Adapting London Plan Offsetting Rates for 2022 Building Regulation Updates

Evidence for Bath & North East Somerset Council

Revision:	Version 2
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Issue date:	5th May 2022

1 Introduction

This report has been issued as an addendum to the CSE's West of England Net Zero Buildings Study report "Carbon offsetting report – Carbon offsetting within an energy intensity policy framing" as additional evidence for Bath and North East Somerset Council (B&NES). It provides evidence to demonstrate that the use of the UK Government's 2021 Carbon Values for Policy Appraisal[1] can be considered broadly equivalent to carbon offsetting rates used in the 2021 London Plan.

1.1 Rationale

B&NES have requested that developer cash in lieu payments for offsetting residual carbon emission are set no greater than the equivalent price paid by most London Borough's as set out on the London Plan. They have also requested that given the timelines of the LPPU, the accounting of offsetting payments should remain in carbon, rather than energy (see section 5.5)

As with the London Plan's approach, any carbon offsetting for new development will only be permitted where the Local Planning Authority is satisfied that all on-site savings through energy efficiency and renewable energy have first been maximised.

2 Carbon values

2.1 Greater London offsetting prices

London has the most established offsetting scheme for new development, with all Local Planning Authorities required to collect carbon offset payments for any major development with a carbon shortfall and set up a carbon offset funds (including developing a pipeline of projects to invest in). In doing so they must adopt the Greater London Authority (GLA) rate of £95 per tonne of carbon dioxide for a period of 30 years, or set an alternative price locally. The majority of boroughs have followed the GLA's lead, with the exception of Islington (a one off payment equivalent to £30/ tCO_2e assuming a 30 year life time) and Lewisham (£104/tCO_2e calculated for 30 years). The methodology for establishing the GLA price level is set out in the 2017 Aecom report "London Carbon Offset Price Report"

2.2 BEIS Green Book Carbon Values

The BEIS Green Book carbon values are the reference values that were used in part to set the London Plan offset rate when evidence for this offset rate was finalised in 2017.[2] The GLA recommend a rate of £95 per tonne of carbon dioxide for a period of 30 years. This is the 'high' rate that was provided in the BEIS Green Book in 2017 and the rate closest to the

[1] BEIS (2021). *Valuing greenhouse gas emissions in policy appraisal*. Available at: https://bit.ly/3uGtbfO
[2] AECOM (2017). *London Carbon Offset Price*. Available at: https://bit.ly/3iJrw3A

development costs of new renewables (as calculated at the time).

The Green Book carbon values have been updated several times since this publication, with an overhaul in 2021 to reflect two key updates:

1. UK EU withdrawal (i.e. all new offsetting measures assumed to be undertaken within UK boundaries).
2. UK Government commitments to net zero carbon by 2050 (i.e. removal of a 20% allowance for fossil fuel attributed offsetting allowed for prior to 2019).

These, alongside other changes such as market costs and inflation, have increased the Government carbon values for policy appraisal significantly, closer towards ambitions for a net zero economy by 2050. On requesting clarification, BEIS have confirmed that the value of £95/t is outdated and should no longer be considered for policy appraisals.

Table 1BEIS Green Book carbon values for policy appraisal

Year	Carbon price (£/tCO_2e)		
	Low	Central	High
2017 *(2016 publication)*	2	64	**95**
2022 *(2021 publication)*	124	248	**373**
2023 *(2021 publication)*	126	252	**378**

This document considers the BEIS high prices only, in the understanding that even the high BEIS prices are significantly less that the example case of offsetting locally (see section 5.4). This is consistent with the approach taken by the GLA.

2.3 2022 Building Regulation Updates

In June 2022, new national Building Regulations come into force. Amongst other updates the calculation methodology for Part L (Heat and Power) of the regulations is being updated.

Part of these updates includes the reduction of assumed carbon content of the UK electricity grid. This is expressed as a 'carbon factor' and is being reduced from 519gCO_2/kWh to 136gCO_2/kWh.

For most developments, the impact of this change will be to reduce the cost of offset payment being made. This is demonstrated in the worked example below where a development using the London Plan price of £95/t would pay nearly four times less from June 2022 if updating carbon emission factors.

