Carbon offsetting report – Carbon offsetting within an energy intensity policy framing

Report to West of England Authorities

Final

30th June 2022

Contents

1. Executive summary

Planning policies and offsetting framed around an energy metric

The West of England Authorities (Bath and North-east Somerset, Bristol, South Gloucestershire and North Somerset councils) are considering developing net zero policies based around the framework[1] proposed by LETI (London Energy Transformation Initiative), using an energy rather than a carbon policy framing and the UK Net Zero Buildings Standard[2]. This report considers the implications of this approach for a possible carbon / energy offsetting regime to ensure new development reaches net zero emission standards, and is an update of our previous report, Carbon Offsetting in the West of England Authorities[3].

Within our previous studies, CSE gave conditional support for traditional carbon offset funds on the basis that they were the best option then available. Nevertheless, our overall view is that traditional carbon offset funds are flawed and complex to administer, with challenges in stimulating genuinely *new*, *additional* carbon saving at the rate necessary to offset the emissions from new development and in monitoring the pace of emission savings achieved. Monitoring of carbon offsetting in London[4] confirms that even where carbon offsetting has been operating the longest in connection with the statutory planning system, these flaws appear not to have been overcome.

Policy based around an energy metric (following the LETI approach) promises a clear, quantifiable, and easily verifiable way of ensuring that new development is net zero in terms of operational emissions. Having optimised fabric energy efficiency development is expected to generate all its electrical demand on-site from renewable energy, typically rooftop solar. Where this is not possible, the residual annual electrical demand is quantified (in kWh) and developers are required to fund the installation of sufficient additional new renewable energy capacity off-site to meet this demand. Through this mechanism and forbidding the use of fossil fuel heating, a new development is made zero carbon in terms of its operational emissions. Offsetting through the provision of additional off-site renewable energy would likewise be clear and quantifiable and would achieve carbon savings at the same rate as the rate of residual emissions[5] from the new development, meeting the principle outlined above.

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[1] Net Zero Operational Carbon – Ten requirements for New Buildings – LETI - www.leti.london/_files/ugd/252d09_d2401094168a4ee5af86b147b61df50e.pdf

[2] UK Net Zero Carbon Buildings Standard – May 2022 – UKGBC and others - www.nzcbuildings.co.uk/_files/ugd/6ea7ba_2bd05d6f5d484cc999108e475a9d8c9c.pdf

[3] www.bristol.gov.uk/documents/20182/3368102/Carbon+Offsetting+in+the+West+of+England.pdf/894f7c11-33e4-a8b4-ec89-383828553184

[4] Carbon Offset Funds: Monitoring Report 2020 – March 2021 (Mayor of London) - https://www.london.gov.uk/what-we-do/environment/carbon-offset-funds-report-2020

[5] Comprising remaining operational emissions from regulated and unregulated energy use once on- carbon abatement measures (fabric efficiency and renewable electricity / heat) have been maximised.

A backstop should be included within policy, limiting the extent offsetting can be relied upon to maximise the carbon emission reductions achieved on-site. To balance other planning objectives and avoid unintended consequences, this should have a practical, non-technical basis and could be based around LETI guidelines for the realistic deployment of on-site solar PV.

Future policy development considering grid decarbonisation

The UK electricity grid is decarbonising rapidly, and this trend is likely to accelerate. This means that, assuming current trends continue, the need and justification for requiring a development to fund new off-site renewable electricity generation to get to net zero emissions will reduce over time. However, in the short to medium term there will be a continued need to increase renewable power generation capacity to meet current demand and the projected increases in demand from the electrification of heat and transport.

As grid electricity is decarbonised it will become more important to include energy storage and flexibility features within new developments than to maximise on-site renewable electricity generation. Such technologies work to match energy demand to intermittent renewable energy supply, supporting the decarbonisation of the wider energy system. With reference to the point above, the West of England authorities should consider strengthening planning policy now, building on the policy wording of the Cornwall Local Plan and the London Plan. Given the speed of technological development, any policy wording should be outcome oriented. Consideration should also be given to trialling the inclusion of flexibility and storage technologies within new developments to support the development of more robust policies in the future, evaluating proposals which come forward.

Approaches for procuring off-site renewables and mechanisms

Other than Cornwall we have not found planning authorities pursuing energy offsetting arrangements as advocated by LETI. There are two broad approaches to procurement:

i. The developer procures their own renewable energy supply and submits details of a power purchase agreement with their planning application, a commitment to purchase renewable energy from a provider
ii. The council collects payments into a fund and procures additional new renewable energy provision

Superficially, option one seems like the simpler option, however this will only be practical where the developer has an ongoing interest in the development and will control the energy supply, such that they can be tied into a renewable tariff. This model will not be practical for volume house builders, or speculative schemes built for onwards sale, where the development will be built for sale to unknown end-users. Furthermore, a Power Purchase Agreement is not in itself proof of additionality.

Given the complexity of securing renewable energy through power purchase agreements and the difficulties of ensuring additionality, we conclude that it would be more straight-forward to establish a council run offset scheme, whereby the council collects contributions into a ring-fenced fund and then procures new renewable energy.

We have considered the potential to partner with the community energy sector, directing capital funding at the creation of field based solar installations. Whilst possible, it would not be straight-forward to ensure that projects are fully additional to what would have happened otherwise and that they come on stream concurrently with the development they are intended to offset. Solar farms which already have planning permission are unlikely to have a high degree of additionality. Conversely, projects which need planning permission but don't yet have it are more likely to be additional to what would have happened anyway, but (being hostage to planning processes) may not come forward quickly or as planned.

We propose that free domestic rooftop solar installations be offered to low-income households or in low-income areas where the occupier would be very unlikely to install them themselves. This could adapt the structures, application processes and delivery routes set up for the existing LADS[6] funding programme, a government funded energy efficiency programme, delivered by local authorities. This procurement route would not be dependent on planning, would be rapid to deploy, simple to administer and would deliver greater and more direct social benefits for householders in terms of energy bill reductions and energy inequality. A high level of additionality is ensured by the eligibility criteria already developed for this programme.

Setting the offset rate

Costs data from the existing LAD's programme (of 131 rooftop PV installations) provides good evidence from which to set the council's rate. Based on 2021 prices, we recommend an offset rate of 9.1p/kWh applied over a period of 30 years, including capital costs, the fees of the managing agent and 15% administrative cost for the Council.

Recommended energy offset charge	
Mean installation cost, including management fee of managing agent **(£ per kWp)**	**£2,180**[7]
Offset charge £/kWh	**£0.08 per kWh** **(£79.99 per MWh)**
Offset price including 15% admin costs (£/kWh)	**£0.091** **(£90.84 per MWh)**

Thus, the calculation for a development needing to fund offsite renewable energy to achieve a net zero operational energy balance would be:

[6] West of England Local Authority Delivery Scheme (LADS) - https://westengland-lad-applications.com/

[7] This includes data for four comparatively large (>4.5kWp) installations that incorporated storage, alongside 126 installations without. The installation cost was very similar in respect, so installations with batteries have been included in the average cost calculations.

Annual residual electrical demand (kwh) X 0.091 (offset rate) X 30 (lifetime)

This represents the realistic costs incurred to install solar panels through the LAD's funding scheme, based on the council's current contact. This rate is comparable with the 'high' carbon price in the UK Government's Green Book (roughly equivalent to 9p/kWh[8]) and to the updated cost of offsetting in carbon as advised by SW Energy Hub, 10p/kWh. Costs should be reviewed regularly to ensure that the offset charge fairly reflects fluctuating installation, capital, and administrative costs.

We consider that if viable, it would be justifiable to fold the costs of an extended guarantee into the offset charge developers pay per kW_p installed solar, however we do not have reliable data on which to set these costs.

The size of the offset pot

With the tighter energy efficiency standards proposed by the West of England Authorities and energy self-sufficiency likely to be possible for most residential development, the amount of energy to be offset is significantly less than we predicted in 2019, and monetary value of any energy offset fund correspondingly smaller, equating to between £4.6m - £14.5m, resulting in a requirement for between approximately 600 and 1900 rooftop installations to compensate for insufficient on-site generation from new build residential development. Further calculations are included at Section 7 and Appendix B.

What should be offset

We do not recommend that embodied carbon should be offset, but if it is, a carbon metric should be used for offsetting.

Where developers propose adding new fossil fuel heat sources to extend or create a heat network, it would be legitimate to require them to offset the additional residual carbon emitted using a carbon metric, however the administrative effort and complexity may exceed the benefits. The priority should be to draft planning policy to exclude fossil fuel heat sources unless unavoidable.

Converting between an energy and carbon metric, either for the purposes of your planning policies or your offsetting regime is complicated and where possible, should be avoided, though such approaches could be acceptable during the transition period from carbon to energy metrics.

Individual policies and off-setting regimes should either be framed in carbon or energy. If an offsetting regime is set up using a carbon metric, funds should be used for projects other than renewable energy provision such as building retrofit schemes, to avoid the need to translate between energy and carbon metrics.

[8] This figure is taken from PPG Note SW002 'Net Zero Offsetting Rates' (February 2022), page 3, it has not been calculated for this report.

We do not recommend that transport emissions be offset, but instead be minimised through robust transport policies aligned with emerging national transport policy and supported by carbon modelling.

Using the commercial carbon offset market as an alternative

Whilst the regulation of commercial offsetting appears to be improving, we do not recommend using this in the context of your planning policies. The significant mismatch between the commercial price of carbon and the cost of reducing emissions on-site could potentially increase rather than reduce emissions by lessening design standards.

Considering implementation in planning

Guidance for developers should be updated, including templates for energy statements aligned with the new policy approach, sources to the data inputs and spreadsheets pre-loaded with the calculations needed. If a council-run offset fund is set up, it would be possible to use unilateral undertakings to secure contributions into the fund, speeding up planning processes, and template agreements should be prepared.

The LETI standards have implications for the viability of district heating, and therefore your heating policies and district heating rollout plans should be reviewed.

2. Rationale & risks of offsetting

Below we have updated our assessment of the rationale and risks of carbon offsetting using a carbon framing, summarising our thinking to date. We have then contrasted our assessment of the rationale and risks of carbon offsetting using the energy use intensity framing now proposed.

Carbon offsetting based on a carbon metric and policy framing

Rationale

At the time of our 2018 report into carbon offsetting, leading authorities were developing net zero policy framed around carbon, specifically around a % improvement on a building regulation compliant scheme, maximising fabric energy efficiency, on site low or zero carbon heat and power with carbon offsetting to achieve the remaining emission reductions offsite. The four west of England (hereafter WOE) authorities were considering the same basic policy architecture.

Cost and feasibility modelling of different building archetypes from Currie Brown[9] showed that zero carbon development could not be achieved on-site through fabric and the incorporation of renewable energy, and that in all cases off-site carbon abatement was required through a carbon offset scheme. Our 2018 study of the role of carbon offsetting for the WOE authorities[10] reviewed approaches to carbon offsetting in England, considered its benefits and risks, made recommendations as to how a carbon offset regime could be administered and what it might be spent on.

