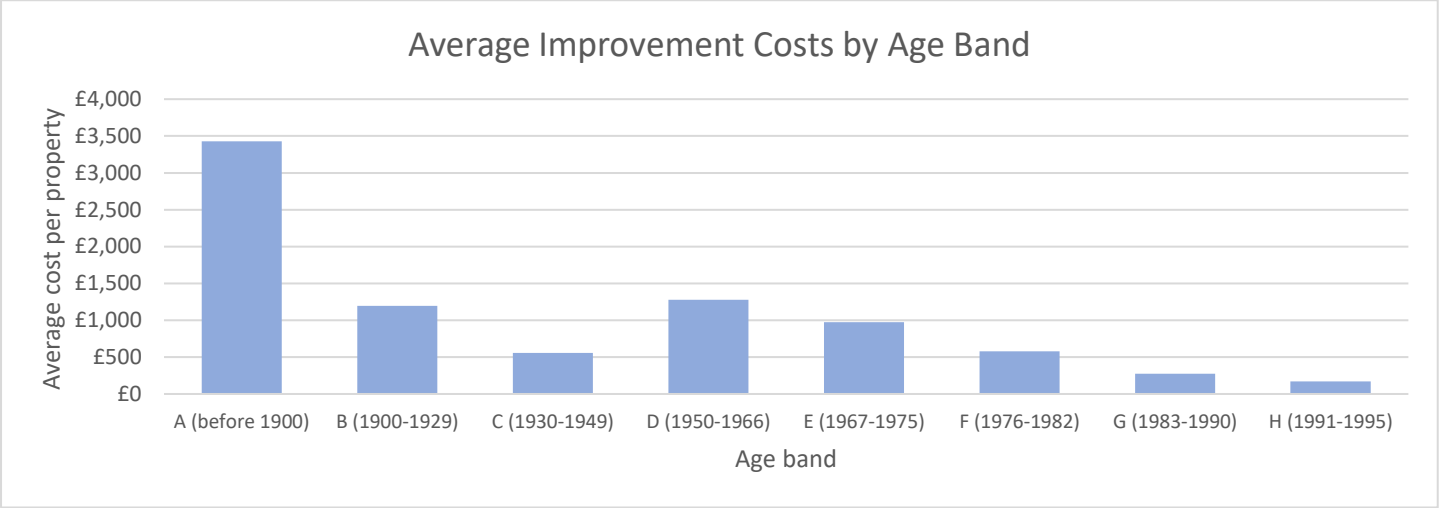
a. *PV Measure is not currently applied to flats or maisonettes*

b. *UPRN Z this is the only available measure to get this property to Band C. Suggest reviewing the data for surrounding properties as some flats have cavity for the wall construction and others system build (some with and some without external wall insulation). If this property has got external wall insulation, then the solid floor insulation improvement would not be required.*



Band C Plan - Analysis by Age band:

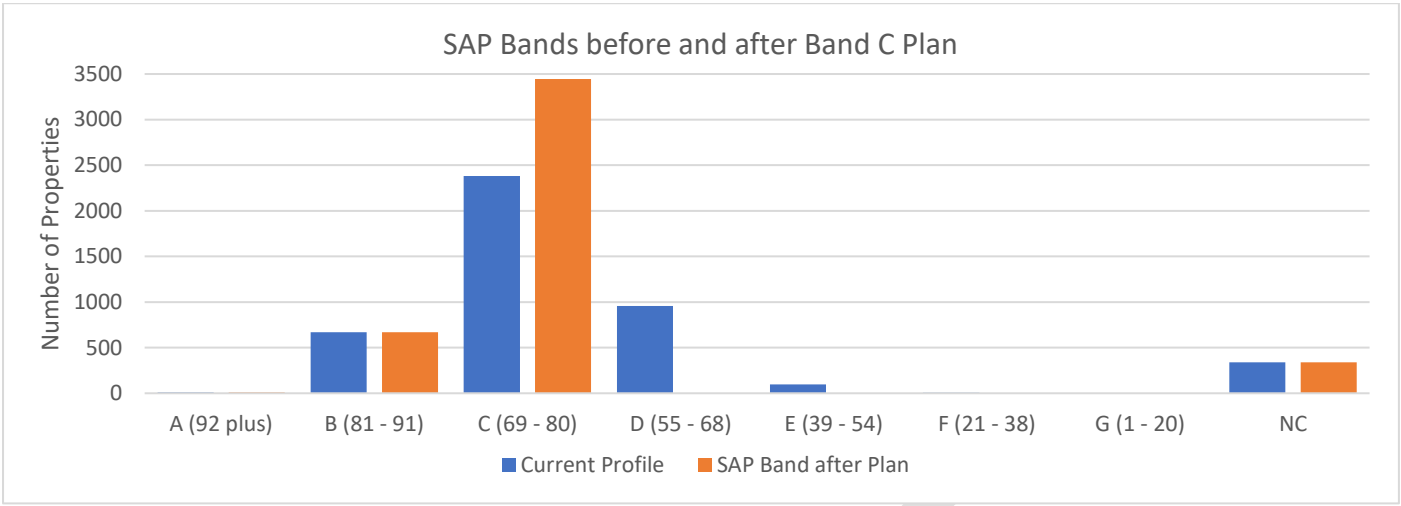
Improvement	Number of properties	Number of improvements	Total Cost	Average Cost per property
A (before 1900)	3	10	£10,284	£3,428
B (1900-1929)	204	533		£1,194
C (1930-1949)	152	335		£555
D (1950-1966)	417	989		
E (1967-1975)		435		
F (1976-1982)		57	£17,322	
G (1983-1990)		73	£10,421	£274
H (1991-1995)		30	£2,730	£171
Total	**1063**			

