



MANAGEMENT OF SUSTAINABLE CONSTRUCTION

Quantity Surveying

Cost analysis of making a house more sustainable

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Lecturer: Dr Juan A Ferriz-Papi

Joshua Williams

Student No. 1001029

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Introduction

This assignment will consider the costs and savings of implementing new energy efficient appliances to an existing property. The items elements that will be improved will be changing light bulbs to LED, installing a combination boiler and PV solar panels, the final improvement to calculated is installing cavity wall insulation. By making these improvements to the home should become more energy efficient and give the homeowner utility bill savings.

Set energy values have been provided for before and after the changes, to calculate the cost of the annual utility bills the average cost of gas and electric per kWh/m² for the UK have been used. The cost of gas per kWh/m² £0.04 and for electric £0.16. As the value of energy consumption has been given per m² the total floor space of the home has been calculated, the total floor space for the home is 478.72m².

After the improvements, the homeowner should benefit from savings to their new utility bill costs. From these savings the break-even cost analysis will be completed to calculate the amount of time that the savings in the utility bills will add up to pay back the cost of the changes made to the appliances.

Part 1.

LED Bulbs

The first change to be made is to change all the light bulbs in the property to LED bulbs. The total amount of bulbs in the property was calculated by assuming that there was 1 light in every room apart from in the basement where there was assumed to be 3 in the garage area due to the size of the room. The total amount of lightbulbs calculated in the property was 29. It has been assumed that the homeowner can change the lightbulbs by themselves therefore the labour cost for this element would be £0.00. Each bulb costs £1.91 therefore the total cost of changing every bulb within the house comes to the total of £55.39.

Cavity wall and ceiling insulation

To calculate the cost of the cavity wall insulation the square metreage of the external walls of the property including all the basement walls. This came to a total value of 554.4m². The cavity wall insulation that has been priced is EPS beading, the average cost of this material to supply and fit into cavity walls is between £18.00 - £22.00

therefore the price that has been used to calculate the cost is £20.00. The cost to fill the cavity came to a total of £11,088.00.

Mineral wool insulation has been quoted to fill the loft space of the home. Mineral wool is supplied in 200mm thick rolls therefore two layers has been used to reach a total thickness of 400mm. The cost per m² for 400mm mineral wool is £3.61. The total area of loft space in the property is 164m². Therefore, the total cost of loft insulation to the plot is £592.04. The total cost of cavity wall and lost insulation for the property is £11,680.04.

Combination Boiler and Solar PV Panel

A quote from a local plumbing subcontractor was used for the supply and fit for the combination boiler and the quote came to a total of £1,500.00. The average cost for installing a solar PV system was used which came to £5,000.00. The total cost for the change of these elements is £6,500.00.

Part 2 - Annual Savings to Utility Bills

As was previously stated the energy values of before and after the changes were pre-determined. The previous consumption of electricity was 148kWh/m² and at £0.16 the annual cost to provide electricity to the home was £10,981.00. After the changes were made the annual usage dropped to 31kWh/m² therefore the annual bill dropped to £2,300.26, meaning the change made the owner a saving of £8,681.62 per year.

Improving the insulation to the home the gas used for the plot dropped from 752kWh/m² to 428kWh/m². At a rate of £0.04/m² the gas bill went from £13,679.96 to £7,785.93 saving the homeowner to £5,894.03.

Changing the boiler and adding PV solar panels the energy usage rose from 752kWh/m² to 863kWh/m². This would seem to be an anomaly as the combination boiler should make the energy consumption and the solar panels should also cause the homeowner to use less power from the grid during daylight hours as the panels create energy. If the calculation is correct then the homeowner would have to pay an extra £2,019.25 in gas bills per year.

If the insulation and boilers were improved and PV solar panels are added then the overall energy consumption of gas will be reduced from 752kWh/m² to 158kWh/m².

This lowers the gas bill from £13,679.96 to £2,874.25 giving the homeowner a huge saving of £10,805.71 per year.

Part 3 - Break Even Analysis

The break-even cost analysis highlights the time taken for the savings that are made through making improvements such as the ones described in this body of work, to pay themselves off.

Due to the average life span of an LED bulb being 15,000 hours the owner will not require to change the bulb in a period of a year after changing. This means that beyond the initial costs of purchasing the bulbs there will be no extra maintenance costs in a year. The time taken for the savings of created by changing to LED bulbs the time taken to break even is 0.01 years.