Risks

Within the 2018 WOE report we found that given the policy options available at the time, overall the advantages of having a carbon offset policy to achieve off-site carbon abatement substantially outweighed the disadvantages, however we also found risks and recommended that specific effort was put into administering any potential fund to manage them. Specifically, the Local Planning Authority should be able to show:

- A proportionate audit trail showing that the contributions will deliver carbon emission reductions within a reasonable timescale of the development being occupied. –
- Additionality - that the carbon savings delivered by the payment are clearly additional to what would have happened anyway
- That the contributions demanded are not double charging

[9] https://www.bristol.gov.uk/documents/20182/3368102/Cost+of+carbon+reduction+-+Full+report.pdf/1bf9f9c1-9893-cd33-43e6-b01199e2ba26

[10] https://www.cse.org.uk/downloads/reports-and-publications/policy/planning/west-of-england-carbon-reduction-requirement-study-carbon-offsetting-april-2019.pdf

- An evidence base to demonstrate that the contribution sought to deliver off-site carbon abatement is reasonable in scale and commensurate with the emissions to be offset

Subsequently in 2020 we undertook a similar study for the Greater Manchester Combined Authority[11] which enabled us to develop our thinking further, with our support for offsetting becoming more conditional.

From the perspective of our fixed and diminishing carbon budgets[12], carbon offsetting should be seen as a contract that councils will deliver carbon savings or enable them to be delivered when developers are unable to. Seen in this light they are a huge commitment with key risks that need to be specifically addressed. At their worst, carbon offset schemes can give us false comfort that development is zero carbon, whilst obscuring the more fundamental changes needed in our development model. The specific concerns identified are:

- That Carbon Offsetting is an avoidance technique that allows us to carry on emitting.
- In the way carbon offset contributions have been calculated to date, it does not fully offset the residual carbon emissions from new developments.
- How to tell that the carbon savings achieved through offsets are additional to what would have happened anyway
- How to deliver the carbon savings you have promised, how to monitor the savings achieved and ensure that the rate at which carbon is saved or offset keeps up with the rate at which it is being emitted.

As councils move beyond general aspirations to reduce carbon to objective measurable commitments to bring emissions down to net zero by a specific end date, carbon offsetting should increasingly be seen as a key component of carbon accounting, that schemes will achieve carbon savings at a *rate* equal or greater than the rate of residual emissions[13] from new development. Tightening energy performance standards which as those being developed by the West of England Authorities and the continued decarbonisation of grid electricity suggest that offsetting will be relied upon significantly less to achieve net zero emissions. Nevertheless, for carbon offsetting schemes to be part of robust zero carbon policies, they must allow this data to be monitored and collected, both at a project and local authority scale.

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[11] Greater Manchester Combined Authority Carbon and Policy Implementation Study – Part 2 - Carbon Offsetting Report to Greater Manchester Combined Authority https://www.greatermanchester-ca.gov.uk/GMCAFiles/PFE/Supporting%20documents/04%20Sustainable%20and%20Resilient%20Places/04.01.03%20Carbon%20and%20Energy%20Implementation%20Part%202%20-%20Carbon%20Offsetting%202020.pdf

[12] Both our 5 yearly national budgets derived from the Climate Change Act, and our global carbon budget consistent with keeping global temperature increases to 1.5 degrees in line with the Paris Climate Accord, both of which can be disaggregated by local authority area

[13] Comprising remaining operational emissions from regulated and unregulated energy use once on- carbon abatement measures (fabric efficiency and renewable electricity / heat) have been maximised.

Our overall view is that traditional carbon offset funds are flawed and complex to administer, with challenges in stimulating genuinely *new*, *additional* carbon saving at the rate necessary to offset the emissions from new development and in monitoring the pace of emission savings achieved.

This also hints at a fundamental shortcoming of the traditional approach to carbon offsetting, that it calculates a fixed *sum* of carbon which is to be offset. In fact, from the perspective of robustly offsetting the genuine contribution of new developments to climate change and genuinely limiting additional carbon in the atmosphere, residual operational emissions are better seen in terms of a *rate* of continuing emissions which must be offset at the same or greater rate than it is emitted, accepting that grid decarbonisation will reduce this rate over time.

The WOE Authorities' climate emergency declarations, all which target achieving net zero emissions by 2030 also challenge the conventionally accepted approach to additionality and carbon offsetting, in that within these timescales, effectively all carbon emissions will need to be avoided or sequestered in carbon sinks. Once again, *the timing* and *rate* at which emission reductions are achieved is critical. If these commitments are to be met, the residual emissions from new development would also need to be offset *by the 2030 deadline* rather than over the lifespan of the measure funded – which has typically been the approach used in the past. (For instance, tree planting will take several decades to sequester significant carbon.) Once again, this suggests that offsetting should seek to match the rate of residual emission generation.

In the context of a commitment to achieve net zero emissions nationally well within the lifespan of development going up today and the 2030 climate emergency declarations adopted by the West of England authorities, it makes very little sense to erect buildings which emit carbon and pay to offset the residual emissions elsewhere, as in the near future we will need to "do everything". That is, we will need to reduce all carbon emissions in the next 30 years or sooner and upgrade our entire building stock. Ultimately, we cannot escape the truth that we need to build genuinely zero carbon (and in terms of climate science, carbon negative buildings) buildings as soon as possible.

Reviewing current practice in local authority carbon offsetting

The 2020 Carbon Offset Monitoring Report[14] (reviewing carbon offsetting across London) suggests that improvements are being made in the way carbon offsetting is being managed in London, with an increase in the amount of carbon offsetting payments collected and a rapid increase in expenditure from the carbon offset fund. Nevertheless, of 35 London Boroughs, less than half have begun spending carbon offset payments and only 42% of the offset payments collected since 2016 has been spent or committed to a specific project, with £18.6 million waiting to be spent and a further £32.4 million secured by legal agreement but not collected.

Whilst this is clearly an improvement to be applauded it is nevertheless a significant concern; funds in bank accounts do not achieve carbon reductions. The lag reported on in 2018 between developments going ahead and carbon being offset is largely still there. This is a significant concern.

[14] Carbon Offset Funds: Monitoring Report 2020 – March 2021 (Mayor of London) - https://www.london.gov.uk/what-we-do/environment/carbon-offset-funds-report-2020

These authorities are falling behind with offsetting the residual emissions from new development, with up to potentially to 5 years of emissions not even begun to be offset. As time ticks down to 2030 and 2050 and as our remaining carbon budget diminishes, the residual carbon debt building up from these delays will become more critical.

Additionally, although project auditing appears to have improved, the Carbon Offset Monitoring Report shows no apparent balance sheet of the overall carbon needing to be offset, versus that offset. In terms of the clear carbon accounting framing described above, carbon offsetting as currently operated lacks precision both in terms of the actual carbon emission reductions achieved and the additionality of those emission reductions. It does not allow the necessary data to be collected in order that new development can genuinely be described as net zero.

Finally seen in the context of climate emergency action plans, carbon offset funds attached to the planning regime have potential to obscure and confuse activity to offset the additional harm caused by new developments with efforts to reduce our baseline emissions in line with climate emergency declarations. With a significant funding stream of up to £14.5m, it could be easy to imagine that the carbon offset fund could pay for the wholescale decarbonisation of the region. The reality of course is that all that this activity is achieving is compensating roughly for the *additional* carbon emissions from new development, getting the authority close to stand-still in terms of the additional carbon emissions from new development. In fact, climate emergency action plans produced by local authorities must secure a great deal more investment. The Bristol Net Zero report[15] published by CSE for Bristol Council estimates the capital investment cost of decarbonising the city of Bristol alone by 2030 to be in the order of £5bn–£7bn.

Overall, the offset monitoring report confirms the assessment we gave to the GMCA of the shortcomings of carbon offsetting as it has been operated to date:

The carbon offset regime linked to zero carbon planning policies *(following the approach adopted by the London Authorities)* should only be seen as a temporary stopgap until planning regulations, development economics and the development industry deliver truly net zero carbon or carbon negative developments on-site.

Net Zero Carbon

The UK Green Building Council[16] define net zero (operational energy) as follows: “When the amount of carbon emissions associated with the building’s operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.” Carbon negative buildings would have a net effect of removing carbon dioxide from the atmosphere.

[15] https://www.cse.org.uk/downloads/reports-and-publications/policy/insulation-and-heating/energy-justice/renewables/behaviour-change/building-performance/Bristol_net_zero_by_2030_study_CSE_26_Feb_2020.pdf

[16] https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2019/04/05150856/Net-Zero-Carbon-Buildings-A-framework-definition.pdf

Offsetting based on an Energy Use Intensity metric and policy framing

Rationale

The rationale behind using an energy metric for framing zero carbon policy and for the use of energy rather than carbon offsetting as proposed within the LETI standard is that if new development can be powered entirely from renewable sources (either on or off-site), it will be zero carbon, at least in terms of its operational energy use, including both regulated and unregulated energy. Very high fabric efficiency standards are imposed to minimise the need for energy inputs, and energy demand not met from on-site renewable energy must be met through investment into off-site renewables elsewhere. Figure 1 below illustrates how the approach would work. Whilst the principle is like carbon offsetting, LETI refer to off-site renewable energy provision rather than carbon offsetting. Within this report, we have referred to it as energy offsetting to draw out the similarities and differences with conventional carbon offsetting.

With tighter fabric efficiency and heat demand standards, a much greater proportion of development (and nearly all new build residential below 6-storeys in height) will be able to meet its full operational energy need on-site from renewable energy. Thus, creating additional off-site renewable energy capacity to make up the shortfall should be a last resort.