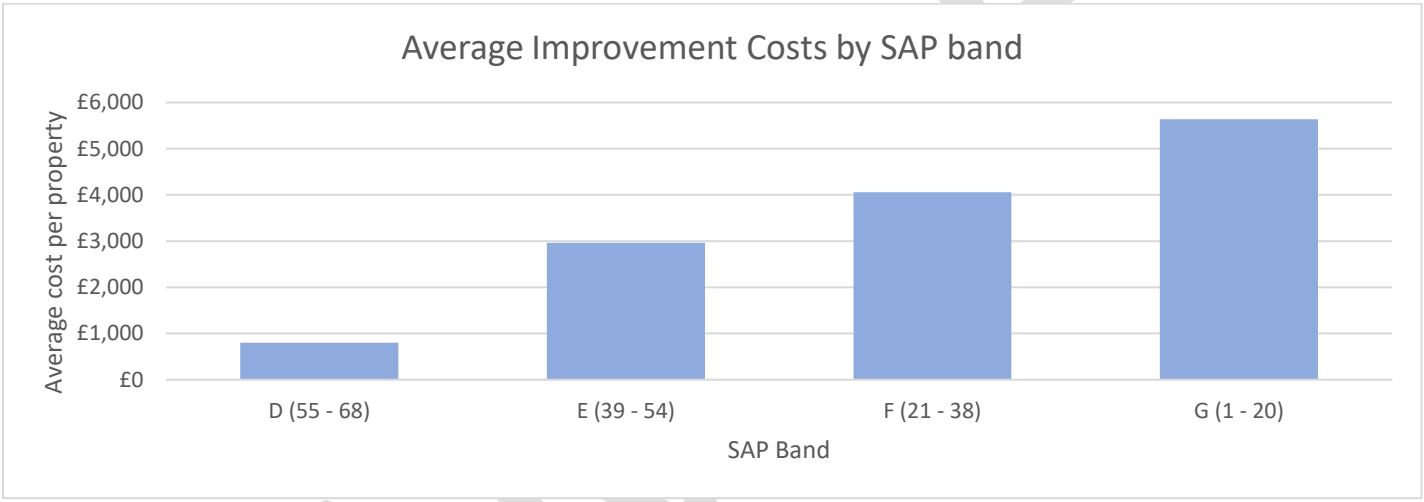


Analytic comments here

Band C Plan - Analysis by SAP Band:

Improvement	Number of properties	Number of improvements	Total Cost	Average Cost per property
D (55 - 68)	956	2081	£765,355	£801
E (39 - 54)	97	343		£2,961
F (21 - 38)	6	22		£4,056
G (1 - 20)	4	16	£22,541	£5,635
Total		**2462**		





Analytic comments here

3.2 Path to Zero Carbon Plan

The zero-carbon plan sets the carbon target for the stock at 0% of current emissions.

Using all of the measures currently available in Intelligent Energy, the plan was able to reduce the CO_2 emissions of the [Customer Name] processing stock by 76% to 2,232 tonnes per year. This illustrates the challenge in creating a zero-carbon strategy using conventional measures.

The headline cost for this plan is £61.3 million.

Budgeting to Achieve Zero Carbon:

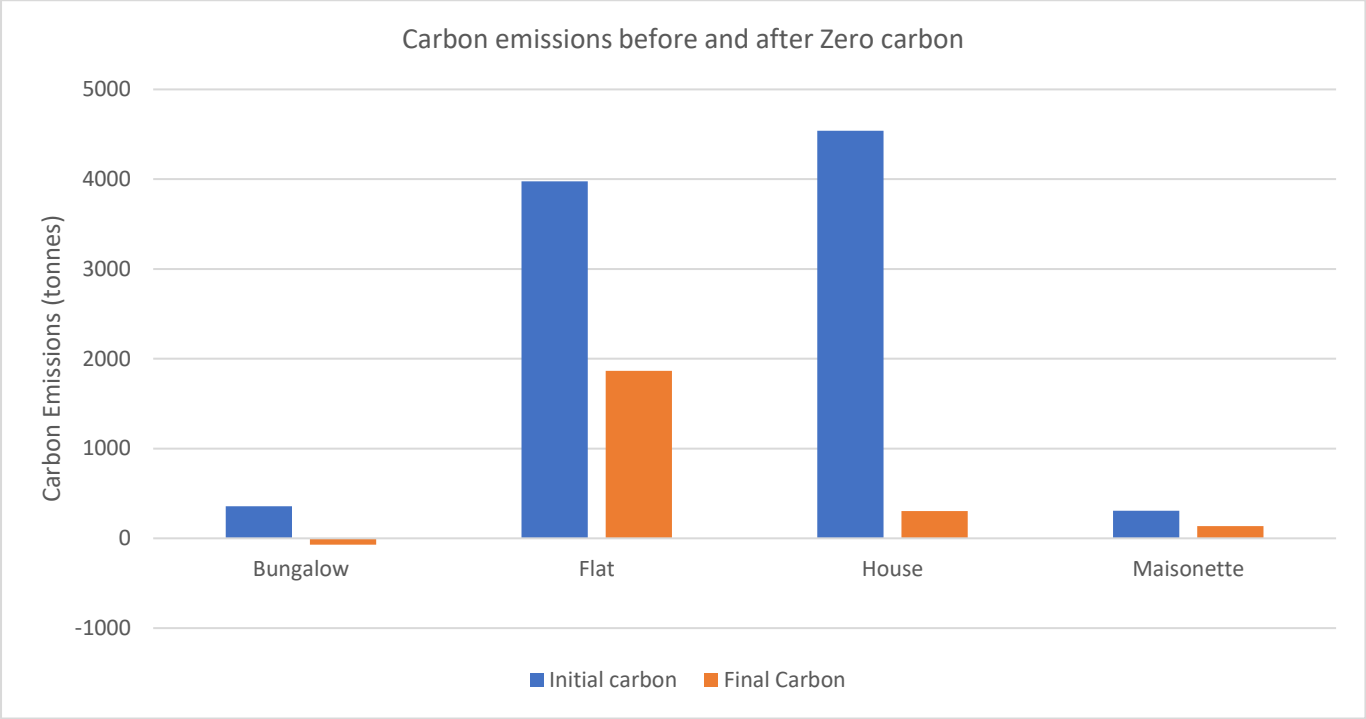
As has been stated above it is highly challenging to create a zero-carbon strategy using conventional measures; the plan, outlined above, has a shortfall of 2,232 tonnes per year. In the longer term it may be possible to deal with this shortfall by additional measures and/or by offsetting; this is known as “net zero carbon”.

To provide an indicative cost for achieving this we have calculated the average cost of reducing carbon emissions per tonne per year: £8,834. On this basis, the additional cost of reducing the carbon emissions to zero would be £19,717,733. Adding this to the cost of measures identified above the overall cost of achieving zero carbon would be £81.1 million.