Insulation also has no maintenance costs so there are no further costs to consider after its installation. Therefore, the savings created from making the improvements will pay back its investment in 2.02 years.

As the energy consumption from adding a combination boiler and solar panels rose as per the table provided this investment would never break even and would continue to cost the homeowner an extra £2,019.25 per year, as previously stated this is expected to be an anomaly in the result.

If the addition of a combination boiler, PV solar panels and insulation were all completed together the total investment of the supply and fit of the materials came to a total of £18,180.04. The addition of all these elements would save the homeowner a total of £7,374.33 per year. Therefore, it would take 2.47 years for the investment to breakeven.

Conclusion

In conclusion, it would seem that making these improvements to a property is cost effective and can pay for themselves in a suitable amount of time meaning that the homeowner will not have to wait too long before seeing a return on their investment. As well as being cost effective the changes allow for homes to consume less energy reducing their carbon footprint.

Bibliography

Bill, H. (2020). *Compare Energy Prices Per kWh | Gas & Electric Per Unit | UKPower*. [online] Ukpowers.co.uk. Available at: https://www.ukpower.co.uk/home_energy/tariffs-per-unit-kwh [Accessed 6 Feb. 2020].

Homebase. (2020). *Knauf Earthwool Loft Roll - 200mm*. [online] Available at: https://www.homebase.co.uk/knauf-earthwool-loft-roll-200mm_p394101 [Accessed 7 Feb. 2020].

Insulation-info.co.uk. (2020). *Cavity wall insulation- Price information & Insulation types*. [online] Available at: <https://www.insulation-info.co.uk/cavity-wall-insulation> [Accessed 7 Feb. 2020].

Nimblefins.co.uk. (2020). *Average Unit Cost of Electricity in the UK 2020*. [online] Available at: <https://www.nimblefins.co.uk/average-cost-electricity-kwh-uk> [Accessed 6 Feb. 2020].

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Appendix

Students » Hub x ACBA5010: Drawings x Philips LED B22 Frosted Light Bul x +

amazon.co.uk led bulbs

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Philips LED B22 Frosted Light Bulbs, 8 W (60 W) - Warm White, Pack of 6 [Energy Class A+]

by Philips

★★★★★ 3,195 ratings | 160 answered questions

Amazon's Choice for "light bulbs"

RRP: £19.99
Price: **£11.48** & FREE Delivery on orders dispatched by Amazon over £20.00 . Delivery Details
You Save: £8.51 (43%)

Note: This item is eligible for click and collect. Details

New & Used (5) from £11.25 & FREE Shipping on orders over £20.00

Size Name: **6 pack**

2 pack 3 pack **6 pack** Single pack

Style Name: **B22 Bayonet cap**

B22 Bayonet cap E27 Edison Screw

Pattern Name: **60W equivalent (806 lumen)**

100W equivalent (1521 lumen) 40W equivalent (470 lumen) **60W equivalent (806 lumen)** 75W equivalent (1055 lumen)

- High Quality LED Light with superior materials, perfect for home use
- Create a cozy and warm environment similar to halogen or incandescent lamps
- Very Low energy consumption - saves up to 80% energy
- Never change your light bulb - Lasts up to 15000 hours
- High colour rendering (CRI > 80) provides vivid colour and extra warm light effect

See more product details

Compare with similar items

Similar item to consider

AmazonBasics LED E14 Small Edison Screw Golf Ball P45 Bulb, 5.5W (equivalent to 40W), Warm White- Pack of 2
£7.29 -prime

£11.48
& FREE Delivery on orders dispatched by Amazon over £20.00 . Delivery Details

Get it Tue, 11 Feb. - Wed, 12 Feb. with FREE delivery.