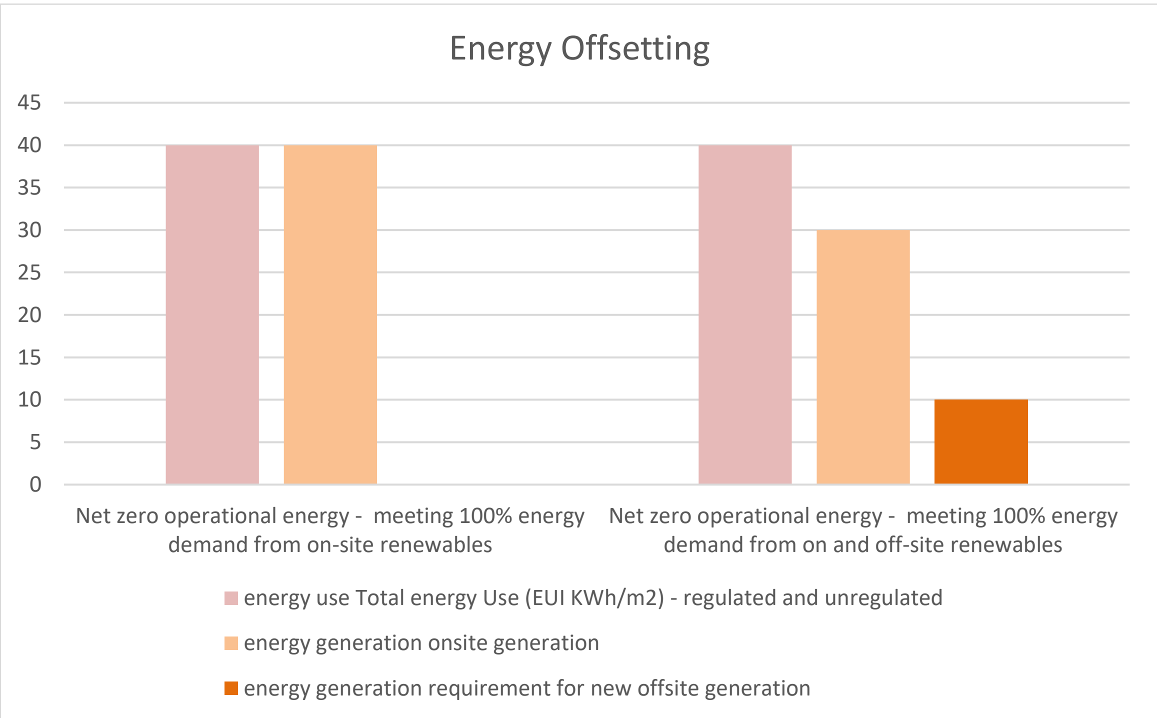

Figure 1 - Diagrammatic summary of energy offsetting

The LETI policy framing around an absolute Energy Use Intensity metric is simpler than the policy framing commonly adopted in Net Zero Local plan policies to date. These are generally worded to require a % reduction in carbon emissions beyond existing building regulations, and therefore require additional calculation to verify as built performance.

The LETI policy framing around energy use intensity is more direct and promises to make monitoring and verification much more straight forward. The energy use intensity of completed developments (as built) can easily be measured against absolute policy standards (in kWh/m^2 per yr.) using annual meter readings for annual energy use, and annual on-site and off-site energy generation. This framing is also easy to grasp conceptually.

This framing also has the potential to simplify the approach to carbon / energy offsetting, with a requirement to achieve a net zero operational energy balance (and therefore zero emissions) through meeting all energy needs renewably on-site or failing that through funding additional renewable energy capacity to meet 100% of the development's energy needs.

Operated effectively this approach ensures that the additional off-site renewable energy plant will compensate for the ongoing *rate* of residual emissions from new development. At a high level this has the potential to overcome some of the shortcomings of traditional carbon offsetting outlined above:

- Matching the residual rate of carbon emissions with an equivalent rate of carbon saving (by avoiding or offsetting all operational emissions through using renewable heat generation and on and off-site renewable energy generation)
- Enabling actual on-site energy use to be monitored accurately, and off-site renewable energy generation

Principles for energy off-setting

Whilst energy off-setting is conceptually clear, and should be objectively measurable, it nevertheless comes with its own complexities. The Renewable Energy Procurement & Carbon Offsetting Guidance by UKGBC[17] sets out useful principles which can be applied to energy offsets to ensure they are robust and deliver a net operational energy balance and therefore net zero development (operational emissions).

A key concern is ensuring additionality, that the renewable energy plant is genuinely *new*, *additional* plant which would not otherwise have been developed and which increases the UK's installed renewable capacity. Additional complexity is introduced by the fact that the *energy attribute* (the fact that it is renewable energy, indicated by Renewable Energy Guarantees of Origin certificates) can be monetised and sold separately from the renewable electricity itself at relatively low cost. Figure 2 below illustrates these principles.

[17] UKGBC (March 2021) Renewable Energy Procurement & Carbon Offsetting Guidance for net zero carbon buildings - https://www.ukgbc.org/wp-content/uploads/2021/03/Renewable-Energy-Procurement-Carbon-Offsetting-Guidance-for-Net-Zero-Carbon-Buildings.pdf

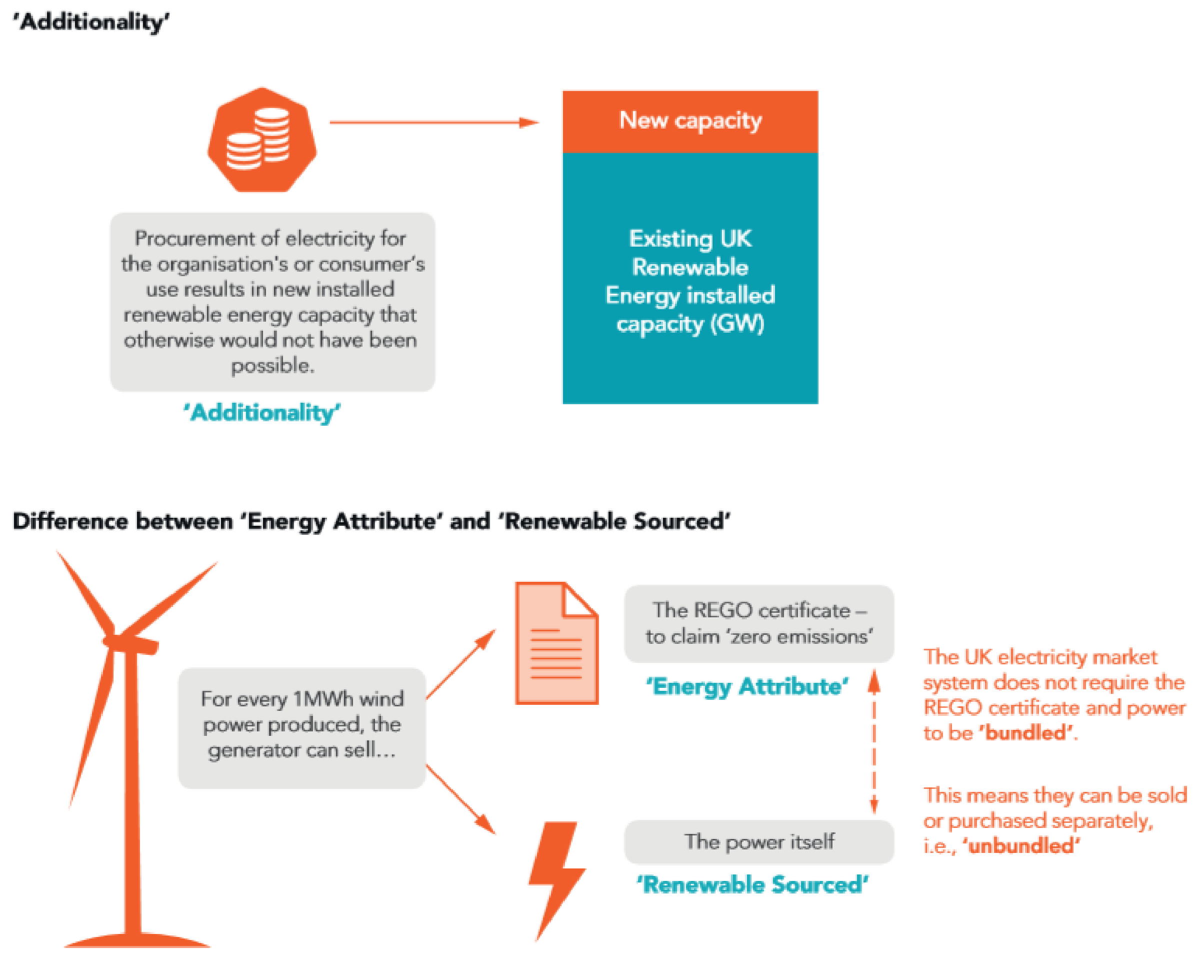

Figure 2 - Illustrative explanation of the three principles used to determine the quality of renewable energy procurement, UKGBC

To be legitimate the procurement must secure exclusive ownership of energy attributes of the renewable electricity generated, the energy must be renewable, and it must demonstrate additionality. Additionality is to be demonstrated either through the development installing, self-generating and consuming renewable energy from their own (off-site) facility, or the developer closing a unique contract to purchase renewable electricity which contributes to the construction of new renewable energy facilities.

These principles can be used to define acceptable approaches to both on and off-site renewable energy generation /procurement.

Risks of offsetting energy rather than carbon

Whilst the principles from the UKGBC document above make sense, the approach recommended (requiring the submission of a Power Purchase Agreement) doesn't resolve all the issues with ensuring that renewable energy is new, is additional to what would have happened anyway, and that the carbon savings from this plant aren't double counted. Irrespective of the submission of PPA, the local planning authority would still need to find a way to establish that the proposed generation met these tests.

Additionally, even if a PPA is secured the procurement pathways for new renewable energy outlined by the UKGBC are complex and not easy to understand. The use of PPA's raises practical problems for volume housebuilders and other situations where the applicant for planning permission will not have control of the ongoing energy use within the building. These questions are explored more in section 5.

As touched on in section 3, once the grid decarbonisation progresses beyond a certain point, the barrier to decarbonisation in the energy system will not be the amount of renewable energy on the system but a lack of flexibility to overcome intermittency, and thereby avoid stand-in fossil fuel generation. Therefore, assuming current trends continue (and supply and demand side concerns are overcome) mechanisms to secure off-site renewable energy generation to achieve a net operational energy balance as described by LETI are only likely to be useful until about 2035 by which point grid electricity is expected to be net zero in most scenarios.

There is finally a risk that with a clearer principle that offsetting activity (framed in carbon or energy) should be brought forward at a fast enough rate to offset the *rate* of continuing emissions from new development, the WOE authorities will struggle to achieve this objective. We would comment that the new framing is only seeing the existing problem posed by carbon offsetting in a clearer light.

Our view is that if offsetting is framed around energy as envisaged by LETI, with developments required to fund a specific rate of off-site renewable energy generation per year, this should be achievable. If the approach fails to meet the objective in practice, it can be refined.

Developing a backstop to limit the use of offsetting

Within the energy policy framing described above, it would be highly beneficial to have a backstop beyond which you cannot offset to maximise the carbon emission reductions achieved on-site as an intrinsic aspect of the development.

The LETI standard recommends setting absolute maximum figures for energy use intensity and space heating, requires development to maximise the use of on-site renewable energy generation, and then sets key performance indicators for the proportion of energy demand which can be generated from different development types, see figure 3 below. Except for office developments, these indicators are largely derived from the roof area which can reasonably be set aside for renewable energy generation in relation to the floorspace of the development.