Property Type	Initial CO_2 (t/yr)	Final CO_2 (t/yr)	CO_2 reduction (t/yr)	Average CO_2 reduction (t/yr)
Bungalow	357	-72	429	1.7
Flat		1,864		1.0
House				
Maisonette	306	135	171	
Total	9,176	2,232		1.7

Total Annual Carbon Emissions After Zero-Carbon Plan

X,XXX tonnes per

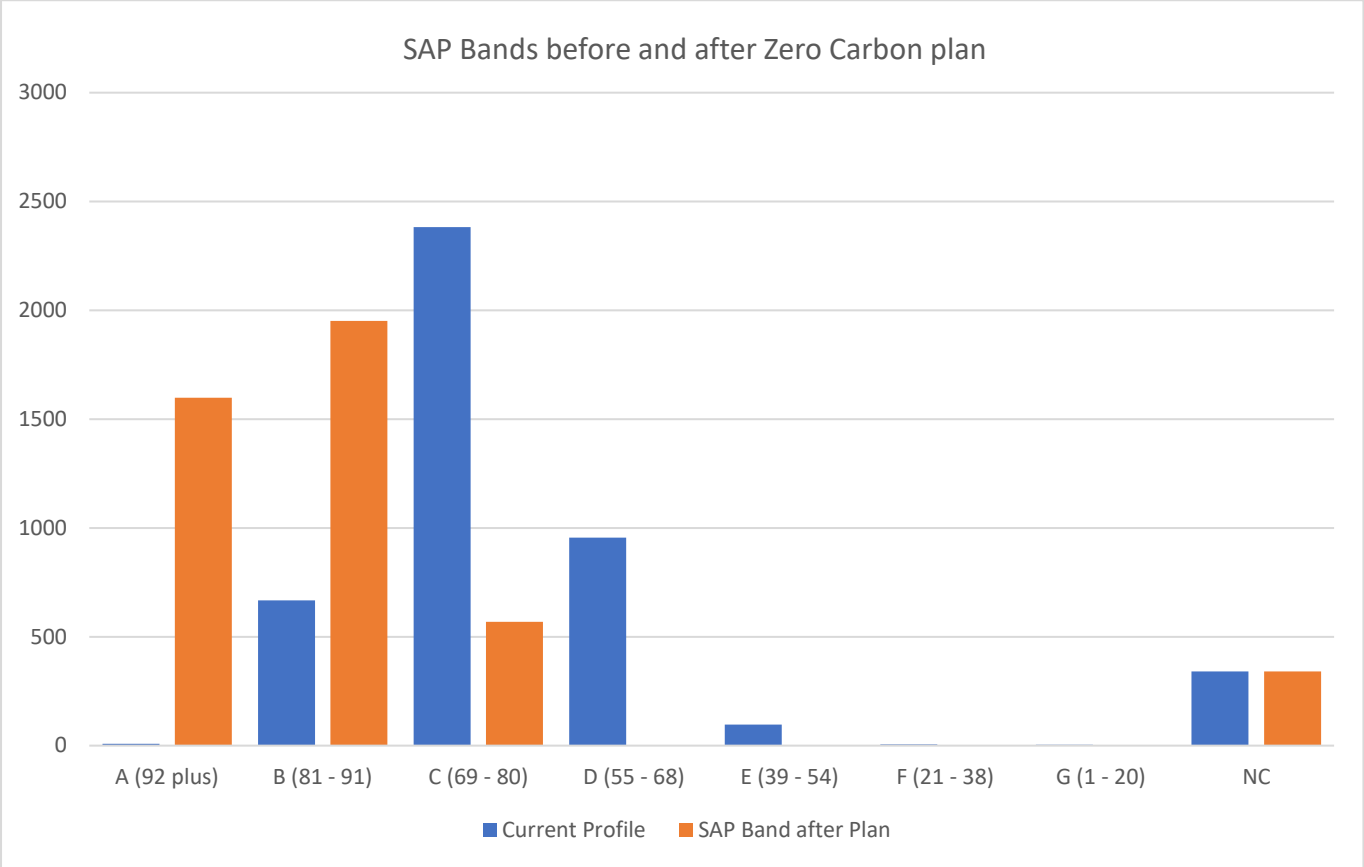


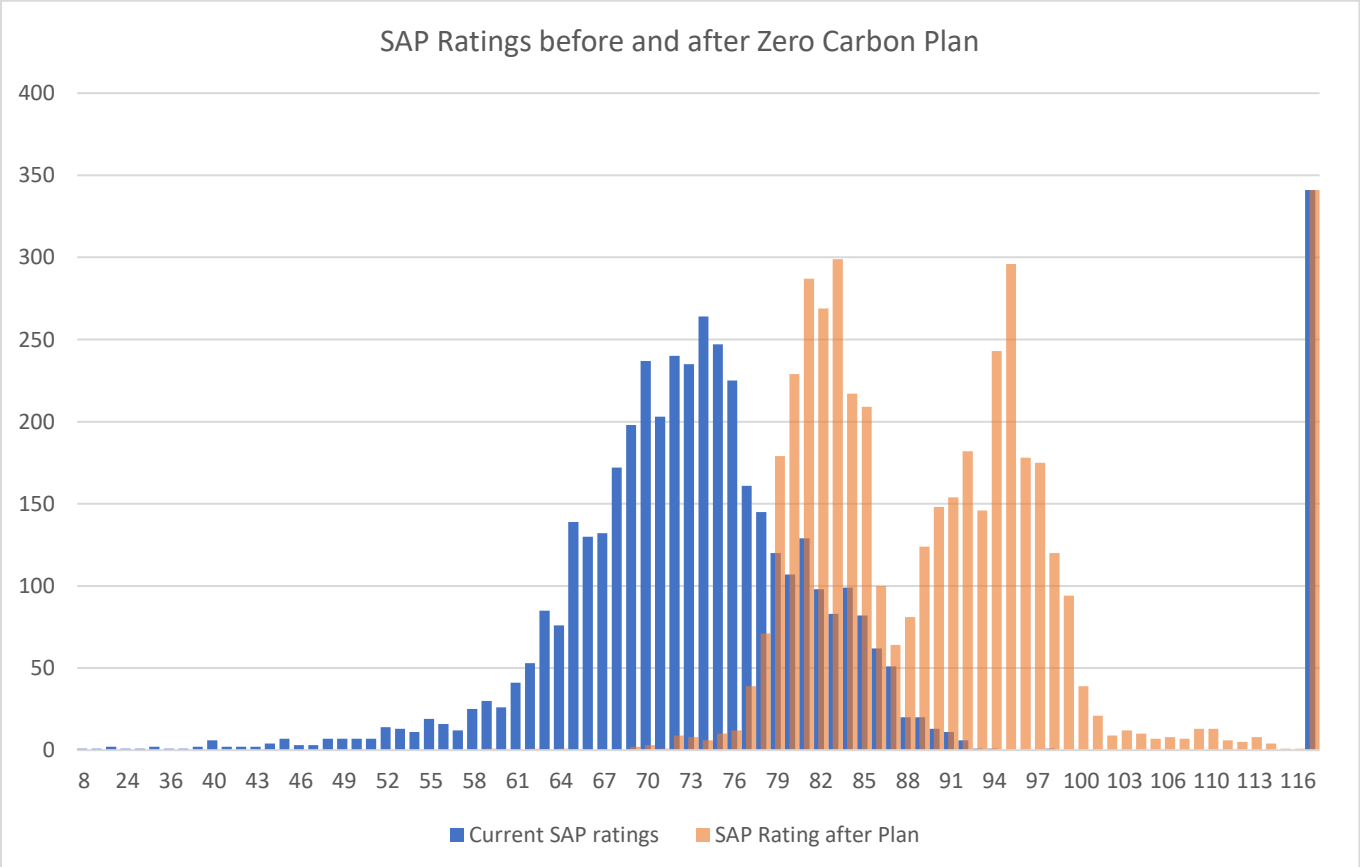
CO_2 (tonnes) before and after Zero Carbon Plan