Get it Tomorrow if you order within 7 hrs 7 mins and choose faster delivery at checkout. Details

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https://www.amazon.co.uk/Philips-LED-Frosted-Light-Bulbs/dp/B01KHILT36/ref=sr_1_5?adgrpid=51992488063&gclid=EAlaIqObChMI5e3Y7YW95wIVQrTtCh3psAUhEAAyAIAAEgLr3PD_BwE&hvadid=259049150860&hvdev=c&hvlocphy=1007460&hvnetw=g&hvqmt=e&hvrnd=16182776903667606940&hvtargid=kwd-47369470&hydadcr=170_1786934&keywords=led%2Bbulbs&qid=1580996224&sr=8-5&th=1

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Average Unit Cost of Electricity in the UK 2020

Most recently, the [average electricity bill in the UK](#) was around £600 per year. But there's quite a bit of variation around the UK, due to differences in household energy consumption and the price paid per kWh for electricity in [different regions](#). Additionally, unit costs vary depending on how you pay: credit, direct debit or prepayment. We've broken out costs according to these different variables so you can see how your cost of electricity compares.

Looking for a cheaper energy deal? Click the blue "Find Deals" button below to compare with Energylinx:

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Unit Cost of Electricity per kWh, by UK Region

The average cost of electricity is 15.5 p/kWh in the UK. Regardless of how you pay for your electricity, residents in North Scotland, the South West, Merseyside & North Wales and South Wales pay the most, with per kWh costs running more than 16p/kWh on average to supply electric to homes. In fact, consumers in the South West and North Scotland pay 7.1% and 7.3% more than the UK average, respectively.

Area	Average variable unit price (p/kWh)
East Midlands	14.9
Yorkshire	15.1
South Scotland	15.2
North West	15.2
East of England	15.3

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<https://www.nimblefins.co.uk/average-cost-electricity-kwh-uk>

published in 2020

ukpower.co.uk/home_energy/tariffs-per-unit-kwh

There are a number of costs that go into making up your annual energy bill, but the price you pay for your actual gas and electricity can be broken down into two distinct parts – the standing charge and the unit rate.

- **Standing charge** - this is a fixed amount that you are charged each day, regardless of how much gas or electricity you use.
- **Unit rate** - this is the price you will pay per unit, measured in kilowatt hours (kWh) of energy, so it can fluctuate depending on how much energy you use.

A deal that offers [cheap gas and electric prices](#) will usually advertise a cheaper unit rate, but it's important to factor in the standing charge when calculating costs.



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Between 1 July 2019 and 31 December 2019, at least 10% of people who switched energy supplier for both gas & electricity with Uswitch saved £479 or more.

Although [energy tariffs without standing charges](#) are available, all contracts come with a unit price for gas and electricity, that's either fixed or variable depending upon the type of deal you're on.

Each energy supplier will set its own rate, but figures from the [Energy Savings Trust](#) show that standing charges for electricity are usually around 20p per day, although you may be charged between 5p and 60p per day. Gas is charged at an average rate of 24p per day, but can be anywhere between 10p and 80p per day.

Both gas and electricity consumption is measured in kWh. The unit rate you pay will vary depending upon the energy price plan you're on, and even [the region you live in](#), but the average cost of electricity per kWh is 14.37p, and the average gas cost per kWh is 3.80p.

Electricity prices per kwh

Supplier	Tariff	Avg. kWh unit price (ex VAT)	Annual Standing Charge (ex VAT)
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Ovo pays £8.9m for overcharging customers

Switch to beat the January price hikes

Switching is easy

Our weekly newsletter has all the latest money-saving deals and energy-saving advice. Just enter your email address to sign up.