Table 2 Reporting carbon shortfall in Part L of the Building Regulations using the London Plan offset price; worked example

		Building Regs. Version		Calculation reference
		2013-'22	2022-'25	
Residual gas demand	kWh/yr.	n/a	n/a	
Residual electricity demand	kWh/yr.	3,000	3,000	A

Electricity emission factor	gCO_2/kWh	**519**	**136**	B
Carbon shortfall	$tCO_2/yr.$	1.6	0.4	C (A x B ÷ 1,000,000)
Cumulative shortfall	tCO_2	48	12	D (C x 30 years)
Carbon dioxide offset price	£/tCO_2	95	95	E
Cash-in-lieu contribution	£	**4,560**	**1,140**	D x E

2.4 Carbon factors

The worked examples in section 2.4 use a static carbon factor throughout the year for simplicity, however in practice the carbon intensity of the UK electricity grid fluctuates significantly throughout each day and across seasons. To improve the reporting of this, calculations for Part L of the Building Regulations will from June have built within them a monthly adjustment, both for carbon emission factors and for primary energy (not discussed in this report). Whilst not perfect, this mitigates an inherent risk of oversimplification where supply of and demand for low carbon energy are mismatched.

To ensure this fluctuation is captured, annual carbon emissions should be taken directly from Building Regulations compliance modelling (SAP version 10.2) rather than calculated using a static annual carbon factor. Where including unregulated energy not captured in SAP (e.g. white goods, external lighting, plug loads) an auxiliary calculation would be required.

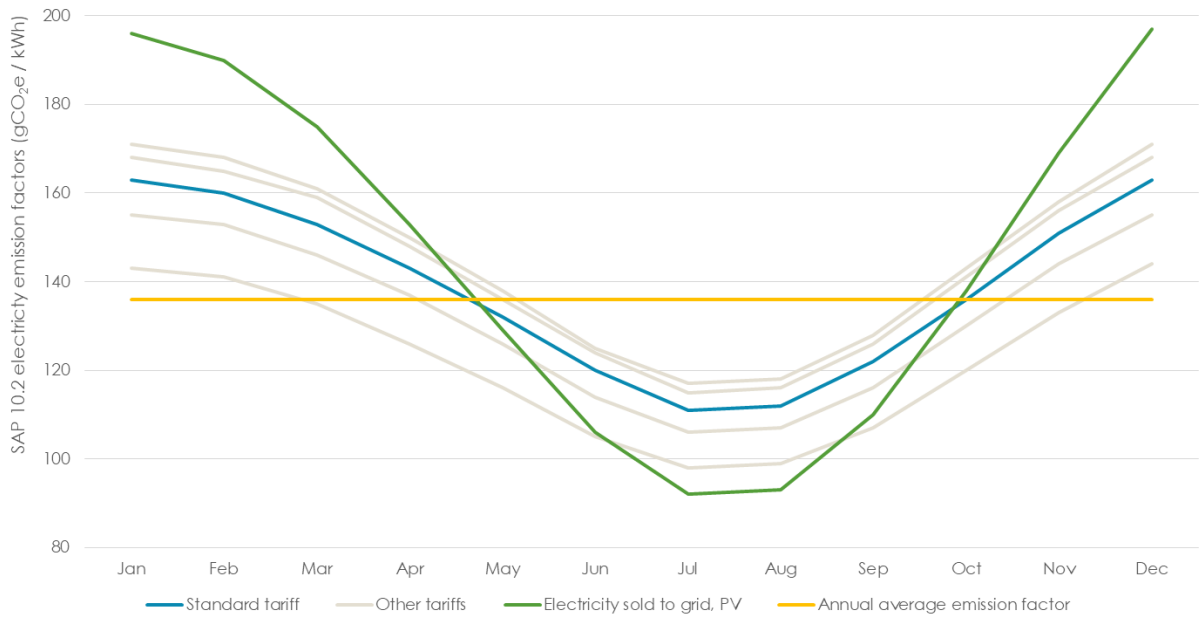

Figure 1 Monthly changes in electricity carbon factors – example from SAP

3 Establishing an equivalent price for 2022

It can be argued that a developer could be expected to pay less in offset payments with a decarbonised grid as greater ambition elsewhere is compensating for a lack of performance

on-site and within the region.

Whilst this argument can be viewed as correct in carbon accounting terms, it dilutes the intention of the GLA £95/t offset rate to act as a financial deterrent to offsite measures. Updating emission factors without updating carbon prices has the effect of reducing the decarbonisation efforts of new development relative to other sectors.

By using updated Green Book Carbon Values for either 2022 or 2023 combined with updated Building Regulation carbon factors, Table 3 shows a far closer cash-in-lieu contribution to the original worked example in Table 2. The impact would therefore not put additional financial viability pressures on developments compared to previous values.