Offsetting:

However, extrapolating in this fashion may not be an appropriate method when taking into account the adaptation of future technology, and because the cost per tonne of CO_2 per year saved is unlikely to be linear as zero carbon is approached. Therefore, one might consider carbon offsetting via a few possible methods:

- the use of surplus renewable energy that is generated on associated buildings
- paying into local funds that are set up specifically to finance carbon reduction schemes (note – this is only a valid method of offsetting if the funded project would not have taken place without the donated money)
- purchasing commercial offsets (otherwise known as 'carbon credits') which guarantee to provide carbon reductions. Carbon credits are not currently regulated by the Financial Conduct Authority (FCA), so it is advisable to check that they are certified by a scheme such as the UN's clean development mechanism (CDM)
- the use of a zero carbon mains electricity tariff, e.g. one that is entirely generated using renewable sources. This is considered a legitimate form of offsetting provided the zero-carbon electricity is (a) additional – ie. more electricity is generated for each home that contracts to use the tariff– and (b) guaranteed to stay connected to the home – i.e. the householder is somehow prevented from switching to a non-zero-carbon tariff on demand
- **carbon sequestration** schemes that remove carbon from the atmosphere, either industrial or natural (e.g. tree planting).


SAP Bands before and after Zero Carbon plan
3000
2500
2000
1500
1000
500
0
A (92 plus)
B (81 - 91)
C (69 - 80)
D (55 - 68)
E (39 - 54)
F (21 - 38)
G (1 - 20)
NC
Current Profile
SAP Band after Plan


SAP Ratings before and after Zero Carbon Plan
400
350
300
250
200
150
100
50
0
8 24 36 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100 103 106 110 113 116
Current SAP ratings
SAP Rating after Plan

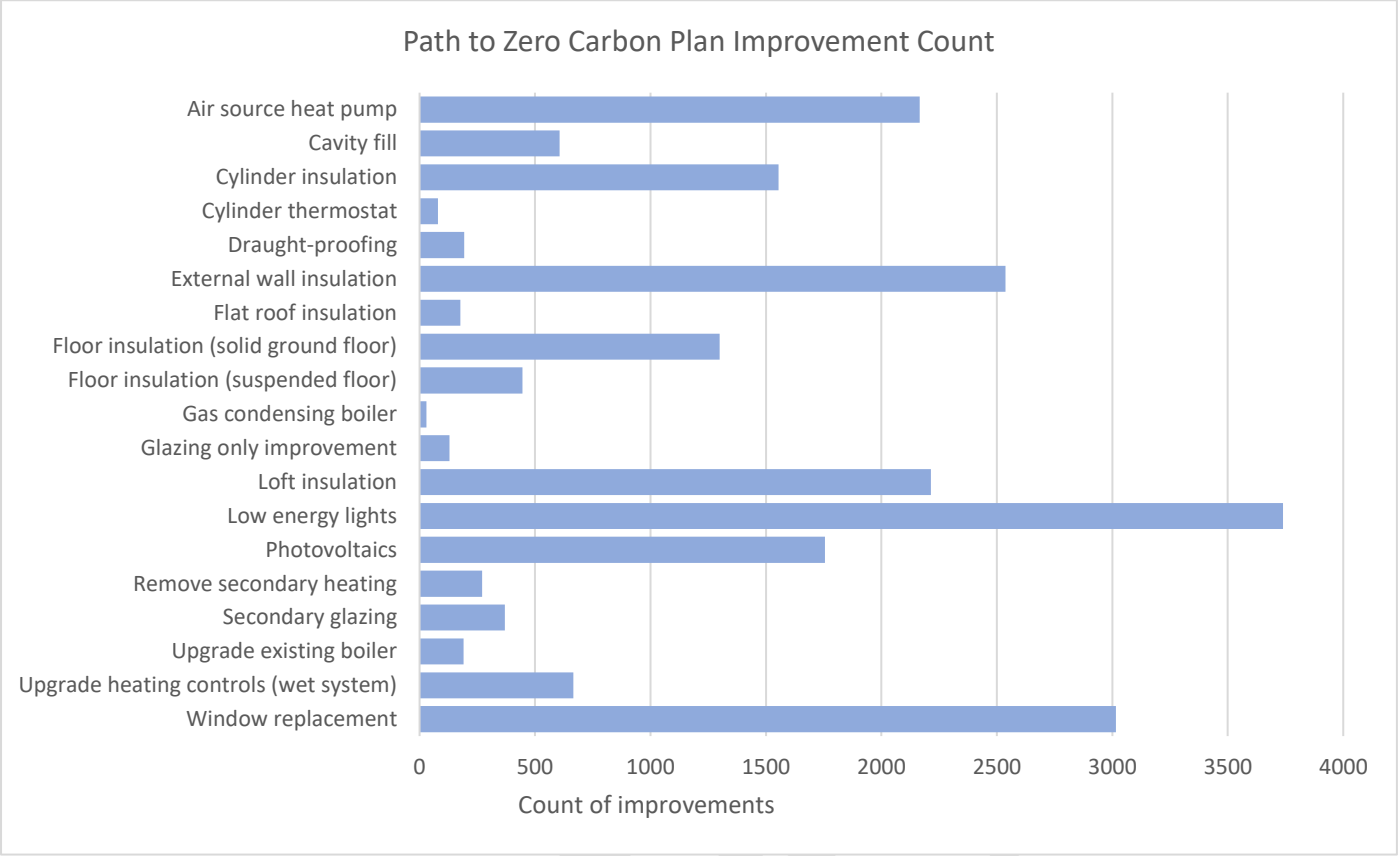
Path to Zero Carbon Plan - Improvement Count:

The following table provides a count of the measures in the zero-carbon plan.

In order to provide some context to the figures in this table, this should be viewed in conjunction with the Improvement Guide Appendix at the end of this document.