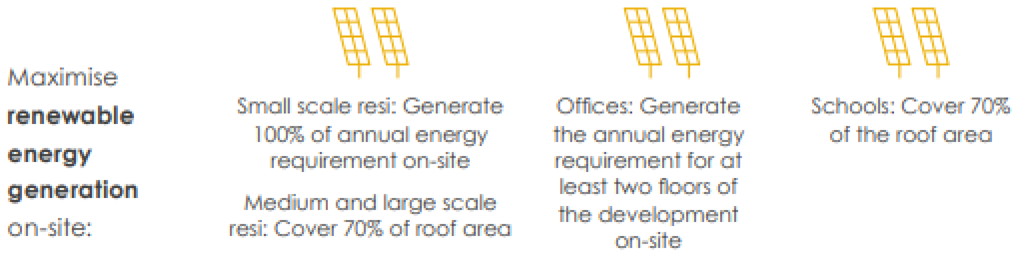

Figure 3 - Key performance indicators, LETI Climate Emergency design guide[18]

Whilst this does not explicitly set out a backstop, the effect is similar, and the logic behind this approach well founded. Given that on-site renewable energy will largely be the deployment of solar PV, the amount of renewable energy per m^2 of floor area which can be generated will largely be a function of the height of the development, with low rise buildings having more roof-space per square metre of floor area in comparison to taller buildings with the same footprint. Unless solar panels are accommodated on building elevations (and this could be an option in urban areas), once a rooftop solar is maximised, generally the remaining renewable energy demand will need to be sourced from off-site renewable energy sources.

The Cornwall residential study showed similarly that (for buildings in the UK up to six stories in height) most residential development could achieve net zero operational balance onsite though this requires best practice fabric efficiency and solar PV design.

The Cotswold Zero Carbon Toolkit[19] recommends the adoption of a renewable energy target of 120 $kWh/m^2_{fp}/yrs$[20] roughly equivalent to 70% of roof space as PV panel area. It is not clear how this target was derived, but the toolkit authors (Etude) could advise.

We consider that creating a non-technical policy backstop like that advocated by LETI above would have benefits for the process of determining planning applications. Where a proposed development is clearly not utilising the available roof space and designing the roof-form to maximise renewable energy generation, planners will be able to refuse planning permission.

Equally, where developments give legitimate justification as to why a greater proportion of roof space could not be utilised for instance due to the need to house plant for mechanical ventilation heat recovery, accommodate green roofs or provide amenity space for residents to meet other policy requirements, case officers would have a reasonable basis for agreeing that the residual renewable energy demand can be met off-site, whilst balancing other objectives.

Even within the topic of our response to the climate crisis, there are legitimate trade-offs between the use of roof-space for renewable energy generation to get to a net zero operational balance, and the use of limited roof space to meet policy requirements around climate adaptation, for instance

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[18] LETI (2020) Climate Emergency Design Guide - https://b80d7a04-1c28-45e2-b904-e0715cface93.filesusr.com/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

[19] https://www.cotswold.gov.uk/media/05couqdd/netzero-carbon-toolkit.pdf

[20] M2fp - building footprint

for green roofs to provide habitat and mitigate overheating or the provision of roof gardens or amenity space for residents. This might mean that in inner urban areas where overheating is likely to be a greater concern, authorities place a greater emphasis on climate adaptation considerations and accept slightly greater use of off-site renewable energy to achieve a net zero operational balance.

There are also likely to be trade-offs between building forms which maximise renewable energy generation (such as asymmetric roof forms) to meet policy requirements and aspirations for contextual designs which are in sympathy with historic or designated townscapes. Ultimately it may be wise to consider updating urban design guidance to set out how these potentially conflicting design drivers should be balanced in different contexts, and potentially updating design guidance for non-designated rural contexts to encourage more innovative design solutions.

Additionally, design advice should stress the need for renewable energy generation to be integrated into design responses, with roof spaces performing multiple functions, such as roof terraces partially shaded by EV panels above head-height.

For these reasons, it is beneficial for any policy backstop to allow practical consideration by case officers of how on-site renewable energy generation has been maximised in scheme design balanced with other considerations, rather than applying a technical backstop for off-setting which might result in unintended consequences, such as design solutions which conflict with other policy objectives.

Interactions between energy offsetting and biodiversity net gain/ nature-based solutions

Within traditional carbon offsetting schemes, it is possible to stack revenue sources to achieve multiple benefits, for instance funding peatland restoration or tree planting schemes to achieve both carbon sequestration and biodiversity net gain. This recognises that where nature-based solutions are funded, both carbon offset and biodiversity net gain funds can potentially deliver both carbon sequestration and biodiversity enhancements simultaneously.

Such approaches can be beneficial in terms of maximising co-benefits, however the downside of traditional offsetting remains, that of ensuring that the rate of carbon reduction / sequestration matches the rate of residual emission generation to be offset.

It might be possible however to achieve the same objective within an offsetting scheme framed around energy. Generating additional renewable energy capacity would not automatically deliver biodiversity benefits, and renewable energy projects will themselves have biodiversity impacts which need to be mitigated, but the landholding on which the development is located could be managed for multiple benefits[21].

[21] The BRE argue that where best practice is adopted, solar farms can achieve a biodiversity net gain: https://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/National-Solar-Centre---Biodiversity-Guidance-for-Solar-Developments--2014-.pdf We are aware of solar farms being developed and managed by wildlife trusts to deliver additional renewable energy capacity and wildlife enhancements.

In such an approach the developer and landowner would be paid separately to generate additional renewable electricity generation and to achieve defined biodiversity objectives or provide specified habitats, for instance within onshore wind schemes or solar farms[22]. Such an approach would not reduce the cost of the energy offset but could potentially provide an additional income source to the developer / landowner and maximise the co-benefits. Such an approach would only really be possible with standalone renewable energy developments, predominantly on greenfield sites and it would first be necessary to ensure that the development first mitigated its own biodiversity impact.

Is it worth pursuing offsetting with the grid decarbonising and policies getting more stringent?

With the tighter energy efficiency standards proposed through LETI and energy self-sufficiency likely to be possible for most residential developments, the amount of carbon / energy to be offset is significantly less than we predicted in 2019, and monetary value of any fund correspondingly smaller.

Assuming an energy metric were adopted, we have estimated the offset pot (residential only) across the four WOE authorities to be in the region of between £4.6m - £14.5m, depending on the growth level adopted and the proportion. (Section 7. for further detail.) Nevertheless, this option should be pursued to maximise carbon reductions.

3. Implications of grid decarbonisation, for offsetting and policy formulation

Our electricity supplies are rapidly decarbonising. As shown in the scenarios in figure 4 below from the national grid, power sector carbon emissions are expected to fall rapidly in the early 2020s in all scenarios, with all but one scenario seeing net zero emissions before 2035. Even the most pessimistic scenario sees carbon emissions from power generation fall by two thirds from current rates by 2030.

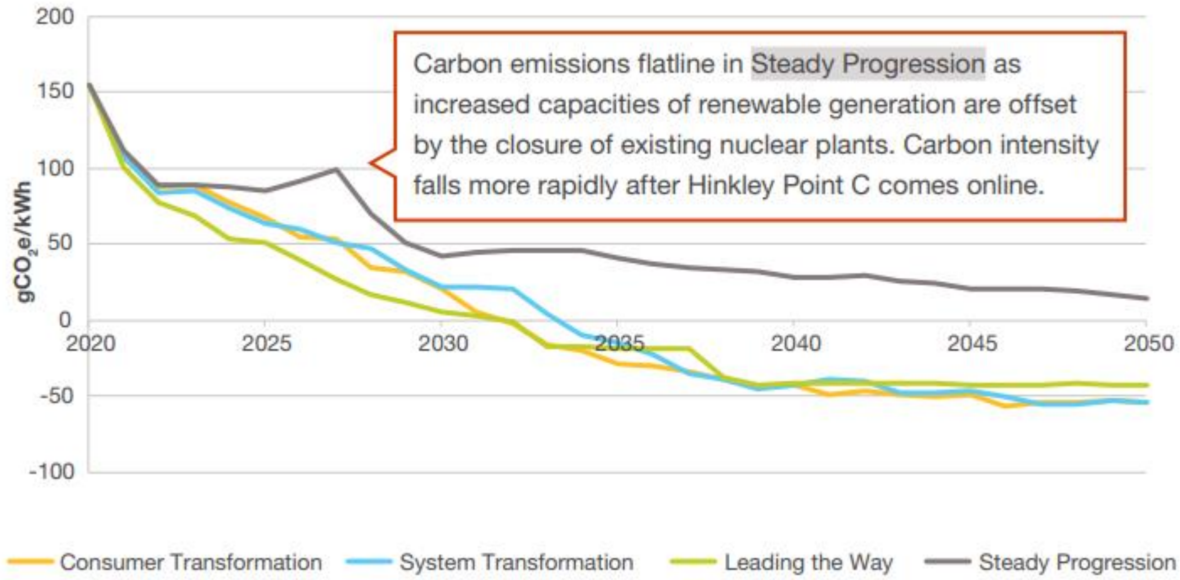

Figure 4 - Power sector carbon intensity (excluding negative emissions from BECCS)[23] -

Current indications are that the grid is decarbonising at an even faster rate, with the National Grid predicting, "by 2025 we will have periods of 100% zero carbon electricity, with no fossil fuels used to generate power in Great Britain. As with coal free operation of the grid, these may be short periods at first but will still be a significant milestone on the road to net zero and these periods will quickly extend[24]."

In response to the current high fossil fuel prices and events in Ukraine, the UK Government has recently published an energy security strategy, including support for the expansion of nuclear, the significant expansion of offshore wind and solar, tentative easing of the block on onshore wind and the potential to license additional domestic oil and gas extraction. The expansion of nuclear and new oil and gas licenses are only likely to impact our energy supplies in the medium to long term, but the expansion of solar and wind could take place much quicker and may further accelerate grid decarbonisation in the short to medium term.

Implications of grid decarbonisation if a "carbon" framing is used for offsetting

As covered in our previous report, the relationship between the carbon offset price and the costs of carbon abatement through funding renewable energy is highly sensitive to the "emissions factor"; that is the carbon intensity of electricity from the national grid, assessed using the SAP calculation methodology embedded into Building Regulations.

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[23] Future Energy Scenarios 2021 – National grid - https://www.nationalgrideso.com/document/199871/download

[24] Great Britain on track for periods of zero carbon electricity in 2025 – National Grid ESO - www.nationalgrideso.com/news/great-britain-track-periods-zero-carbon-electricity-2025

Overall, as the carbon intensity of grid electricity falls, fewer more expensive offsets will be required, as greater additional solar PV capacity will be needed to achieve the same scale of carbon reduction. Our previous assessment was that in electrified buildings these countervailing trends should balance out completely meaning that the overall cost to the developer and therefore viability implications shouldn't change.

The report "Plan Offsetting Rates for 2022 Building Regulation Updates - Evidence for B&NES 2022[25]" has carried out an up-to-date assessment of the impact of grid decarbonisation, assuming the update carbon factor incorporated within the updated building regulations which will come into force in June 2022. The assessment also considers changes to the carbon price (derived from the London Plan) which should increase in line with the BEIS Green Book carbon values to which they are pegged.

This assessment confirmed that whilst the UK Government's Green Book carbon values have increased in recent years (and therefore carbon prices should also increase), decarbonisation of the UK electricity grid has balanced the impact this may have had on additional carbon offset payments in many cases.