Table 3 Cash-in-lieu contributions for different Green Book offset prices

		Green Book Offset Price			Calculation ref.
		2017	2022	2023	
Residual gas demand	kWh/yr.	n/a	n/a	n/a	
Residual electricity demand	kWh/yr.	3,000	3,000	3,000	A
Electricity emission factor	gCO_2/kWh	519	136	136	B
Carbon shortfall	$tCO_2/yr.$	1.6	0.4	0.4	C (A x B ÷ 1,000,000)
Cumulative shortfall	tCO_2	48	12	12	D (C x 30 years)
Carbon dioxide offset price	£/tCO_2	95	373	378	E
Cash-in-lieu contribution	£	4,560	4,476	4,536	D x E

4 Inflation and administration costs

The analysis in Table 3 does not account for inflation since 2017, nor does it allow for the administration cost of running a cash in lieu contribution scheme. Based on historic Bank of England general inflation rates, the adjusted 2017 prices for the same worked example are observed as broadly equivalent to 2022 or 2023 Green Book 'High' prices, inclusive of a 10% administration charge to B&NES.

Table 4 Worked example: inflation and admiration cost adjustments

		Green Book Offset Price			Calculation ref.
		2017	2022	2023	
Cash-in-lieu contribution	£	4,275	4,476	4,536	A
Inflation adjustment	£	684	-	-	B
Administration cost	£	n/a	10%	10%	C
Total cost	£	**4,959**	**4923**	**4,990**	(A+B) x (1+C)

5 Net zero carbon offsetting

The analysis in sections 3 and 4 compares offset rates used in London and advised on by BIES, however it does not consider whether these costs would be sufficient to deliver zero

carbon offsetting on the local region. This section considers the costs that would need to be paid by developers to fund the full carbon shortfall within B&NES, i.e. to have not net carbon increase from new development.

5.1 Balancing net zero at a regional level

In setting a net zero offset rate locally there are two main considerations; maximising onsite renewables and not increasing the burden on existing district wide decarbonisation plans. Net zero offsetting should without exception be a last resort as it is almost always more cost effective to go further with new development than it is to retrofit existing stock.

Historically, offsetting levels have been set based predominantly on the first priority. Whilst this has accelerated the deployment of renewables, its continued use as a mechanism allows new development to use up the low hanging fruit resources, typically large scale renewables that are likely to be delivered without this intervention . Whist this can be accounted for as a net zero balance for the new development, this can drive up the cost of offsetting for other sectors that are less able to meet net zero requirements onsite.