	Count					CO_2 reduction (t/yr)*
Improvement	**Bungalow**	**Flat**	**House**	**Maisonette**	**Total**	
Air source heat pump	67	1,012		64	2,166	1,387
Cavity fill	26			4	607	126
Cylinder insulation	64			29	1,555	171
Cylinder thermostat	5				79	17
Draught-proofing	11			3	193	16
External wall insulation		1,196	1,142	109	2,537	778
Flat roof insulation		86	41	40	176	160
Floor insulation (solid ground floor)		600	599	50	1,299	
Floor insulation (suspended floor)		87	325	6	446	
Gas condensing boiler			28		30	
Glazing only improvement		78	34	1	130	
Loft insulation		707	1353	22	2,215	
Low energy lights		1,825	1,589	106	3,739	345
Photovoltaics	182		1,573		1,755	2,300
Remove secondary heating	25	98	141	7		62
Secondary glazing	37	23		1		58
Upgrade existing boiler	7	96		10		57
Upgrade heating controls (wet system)	67	211		23		98
Window replacement	80	1,856		109	3,015	565
Total	**1,119**	**8,867**				**6,944**

**note due to rounding the rows may not add up to the total cost*



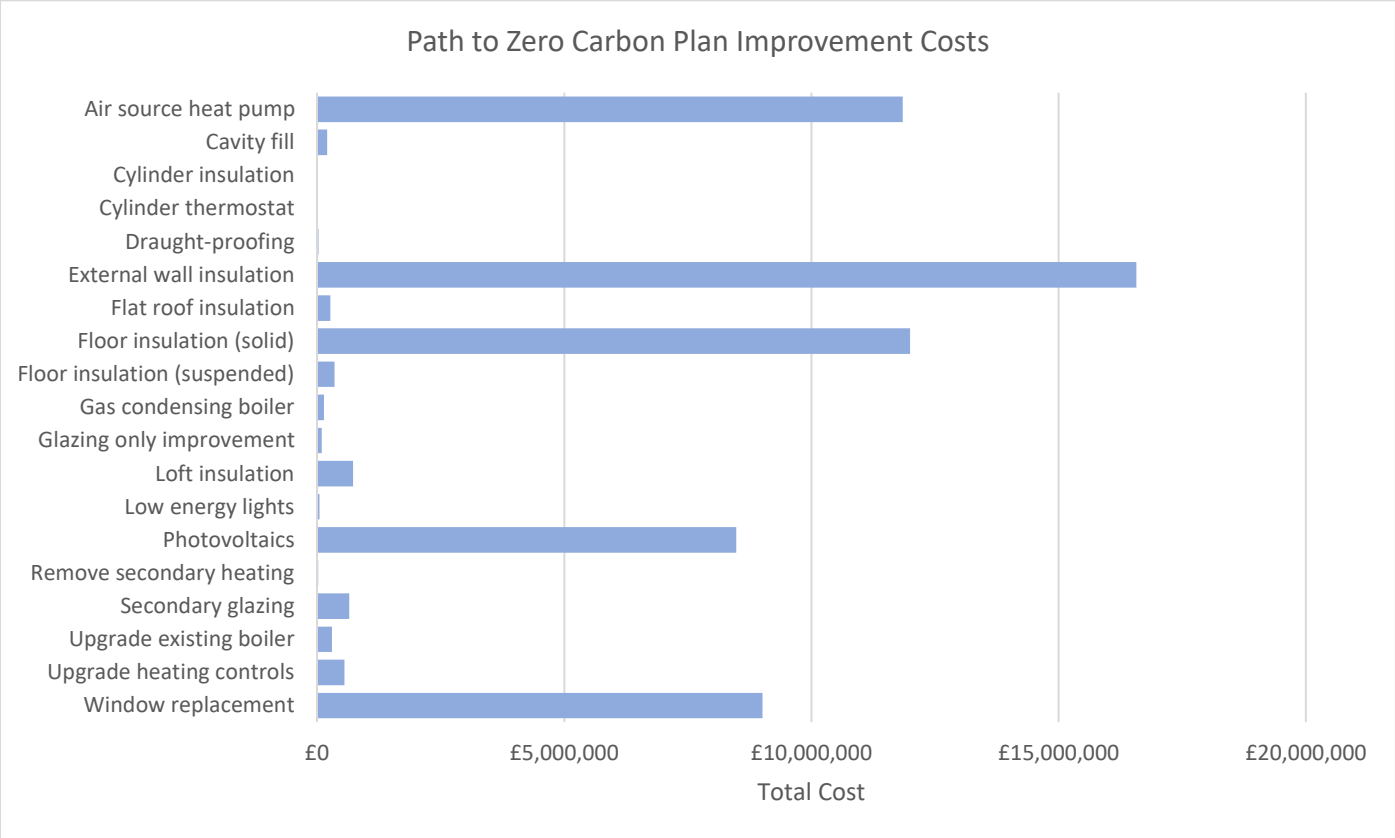
Path to Zero Carbon Plan - Improvement Costs:

The derivation of the costs in the plan are summarised in the Improvement Guide Appendix at the end of this document. These are likely to differ from the costs used by [Customer Name] for planned works.

	Costs				Total cost*	Average measure cost per property
Improvement	**Bungalow**	**Flat**	**House**	**Maisonette**		
Air source heat pump		£5,177,848	£5,956,314		£11,844,229	£5,468
Cavity fill		£124,636			£206,680	£340
Cylinder insulation		£6,318				£12
Cylinder thermostat		£1,200				£100
Draught-proofing		£14,311	£16,600			£174
External wall insulation		£6,700,307	£8,623,974			£6,531
Flat roof insulation		£213,593	£9,909	£45,926		£1,543
Floor insulation (solid)	£398,125	£6,027,401	£5,200,094	£370,905		£9,235
Floor insulation (suspended)	£27,118		£248,487	£3,260		£798
Gas condensing boiler	£9,012		£131,598			
Glazing only improvement	£9,784		£34,829	£769	£96,313	
Loft insulation	£37,631		£424,538	£7,627	£727,668	
Low energy lights	£2,468		£24,640	£1,604	£48,848	
Photovoltaics	£1,018,300		£7,462,895		£8,481,195	
Remove secondary heating	£2,500	£9,800	£14,100	£700	£27,100	
Secondary glazing	£42,748	£25,356		£1,865	£651,081	
Upgrade existing boiler	£10,528	£133,810		£16,394	£303,575	£1,589