Implications of grid decarbonisation if an "energy" framing is used for offsetting

If an energy policy and offsetting framing is used, requiring developments to achieve Net Zero Operational Energy Balance, this complexity is almost entirely avoided. In fact, if a robust way can be developed of procuring sufficient new off-site renewable energy to achieve a net zero operational balance, a carbon price would not need to be set at all for energy offsetting and the grid factor would not need to be considered in determining the scale of investment required. Developers would just be required to fund or procure sufficient new, additional renewable electricity to offset their residual energy demand. This should be seen as a last resort however and minimised through a backstop on the use of offsetting.

Future policy – incorporation of demand response / smart energy technologies to support grid decarbonisation

The rapidity of grid decarbonisation does however mean that the need and justification for requiring a development to fund new off-site renewable electricity generation will reduce over time. Once grid electricity becomes virtually zero carbon, provided they are electrically or renewably heated, new buildings could be zero carbon even where they are net users of grid electricity. However, this does not describe the situation at the time of writing. There are uncertainties in respect of both the scale of future electricity demand (considering additional demand arising from heat and transport electrification), increasing the deployment of renewable and nuclear capacity to meet this demand and the reliance on carbon capture and storage in trajectories presented by Ofgem, BEIS and others, a technology as yet untried on a commercial basis.

[25] Adapting London Plan Offsetting Rates for 2022 Building Regulation Updates - Evidence for B&NES 2022 Local Plan Partial Update (LPPU) - unpublished

As LETI advise[26], as we move towards net zero grid electricity, the needs of our energy system will change:

"Adding more renewable capacity should not continue indefinitely and adding more capacity from wind turbines and solar panels eventually just adds to the over-supply of renewable energy during peak periods without helping when the grid supply comes under pressure - when weather conditions are cold, cloudy and not windy. Other solutions including demand response and storage are needed, rather than just adding more and more renewables."

As the carbon intensity of grid intensity falls, it will become more important to incorporate energy storage and flexibility features within new developments, flexing energy use so as minimise the need for rapidly deployable fossil fuel generation when renewable energy generation is low, or demand is high.

LETI define the following key components of demand response and energy storage:

- Peak reduction, including heating peak reduction, cooling peak reduction, domestic hot water peak reduction
- Active demand response measures
- Electricity generation and storage, including battery systems, hot water tanks, solar to hot water heat storage
- Electric vehicle (EV) charging, including electric vehicle turn down and vehicle to grid charging
- Behaviour change, including responsive occupancy
- Microgrids

The planning system and planners are at an early stage in understanding what demand response and energy storage features are needed and how these requirements can be effectively integrated into planning policy.

LETI have suggested metrics for how demand response or flexibility can be measures and high-level outlines for assessment methodology, but from the perspective of the planning system the following still seems lacking:

- What to ask for in the first place and how to express that clearly in policy – specific types of technology, or specific services to the grid? What metrics should be used?
- How to justify that in policy and viability terms to a planning inspector in terms they will understand and see as being relevant to the statutory planning system.
- How to assess the adequacy of what's proposed through the development management process.
- How to word conditions and up skill planning enforcement officers to ensure that storage and flexibility technology or features are fitted and ensure that once fitted this technology is satisfying its purpose, in delivering the flexibility the grid needs to

[26] Leti – embodied carbon primer (appendix 10 carbon offsetting) - https://www.leti.london/ecp

decarbonise. Local planning authorities will require access to new data / methodologies on how the smart technology installed delivers the flexibility required, and the knowledge base to understand it.

- How far can policy requirements be simplified to be easily operable by non-energy specialists, yet still add value in terms of flexibility, easing grid constraints and enabling system decarbonisation?

An EU Smartness Readiness indicator[27] has been developed and adopted, which may help answer some of these questions. Without simplifying and codifying requirements or sourcing additional expert support (potentially from the DSO), there seems little prospect of the planning system being able to integrate smart energy technology within new developments.

The adopted London Plan includes the following text:

> "As a minimum, energy strategies should contain the following information:
>
> d. proposals to further reduce carbon emissions by maximising opportunities to produce and use renewable energy on-site, utilising storage technologies where appropriate
>
> g. proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible."

Policy Recommendation

Given the rapid pace of change, planning policy being developed now should include wording which encourages the incorporation of energy storage, demand side response, smart metering and smart heating controls and smart energy technologies, potentially allowing the energy system benefits to be counted towards policy compliance, provided that a robust methodology is provided. Any policy wording should be outcome oriented rather than fixed to one particular technology. Although classes of technology (e.g. energy storage and demand shifting) are unlikely to be superseded quickly, it is unlikely that planning policy will be able to keep up with the pace of technological development within these fields.

We would also recommend trialling the inclusion of flexibility and storage technologies within new developments with willing developers to support the development of more robust policies in the future, evaluating proposals which come forward, in terms of their system benefits, flexibility services offered and cost.

[27] Smart technologies in buildings – European Commission - https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/smart-technologies-buildings_en

Reconciling a dual offset approach - how easy would it be to translate back and forth between energy and carbon?

Ongoing grid de-carbonisation and the delay in reflecting an accurate emissions factor within the SAP assessment regime mean that it would not be simple to translate back and forth between energy and carbon metrics, either in terms of your policies themselves or any offsetting regime.

If a carbon offsetting regime is adopted for embodied carbon and transport emissions, it would be best for this to operate using a carbon metric and be entirely separate from any arrangements to deploy additional renewable energy capacity.

4. Critique of what would be offset.

Energy offsetting in non-domestic buildings

Consideration of non-domestic buildings in any depth is outside of the scope of the current work and these building types were not covered in the original report. Provisional energy performance targets for a number of non-domestic building typologies (including schools, tourism businesses such as retail, hotels and leisure, offices, and light industrial) are set out on page 28 of Appendix I of Cornwall's DPD[28] and are consistent in structure with the residential EUI targets (i.e. kWh/m^2/yr). However, these building types can vary widely and so the figures in the Cornwall document are considered to be indicative only and would be difficult to justify in planning policy terms. This means that it would be challenging to deploy an offsetting scheme based on energy credits in line with that proposed for dwellings.

The modelling conducted by Etude for Cornwall Council highlighted the weakness of SAP in estimating operational emissions accurately. To provide a robust recommendation for an energy or carbon-based offsetting scheme to achieve net zero carbon on-site for non-domestic buildings, it would be necessary to look in more depth at how operational emissions could be best calculated. It may be possible to implement an offsetting scheme based on regulated emissions/energy figures from the SBEM modelling outputs, but this would not reflect the same level of ambition across sectors. More research would be required to provide a comprehensive and defendable proposal for offsetting for non-domestic buildings.

[28] Cornwall Council Climate Emergency DPD – Energy Review and Modelling – Etude and Currie Brown (Feb 2021) - www.cornwall.gov.uk/media/mfob2hbj/eb004-energy-review-and-modelling-report.pdf

Offsetting under a carbon-based scheme

In the previous report, offsets were introduced to account for the difference between a carbon-based target and carbon emissions calculated for a building using SAP. The following four scenarios were considered:

Policy scenario 1: 'True' zero carbon, applied to all residential development (regulated and unregulated emissions)

Policy scenario 2: 'True' zero carbon, applied to all major residential development (regulated and unregulated emissions)

Policy scenario 3: Zero regulated emissions, applied to all major residential development

Policy scenario 4: Zero regulated emissions, applied to all super-major residential development

Regulated emissions refer to those that are assessed for compliance under Part L, and cover space heating, hot water, fixed lighting, fans and pumps. Unregulated emissions, which are estimated in SAP but are not included in the standard outputs, cover emissions that arise from the use of equipment and small power. The figures used in the accompanying pot size calculations were based on estimates of carbon abatement requirements by dwelling type and technology that were provided by Currie & Brown.

Offsetting under an EUI-based scheme

LETI's Energy Use Intensity (EUI) targets relate to *operational* carbon emissions. Operational emissions are those that arise because of the total energy use of a building. This includes emissions that are currently classed as regulated as well as unregulated. Expanding the scope of regulation to include the use of energy for equipment and appliances is a positive step, however, at present estimates for unregulated emissions that are calculated in SAP are quite different from those calculated in more comprehensive modelling packages such as the Passivhaus Planning Package (PHPP)[29]. This means that some correction is required to use SAP to assess compliance with LETI's EUI targets (see section 7. calculating compliance). The table below sets out the EUI targets by building type, alongside the space heating targets. We note here that recommendations within Bristol City Council, South Gloucestershire Council and Bath and North-East Somerset Council are that SAP should not be used for energy modelling.

	Proposed EUI target **(kWh/m^2/yr)**	**Proposed space heating target** **(kWh/m^2/yr)**
Residential	35	15

[29] The assumption in SAP does not reflect improvements to the efficiency of appliances over the past decade. The study by Etude for Cornwall Council provides more detail on this, noting that SAP makes an allowance of around 30kWh/m2/yr, compared to 14kW/m2/yr in PHPP (see Technical evidence base for Policy SEC1 – New Housing Technical Appendices, July 2021, for a comparison of the two modelling approaches).

Commercial offices	55	15
Schools	65	15

Figure 5. Proposed Energy Use Intensity target and Space Heating Standard – London Energy Transformation Initiative[30]

In the residential sector, LETI believe that it is already possible to achieve net zero operational emissions onsite in almost all cases , and that designers should be expected to meet the EUI target to obtain planning permission. They do however acknowledge that there may be a limited number of cases where it is not possible to install sufficient renewable energy on site to meet demand, for example where a building is very tall and does not have sufficient roof area for required amount of solar PV panels. They suggest that traditional offsetting schemes are not fit for purpose in these cases, but that 'Renewable Energy Credits' could be permitted to make up for the shortfall.

Both LETI and Etude suggest that Renewable Energy Credits are only used to fund the installation of renewable technology on other new buildings to limit the risk of carbon leakage between sectors, therefore simplifying the carbon accounting process. It is assumed that this policy would be implemented alongside a ban on fossil fuel use on site.

Offsetting embodied carbon

As buildings become more energy efficient, (and electricity generation decarbonises), the operational carbon emissions from new buildings is significantly reduced. This means that embodied carbon will represent a higher proportion of whole life carbon than in the past. LETI[31] estimate that embodied carbon can represent 40-70% of whole life carbon in a new building, see Figure 6 below that shows the magnitude and breakdown of whole life carbon.