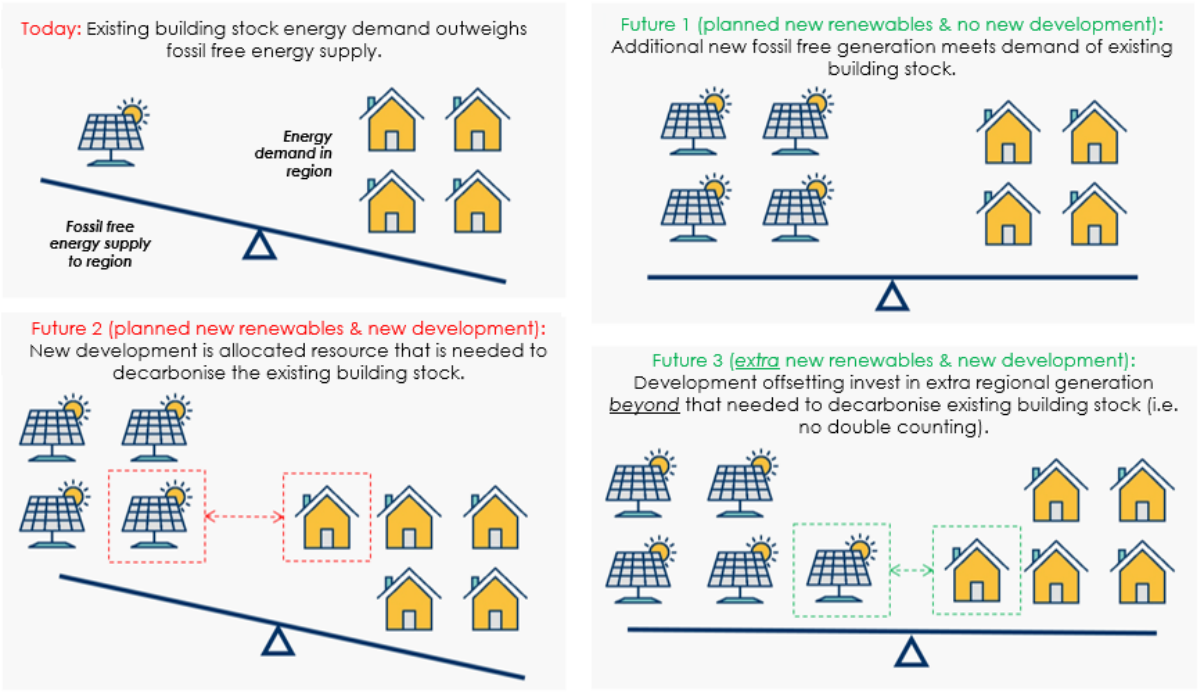

Figure 2 Balancing net zero at a regional level

5.2 Rate of savings

Wider principals of carbon offsetting are not covered in this document, however it is critical that any investment of cash in lieu contributions is spent at the same rate as a development would emit residual carbon. Failure to do so would require higher offset prices to play 'catch-up' with development emissions; offset payments in bank accounts do not save carbon.

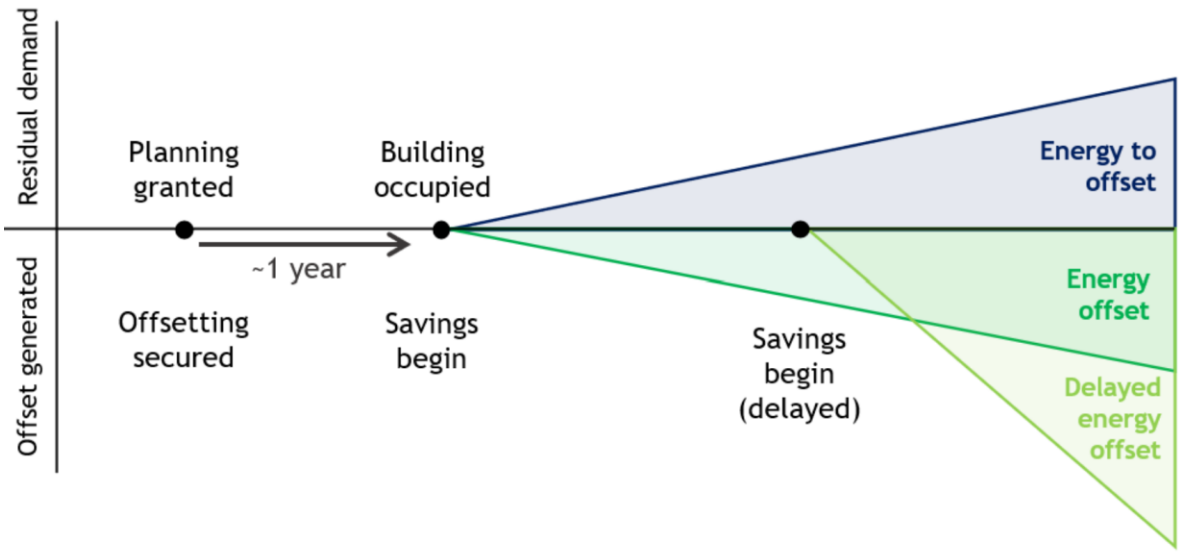

Figure 3 Rate of savings concept

5.3 Energy & carbon imbalance

Calculating energy and emission levels by month (section 2.4) goes some way towards addressing any imbalance between supply and demand of energy and carbon. However this remains simplified and does not account for daily fluctuations in renewable energy generation and building energy use. To address this, energy storage and flexibility should be promoted through primary policy so that supply and demand is better matched at a site level. This is achieved via flexibility mechanisms such as peak demand shifting or battery storage, balancing out peaks and troughs in energy flows. Where this has not been addressed, offsetting rates could include an allowance for energy storage *offsite*. This would increase the prices set out in Table 5, to align them with true net zero development in cases where primary policy does not address this requirement.

5.4 Price comparison

Whist the prices in section 3 and 4 are sufficient to promote some onsite action ahead of offsetting, they are insufficient to deliver true net zero carbon development locally. As an example, Table 5 considers the cost and generation for a recent solar PV project developed by B&NES at Charlton House, Keynsham. Whist other offsetting measures are possible, this is a good example of a project that cash-in lieu payments could be used for. The equivalent cost of carbon that can be calculated for delivering this project is almost twice that of the 2022 Green Book Offset prices.