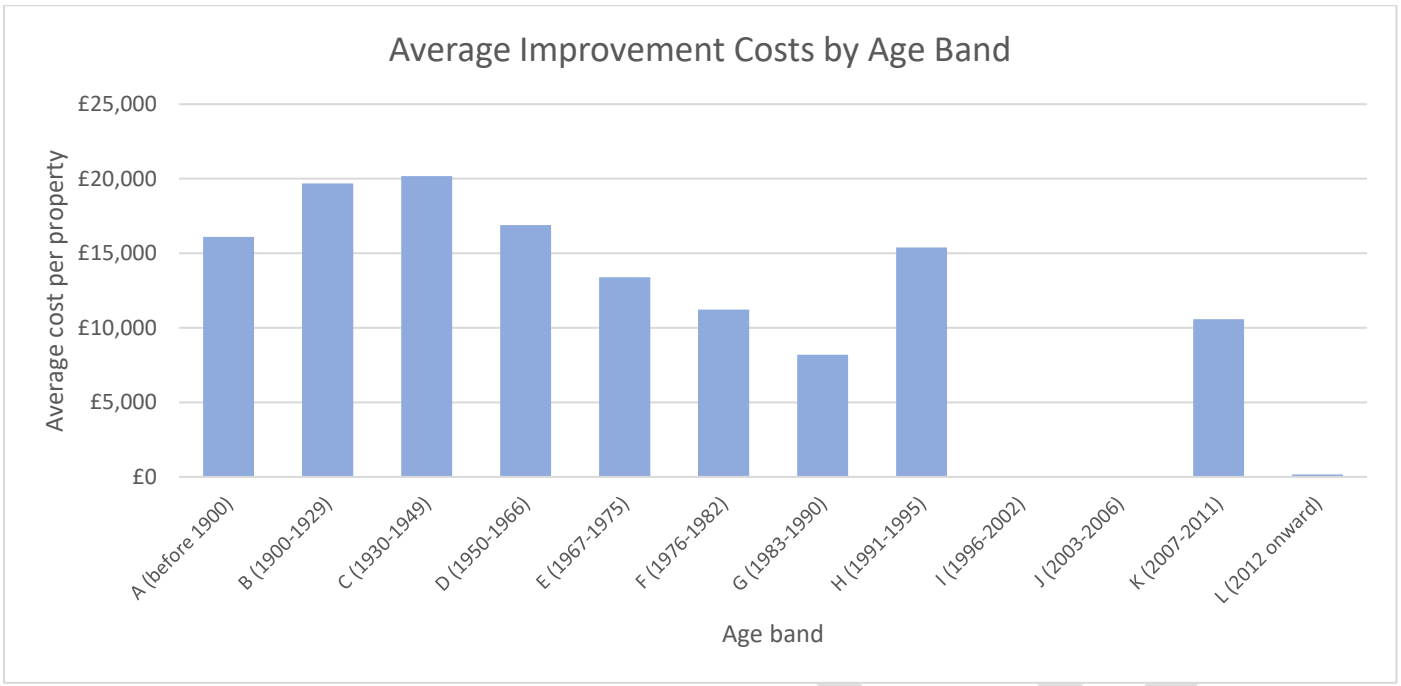
Upgrade heating controls	£47,451	£163,785		£20,430	£551,827	£829
Window replacement	£188,180	£4,534,245		£441,207	£9,010,254	£2,988
Total	**£2,703,645**					

**note due to rounding the rows may not add up to the total cost*



Path to Zero Carbon Plan – Analysis by Age Band:

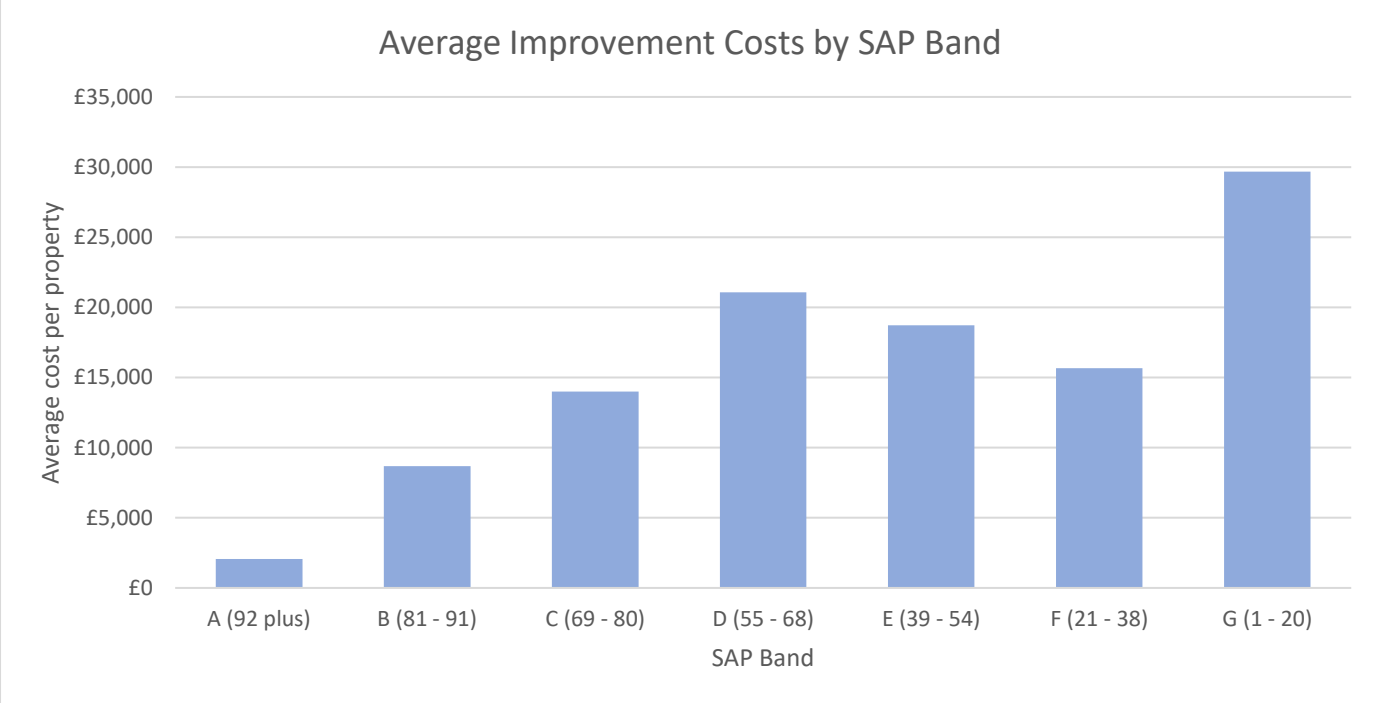
Improvement	Number of properties	Number of improvements	Total Cost	Average Cost per property
A (before 1900)	6	36	£96,600	£16,100
B (1900-1929)	357	2462		
C (1930-1949)	407	2497		
D (1950-1966)		8266		
E (1967-1975)		3819		£13,390
F (1976-1982)	526		£5,903,069	£11,223
G (1983-1990)	423		£3,462,819	£8,186
H (1991-1995)	45	284		
K (2007-2011)	8	36	£84,550	£10,569
L (2012 onward)	56	14	£9,491	£169
Total	**4122**	**21440**		



Analytic comments here

Path to Zero Carbon Plan – Analysis by SAP Band:

Improvement	Number of properties	Number of improvements	Total Cost	Average Cost per property
A (92 plus)	9	18	£18,577	£2,064
B (81 - 91)	668	2542	£5,806,864	
C (69 - 80)		12041		
D (55 - 68)	956	6177		
E (39 - 54)	97	597		£18,719
F (21 - 38)	6	35	£94,006	£15,668
G (1 - 20)	4	30	£118,739	£29,685
Total	**4122**	**21440**		



Analytic comments here

4. Final Comments

Shortened brief

Shortened summary of stock

Plan C overview

Zero carbon overview

Short term steps

Long term situation

Appendix: Improvement guide

Improvement plans within Intelligent Energy contain many different improvements; this guide provides the user with information on the specification for each of the improvements.