[30] https://www.leti.london/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

[31] London Energy Transformation Initiative (2020) - embodied carbon primer - https://b80d7a04-1c28-45e2-b904-e0715cface93.filesusr.com/ugd/252d09_8ceffcbcafdb43cf8a19ab9af5073b92.pdf

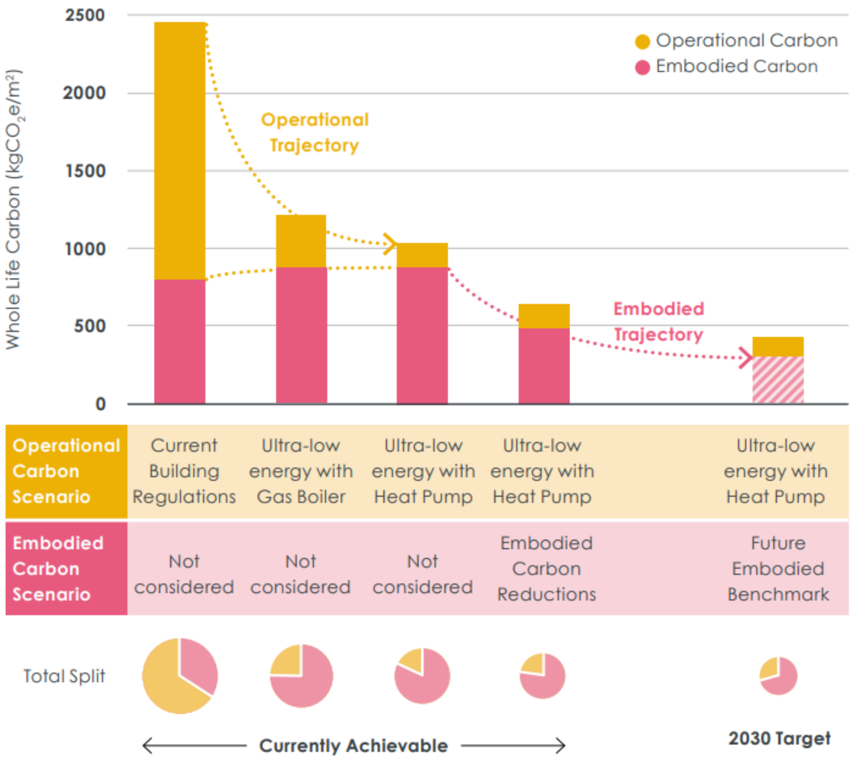

Figure 6 - Diagram showing operational and embodied carbon and trajectories - London Energy Transformation Initiative (2020) - embodied carbon primer

Additionally, whilst fully decarbonising grid electricity fully decarbonises operation emissions (if heating, cooking and power is electrified), it still doesn't fully address the carbon embodied in construction, repair and demolition activities, unless the construction sector and extraction industries are themselves fully decarbonised. Construction, repair and demolition processes are likely to be net sources of carbon emissions well beyond the point that the power sector is decarbonised.

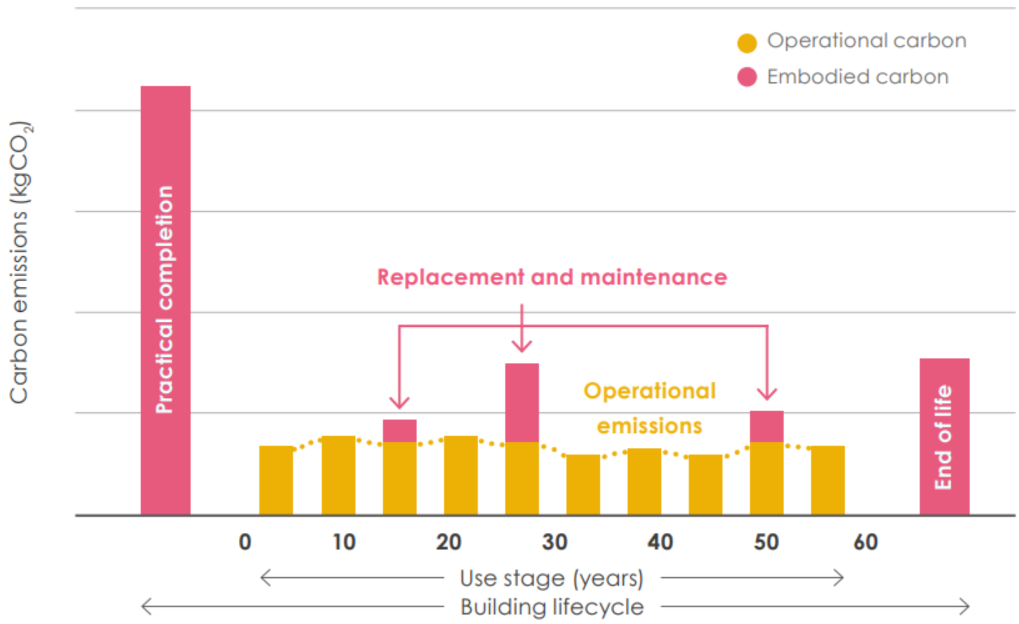

Figure 7 - Emission breakdown of a building's life cycle - London Energy Transformation Initiative (2020) - embodied carbon primer

Whilst the LETI Climate Emergency Design Guide and Embodied Carbon Primer, which were written by and are targeted at designers, architects and engineers, assume that net zero operational emissions is possible in the short term, they note that the industry still has some way to go before net zero embodied emissions can be widely achieved. Instead of directly proposing an offsetting scheme to address these, LETI suggests that its readers focus on actions that are more within their remit, including assessing and reducing the impacts of upfront emissions (product, transport and construction stage) in line with current best practice reporting methodologies and in accordance with Circular Economy principles. LETI proposes targets that become more restrictive over time, as set out at figure 8 below:

	Business as usual (kgCO_2e/m^2)	**2020 target (40% reduction)**	**2030 target (65% reduction)**	**Whole life net zero target**
Residential	800	500 (400 inc. sequestration)	300 (200 inc. sequestration)	0
Commercial Office	1,000	600 (500 inc. sequestration)	350 (250 inc. sequestration)	0
School	1,000	600 (500 inc. sequestration)	350 (250 inc. sequestration)	0

Figure 8 – Embodied energy targets, $kgCO_2e/m^2$ LETI[32]

LETI assumes that these targets are in addition to compliance with the EUI target, and that targets for 'reuse' and 'reusable' materials or elements are also set. Should an offsetting policy be pursued for embodied carbon, then the penalty calculation would be based on the volume of upfront carbon emissions over and above the target value. An appendix containing information relating to the topic of offsetting is included as part of the LETI primer document for reference.

The draft WoE policy recommendations[33] also suggest that developers focus (at least in the short term) on Whole Life Carbon (WLC) and Circular Economy principles and follow existing methodologies for calculating performance, and do not currently require these emissions to be offset. The draft policy recommendations do however include the introduction of a backstop $kgCO_2e/m^2$ target for major developments (from 2025 at the latest), but no specific figure is given at this time. It is suggested that data gathered through WLC assessments be used to inform industry wide development of WLC targets. WLC targets would cover emissions at all life cycle stages, from the construction phase through operation (including repair and maintenance), to end of life.

Given the rapid decarbonisation of energy, the complexities of converting from carbon to energy metrics, and the increasing cost of offsetting carbon emissions (as opposed to residual energy demand) through additional renewable energy, if embodied emissions are offset, a carbon metric should be used for this proportion of emissions, and funds should pay for projects other than renewable energy provision. Converting between an energy and carbon metric, either for the purposes of your planning policies or your offsetting regime is complicated and where possible, should be avoided however, such approaches might be necessary during the transition period from carbon to energy metrics. We understand that Bath and North-East Somerset Council decided to take this approach due to time constraints relating to the Local Plan Partial Update.

Were embodied carbon to be offset, in addition to offsetting energy through the provision of off-site renewable energy generation, this would effectively mean operating and administering two offset schemes in parallel. The administrative effort and complexity of this may exceed the benefits.

Offsetting transport emissions

Transport is now the largest contributor to greenhouse gas emissions, 27% of the UK total, and very little progress has been made in recent decades to reduce this. A rapid step change is needed in how we address transport emissions from development to meet our carbon reduction commitments and this is one of the policy areas where the planning system still has the furthest to go to align with a net zero future.

The Committee on Climate Change[34] comment that their Sixth Carbon Budget pathway sees a rapid shift to electric vehicles over the 2020s and 2030s, but also stresses the need for significant modal

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[32] https://www.leti.london/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

[33] Net zero buildings - draft policy recommendations for WOE - internal report (in draft)

[34] Local Authorities and the Sixth Carbon Budget - https://www.theccc.org.uk/publication/local-authorities-and-the-sixth-carbon-budget/

shift away from car journeys wherever possible, shifting 33 – 35% of shorter trips to walking, cycling and public transport, for cities this can be higher. The Bristol Net Zero by 2030 report[35], forming part of the evidence base for Bristol's climate emergency declaration came to similar conclusions, that to get to net zero emissions by 2030, 'a nearly 50% reduction in car miles and 40% reduction in van and lorry miles travelled in the city is necessary, returning them to levels seen in the mid-1980s. This would be driven by a significant effort to shift travel to public transport, cycling, walking (to a modal split more like Amsterdam) and to reduce demand for vehicle use through behaviour and system change, including freight consolidation and use of cargo and e-bikes, car-clubs and 'mobility as a service' initiatives.' This was in addition to switching almost all remaining vehicles to ultra-low emission vehicles and the installation of an extensive private and public EV charging network.

If we are to deliver net zero, this is the scale of change needed in how we travel. There are significant ramifications for how the planning system addresses the transport implications of development, including an almost wholesale re-imagining[36] of development patterns around sustainable transport, especially greenfield development models and layouts.

Whilst not yet reflected in national planning policy, national transport policy documents[37] are starting to recognise the scale of this challenge, and we think it could be used support a much more robust approach to setting transport infrastructure requirements in planning policy, particularly if evidence like the Bristol Net Zero report can model the scale of change needed in order to deliver on national carbon reduction commitments.

> For these reasons, and because it is far better to reduce emissions at source than to attempt to offset emissions after the fact, we do not consider that transport emissions should be offset, but instead be minimised through robust transport policies aligned with emerging national transport policy and supported by carbon modelling.

[35] Bristol net zero by 2030: The evidence base - www.cse.org.uk/downloads/reports-and-publications/policy/insulation-and-heating/energy-justice/renewables/behaviour-change/building-performance/Bristol_net_zero_by_2030_study_CSE_26_Feb_2020.pdf

[36] The RTPI report Net Zero Transport - The role of spatial planning and place-based solutions suggests the kind of street layouts and development forms compatible with zero transport emissions: www.rtpi.org.uk/media/7600/rtpi-net-zero-transport-january-2021.pdf

[37] Decarbonising Transport (DoT) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/932122/decarbonising-transport-setting-the-challenge.pdf, Gear Change A bold vision for cycling and walking – (DoT) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf, Local Transport Note 1 / 20 - Cycle Infrastructure design (DoT) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/906344/cycle-infrastructure-design-ltn-1-20.pdfhttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/9

Offsetting residual emissions from fossil fuel-based district heating systems

Where developers including local authorities propose adding new fossil fuel heat sources (other than waste heat) to extend an existing district heating system or create a new network, it could be legitimate to require them to offset the additional residual carbon emitted. This could also apply to Local Authorities as heat providers. If these emissions are offset, a carbon metric should be used, with funds used for projects other than renewable energy provision.

This would result in a parallel carbon offset fund needing to be created, and this complexity would likely exceed the benefits. The priority should be to draft planning policy to exclude fossil fuel heat sources unless unavoidable.