Latest energy price updates

Latest supplier prices change: **12 September 2019**

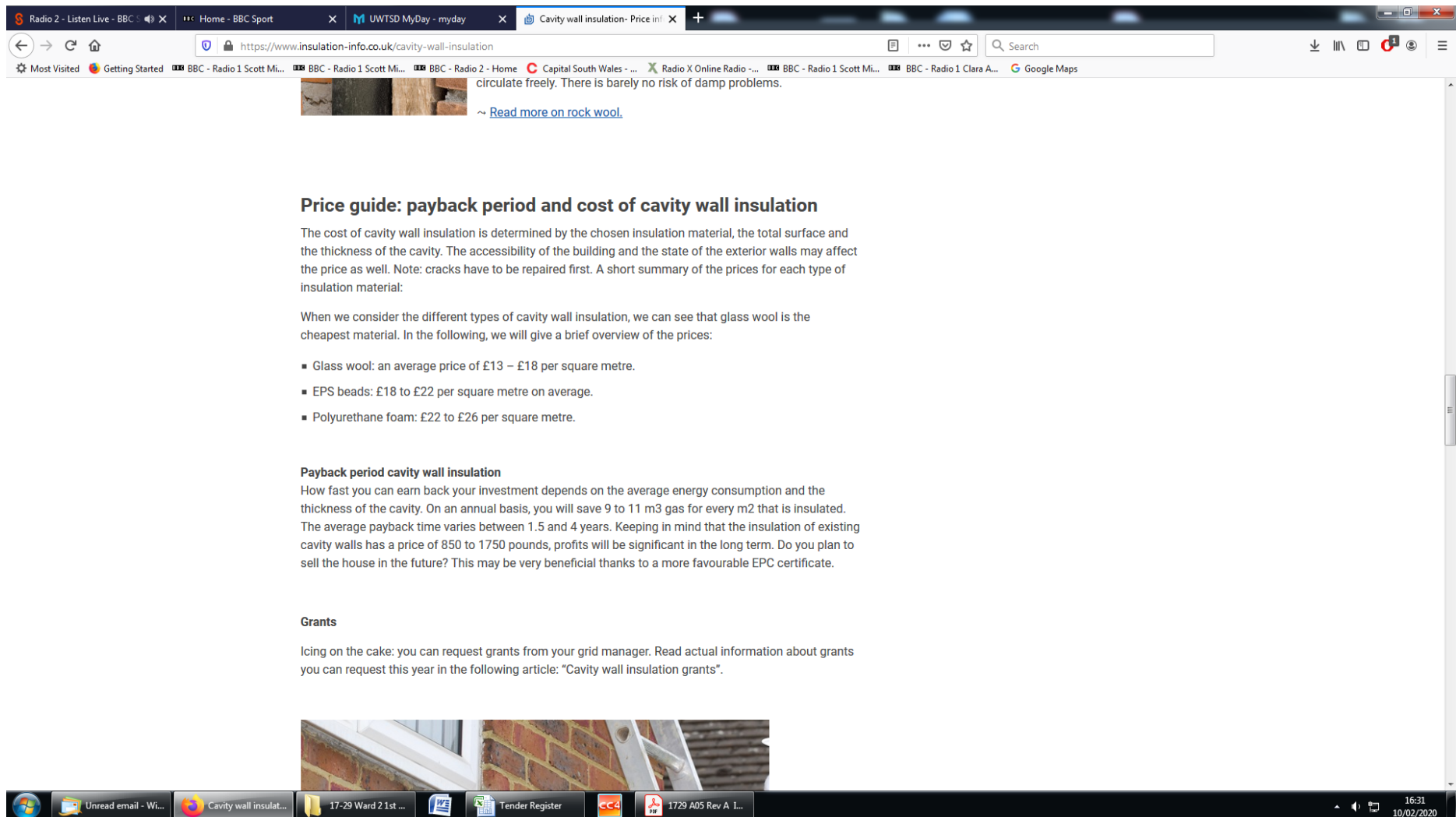
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https://www.ukpower.co.uk/home_energy/tariffs-per-unit-kwh

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https://www.insulation-info.co.uk/cavity-wall-insulation

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circulate freely. There is barely no risk of damp problems.

[~ Read more on rock wool.](#)

Price guide: payback period and cost of cavity wall insulation

The cost of cavity wall insulation is determined by the chosen insulation material, the total surface and the thickness of the cavity. The accessibility of the building and the state of the exterior walls may affect the price as well. Note: cracks have to be repaired first. A short summary of the prices for each type of insulation material:

When we consider the different types of cavity wall insulation, we can see that glass wool is the cheapest material. In the following, we will give a brief overview of the prices:

- Glass wool: an average price of £13 – £18 per square metre.
- EPS beads: £18 to £22 per square metre on average.
- Polyurethane foam: £22 to £26 per square metre.

Payback period cavity wall insulation

How fast you can earn back your investment depends on the average energy consumption and the thickness of the cavity. On an annual basis, you will save 9 to 11 m³ gas for every m² that is insulated. The average payback time varies between 1.5 and 4 years. Keeping in mind that the insulation of existing cavity walls has a price of 850 to 1750 pounds, profits will be significant in the long term. Do you plan to sell the house in the future? This may be very beneficial thanks to a more favourable EPC certificate.