Each measure specifies:

- Criteria: This explains when the improvement is evaluated
- Specification: Details of the improvement applied to create the improvement
- Variants: For some improvements there is more than one improvement option. All variants will be evaluated, and the most cost-effective variant included in the plan.
- Identifier: Each improvement, and variant if applicable, has a short code to identify the improvement applied. These codes can be seen in the csv download of the Improvement Plan.
- Packages: The improvement package the measure/variant is include in.
- Costs: An explanation on the basis for the capital costs used

Loft insulation (Code: A)

Criteria	*Specification*	*Variants*	*Identifier*	*Packages*	*Capital costs*
The presence of any pitched roof including thatched roofs, no access pitched roofs and roofs with unknown levels of loft insulation.	Mineral wool insulation to all available loft space. U-values for variants taken from table S9 Appendix S SAP 2012	270mm 400mm U-value = 0.09 W/m^2K	LI-270 LI-400 LI-U0.09	ALL/ECO/EPC ALL/ECO ALL/ECO	The roof area where the insulation is applied as well as the thickness of mineral wool required to reach the variant level is used to calculate bespoke capital costs for each dwelling. The cost per m^2 of the mineral wool insulation is averaged from a variety of commercial sources with a bulk discount applied and the overall cost includes a fixed installation cost. Where insulation already exists in the loft space, the capital costs take this into account and will only calculate the cost of the 'top-up' required.

Cavity fill (Code: B)

Criteria	Specification	Variants	Identifier	Packages	Costs
The presence of any cavity wall that is not recorded as filled, including cavity walls recorded as 'unknown' insulation,	Blown fibre insulation to all suitable walls. Resultant U-value used in the calculation is taken from table S6 Appendix S SAP 2012	None	CWI-STD	ALL/ECO/EPC	The wall area to be treated is used to calculate the capital costs. There are additional costs included for scaffolding for top floor flats, 3 storey dwellings and dwellings with a conservatory. The cost per m^2 and fixed install costs are derived from figures published by EST. The costs assume the cavity is a standard cavity and not classed as 'hard-to-treat'.

Flat roof insulation (Code: A2)

Criteria	Specification	Variants	Identifier	Packages	Costs
The presence of any flat roof that has a U-value greater than 0.18 W/m2K, either entered or inferred. Including flat roofs recorded as 'unknown' insulation.	A U-value of 0.18 W/m2K is applied to all applicable flat roofs	None	FRI-U0.18	ALL/ECO/EPC	The flat roof area to be treated is used to calculate the capital costs. There are additional costs included for scaffolding for top floor flats, 3 storey dwellings and dwellings with a conservatory. The cost per m^2 and fixed install costs are derived from figures published by BEIS.

External wall insulation (Code: Q)

Criteria	Specification	Variants	Identifier	Packages	Costs
All walls, except park home walls. This includes cavity walls, although it is likely cavity wall insulation will be a more cost-effective measure.	EPS boards with a thermal conductivity of 0.038 W/mK to all suitable walls.	50mm 100mm 150mm 200mm	EWI-50 EWI-100 EWI-150 EWI-200	ALL/ECO ALL/ECO/EPC ALL/ECO ALL/ECO	The wall area to be treated is used to calculate the capital costs. There are additional costs included for scaffolding for top floor flats, 3 storey dwellings and dwelling with a conservatory. The cost per m^2 and fixed install cost are derived from figures published by BEIS, assuming a minimum U-value of 0.3 W/m2K must be installed to satisfy building regulations.

Solid floor insulation (Code: W2)

Criteria	Specification	Variants	Identifier	Packages	Costs
All solid heat loss floors, either exposed or ground floor.	EPS boards with a thermal conductivity of 0.038 W/mK to all suitable floors.	50mm 100mm 150mm	FISO-50 FISO-100 FISO-150	ALL/ECO ALL/ECO/EPC ALL/ECO	The floor area to be treated is used to calculate the capital costs. The cost of removing the concrete floor and replacing the concrete is included. The cost does not include any replacement of floor coverings. The cost per m^2 and fixed install cost are derived from figures published by BEIS and a variety of commercial sources.

Suspended floor insulation (Code: W1)

Criteria	Specification	Variants	Identifier	Packages	Costs
All suspended heat loss floors, either exposed or ground floor. This includes brick and block suspended floors	Application of rockwool to the underside of the floor.	50mm 100mm 150mm	FIST-50 FIST-100 FIST-150	ALL/ECO ALL/ECO/EPC ALL/ECO	The floor area to be treated is used to calculate the capital costs. The cost of removing include removing and replacing the floorboards. The cost does not include any replacement of carpets etc. The cost per m^2 and fixed install cost are derived from figures published by BEIS and a variety of commercial sources.

Window replacement (Code: O)

Criteria	Specification	Variants	Identifier	Packages	Costs
Any windows* single, double or triple glazed with a U-value < 1.0 W/m2K. *Does not apply to RdSAP datasets where all the windows have been measured and entered individually	Replace window; glazing and frame. Double glazing: U=1.3 W/m2K, g=0.71 Triple glazing: U=1.0 W/m2K g=0.66	Double glazing Triple glazing	WRD-1.3 WRT-1.0	ALL/ECO/EPC ALL	The costs are based on the number of windows which is inferred from the habitable room count. The cost per window and fixed install cost are derived from a variety of commercial sources.

Glazing only replacement (Code: O3)

Criteria	Specification	Variants	Identifier	Packages	Costs
All double glazed* windows.** *Does not apply to RdSAP datasets where all the windows have been measured and entered individually. ** For the EPC package the window must have uPVC frame and 12mm gap.	Replace the glazing within the existing frame. 6mm or unknown glazing gap: U=2.0 W/m2K, g=0.76 12mm glazing gap: U=1.6 W/m2K, g=0.74 16mm glazing gap: U=1.3 W/m2K, g=0.71	6mm 12mm 16mm	DGR-2.0 DGR-1.6 DGR-1.3	ALL ALL/EPC ALL	The costs are based on the number of windows, which is inferred from the habitable room count, and the glazing gap of the window. The cost per glazing pane and fixed install cost are derived from a variety of commercial sources.