Where fossil fuel-based energy centres are required temporarily in the early phases of significant development projects, detailed transition plans should be drawn up setting out a timescale for their replacement with renewable heat sources, and these should be drawn into legally binding planning obligations. Such transition plans may rely on later phases of development to deliver the renewable heat supply. The WOE authorities should consider whether backstops can reasonably be included within legal agreements requiring replacement renewable heat sources should the later phases of development fail to go ahead.

It should be recognised that heat networks are communal in nature. Developers should only be responsible for the additional carbon they add to the network. Local authorities and heat providers have a role in exploring how existing fossil fuel energy sources can be replaced with renewable heat sources.

5. Approaches to off-site renewable energy procurement

Approaches adopted by other Local Planning Authorities

CSE contacted LETI and the UK Green Building Council to seek examples of how other local planning authorities developing LETI style planning policies intend to procure additional new renewable energy plant to offset the impact of new development. We also posted the same question to organisations following the LETI twitter account and shared the question on planning and climate forums on Linkedin.

In addition, we reviewed the UKGBC policy playbook (published January 2021) and the RTPI / TCPA Climate Guide and carried out a short desk review, looking at emerging local plans from the core cities, including Leeds, Sheffield, Brighton, Nottingham, Liverpool and Manchester. So far, whilst we are aware of several authorities[38] seeking to develop LETI style planning policies, framed around

[38] Basingstoke and Dean Borough Council and Cotswold District Council

energy, other than Cornwall Council we have found no examples of how these authorities intend to secure additional renewable energy capacity.

Policy SEC1 of the Cornwall Climate Emergency Development Plan Document[39] proposes an approach similar to that being considered by the West of England authorities. Cornwall's supporting evidence for the policy[40] recommends that the fund is used to fund solar photovoltaic panels on new buildings and large-scale renewable energy generation, and recommending against using the funding for retrofit of existing buildings, reduction of energy demand, solar photovoltaic panels on existing buildings and reforestation, afforestation or peatland restoration.

It doesn't seem practical to use offset funding to pay for the installation of PV panels on other new buildings when driven by the policy, all new development will already be seeking to maximise on-site renewable energy generation to achieve a net zero energy balance.

Options for procuring off-site renewable energy

In circumstances where it is not possible to achieve net zero energy balance on-site, two basic alternative approaches seem available in terms of procuring off-site renewable energy

Option 1. Developer procures a new supply of off-site renewable energy to power the proposed development, evidenced through the submission of a Power Purchase Agreement.

In this model, the developer would submit their planning application, together with a confirmed approach detailing how they would secure sufficient additional off-site renewable energy to meet all their operational energy needs from on and off-site renewable energy. The UK Green Building Council[41] have published guidance exploring this approach and setting out principles to this approach.

The developer would submit a Power Purchase Agreement with a renewable energy company committing which would detail their commitment to purchase sufficient kWh of renewable electricity to achieve the required net operational balance. UKGBC advise that the developers would also be expected to retire the Renewable Energy Guarantees of Origins[42] certificates (REGO) so that the energy attributes (the carbon savings) can't be sold or claimed elsewhere, to ensure the carbon emission reductions aren't double counted.

[39] Cornwall Climate Emergency Development Plan Document https://www.cornwall.gov.uk/media/ytsowko1/climate-emergency-dpd.pdf

[40] Cornwall Council Climate Emergency DPD – Energy Review and Modelling – Etude and Currie Brown (Feb 2021) - www.cornwall.gov.uk/media/mfob2hbj/eb004-energy-review-and-modelling-report.pdf

[41] UKGBC - Renewable Energy Procurement & Carbon Offsetting Guidance for net zero carbon buildings (2021) https://www.ukgbc.org/wp-content/uploads/2021/03/Renewable-Energy-Procurement-Carbon-Offsetting-Guidance-for-Net-Zero-Carbon-Buildings.pdf

[42]

What are Renewable Energy Guarantee of Origins certificates (REGO's)?

Ofgem operates the Renewable Energy Guarantees of Origin (REGO) scheme to provide transparency to consumers about the proportion of electricity that supplier's source from renewable generation. For every 1 MWh of renewable electricity created by a solar farm, hydro plant or other renewable energy generator, OFGEM (the energy regulator) issues an accompanying certificate, known as a REGO (Renewable Energy Generation Origin certificate).

Crucially, REGO certificates carry commercial value in themselves, and the certificate and the electricity don't have to be sold together, and this is where the opportunity to attach a REGO certificate to a non-renewable unit of energy arises, resulting in a phenomenon called 'greenwashing'. Some energy suppliers thus have almost no green energy in the mix that they purchase but are able to advertise '100% renewable' tariffs through separately purchasing REGO's to match every unit of 'green' energy they want to sell.

Therefore, allowing the REGO to be separated from the renewable electricity and sold off effectively negates the effect of providing additional renewable energy capacity.

Whilst superficially this sounds straight-forward, the UKGBC outline that there are a wide variety of procurement models which partially or fully meet the principles they have outlined, plus other procurement routes that are not listed or have specific circumstances that mean they do not fit in any of the common models.

To be feasible, greater work would be needed to clarify and standardise what procurement routes would be accepted, as this complexity could cause significant confusion for development management officers.

This approach potentially works well for large commercial buildings with single users, build to rent developments or any development where the applicant applies for planning permission will also be the building occupant or manager, where the applicant will also have control of the ongoing energy procurement for the development. It is however not clear from the LETI or UKGBC documentation how practically this would operate for volume house builders, or speculative schemes built for onwards sale, where the development will be built for sale to unknown end-users. For these types of developments, which are likely to be most planning proposals, the UKGBC guide raises a number of questions, bulleted below. CSE put these questions to UKGBC whose responses are given below in italics:

- Would this approach require local planning authorities to tie householders of new residential developments or speculative office developments into renewable energy tariffs for the residual off-site generation?

"Based on UKGBC Framework Definition, net zero carbon buildings for operational energy is based on (amongst transparency and measurement) the polluter paying – this means that for build to sell developments, the operational element will be down to the householders to demonstrate they meet the net zero standard in operation, not the developers.

Beyond on-site small-scale renewables, it would be difficult to tie householders of new residential developments to renewable energy procurement. The developer by default has to connect the development to a tariff, so leading residential developers have been ensuring their new builds are connected to a genuinely green tariff with a supplier that also provides smart meters for new builds – the onus is then on the new owner to switch away when they move in if they are unhappy."

- If not, where does the supplied electricity from the Power Purchase Agreement go? It could lead to housing developers having to commit to purchasing renewable electricity for which they have no use. Is it enough that the PPA is signed (and then sold on elsewhere) and the REGO is registered and then retired? This would still ensure the renewable energy plant is new and additional to what would have happened anyway?

"As you indicate, it is difficult for residential build to sell developers to incorporate PPAs within their strategies, unless they happen to also be a licenced supplier and have contingencies elsewhere for the potential excess supply. It can potentially be feasible for large scale BTR (build to rent) but would recommend speaking with a specialist PPA advisor on the various risks related to this, as generally speaking developers within our membership exploring PPAs as an option (largely commercial side) have found it to be a significant undertaking.

With regard to the PPA being signed then sold elsewhere – again it goes back to who has ownership of the emissions and is responsible for ensuring it is at NZC standard. For a residential build to sell market, it's the owner, not the developer, so it would be surprising for a developer in this instance to secure a PPA. If the developer is investigating this for a BTR (build to rent) development and are looking into a PPA – it wouldn't make sense for the PPA to be signed and sold elsewhere in the context of net zero. We encourage procurement routes that are additional, but also where the power and REGOs are bundled with one another.

In conclusion, other than in the narrow case of build to rent proposals (where the end user is known and a PPA can be agreed tying them into 100 % renewable electricity supply) the requirement for a developer to submit a power purchase agreement with their planning application would not be practical for most development and would not short cut considerations around additionality.

Whilst acknowledging the polluter-pays principle, the current energy system is predicated on householders having unrestrained choice of their energy supplier. Putting the onus on the householder to demonstrate net zero operational emissions would require the local planning authority to mandate the type of energy tariff individual householders could choose. It is difficult to envisage how individual households could be tied in in this way through existing planning processes, and doubtful whether planning inspectors would see such restrictions as reasonable or enforceable, requiring lengthy and invasive monitoring going forward.

Additional points worth making are that power purchase agreements are simply agreements between energy providers and off-takers to provide renewable energy over a particular period. PPAs are also commercially confidential agreements. Their sale and transfer is confidential, and therefore additional safeguards would need to be in place to ensure the PPA was from a new, additional renewable energy plant. It is furthermore possible to sign PPA's to secure renewable energy supplies from existing renewable plant, in which case additionality is not achieved.

Option 2. Energy off-setting - council run

The developer contributes into a council run energy offset fund at an agreed cost per kW_p or per kWh generated, to meet the net annual energy demand for a scheme (after on-site renewable energy is maximised). The council collects and adds up contributions and regularly procures new commercial scale renewables and once again, retires the REGO, or offers free rooftop solar installations to households unlikely to be able to invest themselves. The fund is used exclusively for the installation of renewable energy plant.

Once again, the use of power purchase agreements to commission new commercial scale renewable energy generation raises questions, in that within this model, the developer has made a fixed contribution, whilst if the council signs a power purchase agreement it has committed to purchase renewable electricity over a fixed timespan it has no direct need for.

Conclusion

Given the complexity of securing additional renewable energy through power purchase agreements, we conclude that it would be simpler and more straight-forward to establish a council run offset scheme, whereby the council collects contributions into a ring-fenced fund and then procures new renewable energy.

6. Mechanisms for council run schemes

Below we have provided recommendations on how to facilitate a pipeline of projects which can demonstrate additionality and possible mechanisms for a council run scheme.

In assessing ways to procure additional renewable energy capacity, we have considered the potential additionality offered by different procurement sources, the likely co-benefits arising, practicality and other advantages and disadvantages.

Additionality

Additionality assesses the degree to which the carbon savings would have occurred without the funding. Ensuring that the offsetting project achieves carbon emission reductions beyond what would have happened anyway is critical to the approach being defensible, both in terms of the planning regime and achieving carbon reduction commitments.

The planning legal tests state that in order be a legitimate justification for granting planning permission, planning obligations must be necessary to make the development acceptable in planning terms; directly related to the development; and fairly and reasonably related in scale and kind to the development. If therefore the off-site renewable energy project would have happened anyway without the funding, the contribution cannot be necessary in terms of planning law.

Similarly, if the renewable energy project would have occurred without the funding, the project cannot be said to be realising additional carbon emission reductions.

Field based solar installations, partnering with community energy groups

We have considered the potential to partner with the community energy sector, directing capital funding at local community energy groups to direct fund the creation of field based solar installations. We have created a flowchart (at figure 9) illustrating how such a partnership might work, and how this partnership could integrate with planning processes. This pre-supposes this activity is directed at funding new field based solar farms, as the most mature and readily deployable type of renewable energy.