Grants

Icing on the cake: you can request grants from your grid manager. Read actual information about grants you can request this year in the following article: "Cavity wall insulation grants".

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<https://www.insulation-info.co.uk/cavity-wall-insulation>

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Radio 2 - Listen Live - BBC Home - BBC Sport UWTSD MyDay - myday Cavity wall insulation- Price in Knauf Earthwool Loft Roll - 200mm

https://www.homebase.co.uk/knauf-earthwool-loft-roll-200mm_p394101

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Knauf Earthwool Loft Roll - 200mm

SKU: 394101



Was £17
£14
You save £3
Offer valid until 03/03/20

Delivery within 10 days
Delivery cost: £10.00

Available in stores
Store pickup: Free
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[How to insulate your loft](#)

Product Description		Product Details		Delivery & returns	
Material	Glass mineral wool	Colour	Natural		
Features	For use as a top up layer or between ceiling joists/lightweight and economical insulation quilt/partially cut perforations giving flexibility/provides excellent thermal performance/made with EcoSe technology	Additional information	Thickness 200mm, Length 3.40m, Width 1140mm		
Coverage	Area Per Roll 3.88m2	Industry standards or certification	BS EN 13162		

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https://www.homebase.co.uk/knauf-earthwool-loft-roll-200mm_p394101

Sustainable Development

	Ground Floor	First Floor	Second Floor	Total
Total Floor Space (m2)	187.1	145.811	145.811	478.72 m2

Part 1

Cost of refurbishment

	Quantity	Unit	Cost per Bulb	Total Cost of Replacement
LED Bulbs	29	Nr	£1.91	£55.39

	Quantity	Unit	Cost per m2	Total
Insulation				
Cavity walls	554.4	m2	£20.00	£11,088.00
Ceiling	164	m2	£3.61	£592.04
			Total	£11,680.04

	Quantity	Unit	Cost	Total
Heating and hot water system				
Boiler	1	Item	£1,500.00	£1,500.00
PV Panels	1	item	£5,000.00	£5,000.00
			Total	£6,500.00

Part 2

Current cost of energy consumption per year

(1)	Consumption	Unit	Average cost of electricity (UK)	Unit	Total/m2	m2	TOTAL COST
Lighting costs							
Old cost per year	148	kWh/m2	£0.16	p/kWh	£22.94	478.722	£10,981.88
New cost per year	31	kWh/m2	£0.16	p/kWh	£4.81	478.722	£2,300.26
						Saving	£8,681.62

(2)	Consumption	Unit	Average cost of gas (UK)	Unit	Total/m2	m2	TOTAL COST
Gas costs (Insulation)							
Old cost per year	752	kWh/m2	£0.04	p/kWh	£28.58	478.722	£13,679.96
New cost per year	428	kWh/m2	£0.04	p/kWh	£16.26	478.722	£7,785.93
						Saving	£5,894.03

(3) Gas costs (Boiler and PV panels)	Consumption	Unit	Average cost of electricity (UK)	Unit	Total/m2	m2	TOTAL COST
Old cost per year	752	kWh/m2	£0.04	p/kWh	£28.58	478.722	£13,679.96
New cost per year	863	kWh/m2	£0.04	p/kWh	£32.79	478.722	£15,699.21
						Saving	-£2,019.25

Combined insulation and changed heating	Consumption	Unit	Average cost of electricity (UK)	Unit	Total/m2	m2	TOTAL COST
Old cost per year	752	kWh/m2	£0.04	p/kWh	£28.58	478.722	£13,679.96
New cost per year	158	kWh/m2	£0.04	p/kWh	£6.00	478.722	£2,874.25
						Saving	£10,805.71

Part 3 - Payback Period

	Cost of change	Saving per year	Difference per year	Numbers of years until payback
Bulbs	£55.39	£8,681.62	-£8,626.23	-0.01 years

	Cost of change	Saving per year	Difference per year	Numbers of years until payback
Insulation	£11,680.04	£5,894.03	£5,786.01	2.02 years

	Cost of change	Saving per year	Difference per year	Numbers of years until payback
Boiler & PV Panels	£6,500.00	-£2,019.25	£8,519.25	0.76 years

	Cost of change	Saving per year	Difference per year	Numbers of years until payback
Insulation, Boiler & PV Panels	£18,180.04	£10,805.71	£7,374.33	2.47 years