Table 5 Offset price needed to deliver B&NES rooftop PV example

Project value	£	72,343	A
Lifetime operation and maintenance (estimate)	£	13,400	B
Mid-life inverter replacement (estimate)	£	3,000	C
Lifetime cost	£	88,743	D (A + B + C)
Annual generation	kWh	50,000	E
Electricity emission factor	gCO_2/kWh	136	F

Emissions offset from electricity grid	tCO_2/yr.	6.8	G (E x F ÷ 1,000,000)
Cumulative emissions offset from grid	tCO_2	136	H (G x 20 years)
Equivalent offset price	£/tCO_2	652	D ÷ H

'Fabric first' developments should have a low demand by default. Whilst an increase in carbon *price* from £378 to £652/tCO_2e is significant, the impact on housing delivery and development viability needn't be. A policy compliant home should have a total energy use no greater than 40kWh/m^2 and typically met carbon neutrality onsite.

The example in Table 6 compares a home that can install 8 solar panels, versus one that can install none (for this example, 9 to 10 panels would not require any carbon offset). To increase ambition from the BEIS benchmark to a fully net zero carbon development for this example would add an additional one off cost of £4,000 per home in the worst case where no renewables are delivered on site. This falls to £900 where 8 panels are installed.

Table 6 Example building calculation

		Building A		*Building B*		
		Scenario 1	*Scenario 2*	*Scenario 3*	*Scenario 4*	
Building energy use	kWh/m^2	40				*A*
Floor area (GIA)	m^2	90				*B*
Solar panels	number	0	*0*	*8*	*8*	*C*
Soar irradiance	kWh/panel	347				*D*
Energy from solar PV	kWh	0	*0*	*2,776*	*2,776*	*E (C x D)*
Residual energy	kWh	3,600	*3,600*	*824*	*824*	*F (A x B – E)*
Carbon factor[3]	gCO_2/kWh	136				*G*
Residual carbon	tCO_2/yr.	0.49	*0.49*	*0.11*	*0.11*	*H (FxG÷1,000,000)*
Residual carbon	tCO_2	14.7	*14.7*	*3.3*	*3.3*	I (H x 30 years)
Offset price	£/tCO_2	378	652	378	652	*J*
Amount to offset	**£**	**£5,556**	**£9,584**	***£1,247***	***£2,152***	***K (I x J)***

5.5 Accountability

The core LPPU energy policy has moved towards setting targets based on energy rather than carbon (though carbon emissions will still be reported). This serves to increase transparency of reporting and accountability in the occupation phase of development. Whilst converting from energy to carbon is possible through the use of carbon factors, B&NES may wish to consider the merits of requesting net zero *energy* reporting in future Local Plan updates. A move towards this approach is also recommended in recent work by CSE[4] for the West of England Unitary Authorities.

[3] Indicative calculation, SAP calculates carbon factors monthly, see section 2.4.

[4] CSE (2022). *West of England Net Zero Buildings Study. [publication TBC]*

6 Conclusions

Whist the UK Government's Green Book carbon values have increased in recent years, decarbonisation of the UK electricity grid has balanced the impact this may have had on additional carbon offset payments in many cases. When using carbon factors set out in the 2022 update to the UK Building Regulations and the BEIS 2022/2023 carbon values, the cost to a developer of offsetting a residual electricity demand (assuming no fossil fuel use on-site) can be shown as equivalent to the cost used to establish offsetting viability in the 2021 London Plan.

Following Building Regulation updates in June 2022, the London Plan carbon price of £95/t should no longer be considered relevant. To adapt, B&NES should update its offsetting price to either BEIS Green Book carbon values (373£/tCO_2(2022) /378£/tCO_2(2023), a higher price sufficient to install local renewables (£650 or greater), or switch to a method of energy offsetting (refer to the CSE report referenced earlier).

Whilst a local net zero offsetting price is the highest of the options considered, the B&NES energy policy promotes a fabric first approach, meaning that offsetting should only apply to a small volume of residual emissions. As an example, a typical 90m^2 dwelling meeting other parts of the B&NES energy policy would require 9 or 10 solar PV panels to avoid the need to make offsetting payments. For the prices considered, if no renewable generation could be achieved onsite this would increase to a maximum one-off payment of £5,500 (BEIS Green book carbon values) or £9,500 (local net zero offsetting rate).

Crucially, if B&NES adopt a price that is considered lower than can deliver local renewables, such a policy should be labelled as a *contribution* towards net zero carbon development and be set out alongside a cost estimate that could deliver this goal. This approach would serve to acknowledge and highlight the gap remaining and avoid the risk of misleading accounting and a temptation for greenwashing until the point at which policy can develop further to achieve net zero developments.