Secondary glazing (Code: P)

Criteria	*Specification*	*Variants*	*Identifier*	*Packages*	*Costs*
All windows* single, double or triple glazed. *Does not apply to RdSAP datasets where all the windows have been measured and entered individually.	Install secondary glazing to all windows. Removeable: U=2.0 W/m2K, g=0.76 Fixed: U=1.5 W/m2K, g=0.76	Removeable Fixed	SG-STD SG-FIX	ALL/EPC ALL	The costs are based on the number of windows which is inferred from the habitable room count. The cost per secondary glazing pane and fixed install cost are derived from a variety of commercial sources.

Cylinder insulation (Code: C)

Criteria	*Specification*	*Variants*	*Identifier*	*Packages*	*Costs*
The presence of a hot water cylinder with anything less than 25mm factory applied insulation or 80mm jacket. Includes cylinders where no access has been recorded.	80mm jacket applied. Note: 25mm of factory applied insulation has the same insulation properties as an 80mm jacket.	None	CYLI-80	ALL/EPC	The cost of the jacket is dependent on the cylinder size. The cost of the jacket is averaged from a variety of commercial sources and it is assumed this is a DIY task.

Low energy lights (Code: E)

Criteria	Specification	Variants	Identifier	Packages	Costs
Less than 100% low energy lighting recorded.	Low energy lighting for all fixed lighting outlets.	None	LEL-100	ALL/EPC	The cost per LED bulb is averaged from a variety of commercial sources. The number of bulbs required uses the number of fixed lighting outlets with no low energy lighting.

Cylinder thermostat (Code: F)

Criteria	Specification	Variants	Identifier		Costs
The presence of a hot water cylinder with no cylinder thermostat. Includes cylinders where no access has been recorded.	Apply cylinder thermostat wired to the heat source.	None	CYLT	ALL/EPC	The cost for a cylinder thermostat (supply and fit) is averaged from a variety of commercial sources for a standard cylinder thermostat.

Upgrade heating controls (wet system) (Code: G)

Criteria	Specification	Variants	Identifier	Packages	Costs
Any wet heating system supplying either radiators or underfloor heating.	For current controls anything less than programmer, room thermostat and TRVs, upgrade controls.	Boiler (B) or Heat pump (HP): Programmer, room stat and TRVs or Time & temperature zone control Programmer, room stat and TRVs Time & temperature zone control	BCTL-EPC HPCTL-EPC BCTL-PTTRV HPCTL-PTTRV BCTL-TT HPCTL-TT	ALL/EPC ALL ALL	The costs for this measure are dependent on the current controls, i.e. if the current controls are programmer and room thermostat, the costs will be for installing TRVs to radiators. The costs for TRVs are based on the number of radiators inferred from the number of habitable rooms. There are fixed costs for a standard digital programmer and analogue room thermostat. Time and temperature zone controls use the number of habitable rooms to estimate the capital costs. The capital costs include an install cost.

Storage heaters (Code: L2)

Criteria	Specification	Variants	Identifier	Packages	Costs
Current heating system is not high heat retention storage heaters (HHRSH) or community heating	Install HHRSH in all habitable rooms, with HHRSH controls. If current hot water system is not from a dual immersion, a dual immersion is installed together with a cylinder if applicable.	HHRSH and cylinder if required HHRSH only	SH-SYS SH-UNIT	ALL/ECO/EPC ALL	The costs are derived from EST and commercial sources. The capital costs use the number of heaters and different install cost depending on whether the current heating system is storage heaters. Where the water heating is changed to dual immersion there are costs for just immersion heater change or immersion heater plus cylinder.

Replace existing boiler (Code: I)

Criteria	Specification	Variants	Identifier	Packages	Costs
Current heating system is a gas or oil boiler and not community heating. The boiler can be condensing or non-condensing.	New condensing boiler The boiler type (regular or combi) will remain the same after the upgrade.	Condensing boiler with standard controls (programmer, room stat and TRVs) (combi or regular)	RBOIL	ALL/EPC	The costs are derived from BEIS published install cost data, EST and commercial sources. There are different capital costs for regular boilers and combi boilers. The total capital cost is based on the number of assumed radiators which is inferred from the number of habitable rooms recorded and includes an allowance for controls if required.

Gas condensing boiler (Code: T)

Criteria	Specification	Variants	Identifier	Packages	Costs
Current heating system not a mains gas boiler or community heating.	Install full mains gas central heating system with controls and radiators. The new gas boiler will be a regular boiler with cylinder the current water heating uses a hot water cylinder, otherwise a combi boiler.	Condensing boiler with standard controls (programmer, room stat and TRVs) (combi or regular) Condensing boiler and time with temperature zone control (combi or regular)	NBOIL-CTL NBOIL-TT	ALL/ECO/EPC ALL/ECO	The costs are derived from EST and commercial sources. The capital costs use the number of heaters and different install cost depending on whether the current heating system is storage heaters. Where the water heating is changed to dual immersion there are costs for just immersion heater change or immersion heater plus cylinder.

Air source heat pump (Code: Z1)

Criteria	Specification	Variants	Identifier	Packages	Costs
Any heating system that is not and Air source heat pump (ASHP) or community heating.	New ASHP (air to water) with radiators, with a new cylinder if there is no cylinder currently. The output of the installed heat pump is dependent the design heat loss* of the dwelling. **design heat loss is the average heat loss coefficient multiplied by a temperature difference of 24.2K. 21K inside and -3.2K outside*	S: <3 kW M: 3 – 8 kW L: > 8 kW	ASHP-S ASHP-M ASHP-L	ALL/ECO ALL/ECO ALL/ECO	The capital costs for the heat pump are based on the installed output, with a cost per kW. The costs are derived from various commercial sources and EST data.

Photovoltaics (Code: U)

Criteria	Specification	Variants	Identifier	Packages	Costs
House or bungalow, no thatched roof. Includes properties with some existing PV.	Install PV and inverter	1.0 kWp 2.5 kWp 4.0 kWp	PV-1.0 PV-2.5 PV-4.0	ALL ALL/ECO/EPC ALL	The costs are derived from BEIS published data in PV install costs. The available roof area is calculated to ascertain which variants are possible.

Removing secondary heating (Code: RS)

Criteria	Specification	Variants	Identifier	Packages	Costs
Secondary heating is present and hot water is not from secondary and main heating type is not storage heaters	Remove secondary heating.	None	R-SEC	ALL	The capital costs are derived from various commercial sources for removing a mains gas fire.

Draught-proofing (Code: DP)

Criteria	Specification	Variants	Identifier	Packages	Costs
Current draughtproofing is less than 100%	Increase draughtproofing to 100%	None	DRA-100	ALL/EPC	The capital costs are based on the percentage of the property that requires draughtproofing and use a professional install cost.

Glossary:

Fabric First

No/Least Regrets

Carbon Sequestration