In this model, the community energy group would be given a grant to meet the capital costs of installing a solar farm of a specific output, but no funding would be available for the feasibility or development costs.

As illustrated in the flowchart community energy groups would be given early notice of the likely "energy deficit" arising from new developments, the scale of capital funding likely to be available and the timescale over which the additional renewable energy capacity would need to come on stream. At this early stage they would enter into an option agreement or similar with the council, indicating their interest in the grant funding their intention and ability to deliver the additional renewable capacity when the new development becomes operational, and the grant funding is released prior to the commencement of development. This would enable them to scale up site finding and development processes to meet the likely demand.

The funding would be issued as a grant to the community energy organisation, for the full capital costs of installation, with a contract committing that they will install a specified amount of solar PV by a specified target date, aligned with the likely occupation date of the new development, once complete.

Minimising time-lags and maximising additionality

A key problem which would need to be solved in this model (and all forms of large-scale renewable energy projects needing planning permission) is the conflict between additionality and speed.

Put briefly, renewable energy projects which already have planning permission are unlikely to have a high degree of additionality. (They might be developed anyway without the funding.) Conversely, renewable energy developments which need planning permission but don't yet have it are more likely to be additional to what would have happened anyway, but (being hostage to uncertain planning processes) are unlikely to come forward quickly.

The process illustrated in the flowchart is designed to maximise additionality by funding genuinely new projects which are not yet in the planning system, and to align community energy group processes and capacity to deliver the additional renewable energy in the shortest possible time after the carbon emitting development is occupied. However, trying to ensure that genuinely new additional solar farms are procured and come forward quickly would be likely to be difficult to achieve in practice and would require new relationships, structures and processes to be set up which would themselves require managing.

Practicality

We have concerns that the good intention of community energy groups to deliver new solar farm capacity quickly would in some cases be frustrated by planning reverses, leaving the funding local planning authority with no recourse but to wait. What happens if the community energy organisation fails to deliver the renewable energy capacity they have committed to?

This relationship might also put the WOE planning departments in a difficult position, under pressure to approve greenfield solar farm applications (some of which they may not find acceptable) to deliver additional off-site renewable energy to mitigate the impact of development they have permitted elsewhere. These difficulties are likely to mount as the number of greenfield solar farms funded by this route increase and could give rise to tensions between urban areas where most residential development is to take place and rural non-green belt areas, where solar farms are likely to be developable.

Additionality

Theoretically in the long-term the funding model proposed could offer greater levels of additionality than approaches which fund development and feasibility costs of new renewables, in that the grant funding would solely fund the actual installation of renewable energy, rather than abortive projects which never go on to generate renewable electricity.

The grant funding would enable community energy groups to own the renewable energy asset and keep any profit, growing their ability to develop more community owned renewable developments in the future.

It is likely that by substantially growing the capital funding available to the community energy sector such a partnership would genuinely increase renewable energy installations over what would have happened anyway, particularly as many Community Energy Groups have articles of association preventing them from selling their assets or distributing profits to shareholders.

Co-benefits

Partnering with community energy groups would deliver significant co-benefits. These groups are often incorporated as non-profit community interest companies or Community Benefit Societies and are required by their articles of association to return their profits to the community. Profits would be likely to be used to fund fuel poverty projects, other community projects and buildings, growing community capacity and delivering additional carbon savings.

Partnering with the community energy sector would have benefits for the local supply chain and would potentially upskill and increase paid employment within local community energy groups. The community energy sector if nourished has the potential to contribute to the wider low carbon economy in the WoE region and increase the proportion of energy spending captured in the local and regional economy.

Bottom-up community energy projects also have potential to increase energy literacy amongst the wider community, and can deliver informed consent around renewable energy projects, which can in turn reinforce local authority initiatives and open up the scope of what is possible.

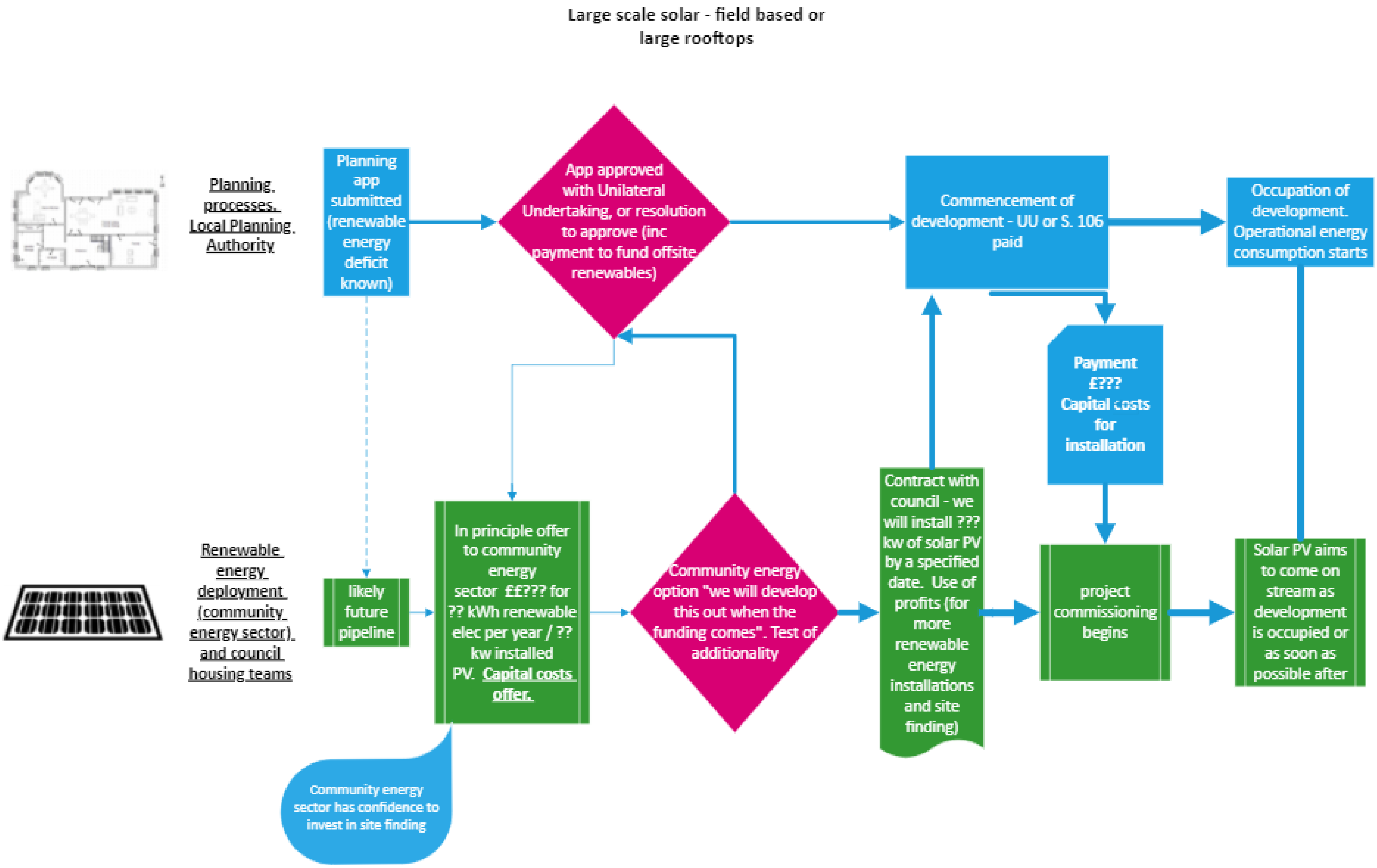

Figure 9 - Flowchart for partnering with community energy sector - procuring new field based solar farms

Domestic Rooftop solar

Additionality

Without careful scheme design, is could be difficult to demonstrate clear additionality for the installation of rooftop solar systems. Wealthier households may have the capacity and intention to fund the installation of solar panels themselves, but if a funding pot is available will still take advantage of it, with the result that a proportion of the installations would have happened anyway without the funding.

Having stated this, a large majority of households and low-income neighbourhoods are very unlikely to be able to install rooftop solar panels without financial assistance, and therefore providing funding is directed only at these groups, a high level of additionality should be possible.

We propose that free domestic rooftop solar installations should be offered to low-income households or in low-income areas where the occupier would be very unlikely to install them themselves without outside funding. This could be achieved through re-funding and re-using the Green Homes Grant Local Authority Delivery Scheme, using the same eligibility criteria developed for this grant programme. LADS funding is directed at households with an income of under £30,000 where the EPC rating is E or lower.

Other criteria would need to be established to ensure that the potential host rooftops are technically suitable for the installation and capable of housing a minimum amount, for example 3 kW.

With this approach, clear additionality is secured through the scheme design, and through the criteria which define who is eligible for free rooftop solar panels.

Co-benefits, practicality

Prioritising rooftop solar would minimise the use of agricultural land for solar development and the associated landscape and other impacts. This is likely to align with understandable public and political opinion that we should prioritise rooftop installations ahead of greenfield solar.

The free installation of rooftop solar in low-income households and areas could have considerable direct benefits for households in fuel poverty, reducing their reliance on electricity from their supplier and directly reducing their bills. Given current pressures on living standards and current and likely future energy prices rises, this benefit weighs heavily in its favour.

Increasing renewable energy deployment through directly funding rooftop solar seems quite practical. In most cases planning permission will not be needed, or be relatively uncontroversial, and the funding processes and systems are already in place.

Conclusions

Overall, we would recommend that funding is directed towards the installation of rooftop solar PV on existing buildings in disadvantaged areas rather than solar farms on greenfield sites, due to the greater and more direct social benefits for tenants in terms of energy bill reductions and energy inequality. This procurement route would not be dependent on installations receiving planning permission, would be relatively rapid to deploy and relatively simple to administer.

Administration

There would be benefits for administering the rooftop solar fund jointly across all four local authorities. Given that this would be a continuation of the existing LADS funding programme and could adapt or re-use the existing application forms, website and back-end processes this should be relatively straight forward.

As we advised in our 2018 report, the implication of the legal tests[43] for planning obligations are that administration process around offset contributions should be able to show:

- A proportionate audit trail showing that the contribution has delivered what is funded within a reasonable timescale of the development being occupied.
- Additionality - that the carbon savings (or in this case additional renewable energy) delivered by the payment are clearly additional to what would have happened anyway
- Evidence that the contribution sought is reasonable in scale

If rooftop solar is to be funded through recharging LADs funding, this would mean tracking:

- Capital expenditure against the funding received
- The rate of rooftop solar completions and amount of installed PV against the deficit in renewable energy generation the contributions are expected to make up.
- The actual real-life costs of installing rooftop solar PV, to ensure that the offset charge is sufficient and is borne out through real world installations

At present, once a household has applied for LADS funding, their eligibility for funding is checked, and an installer is funded to carry out the necessary structural and other surveys. If the property is deemed to be technically suitable, the PV installation goes ahead. Following installation, a new Energy Performance Certificate is issued, which is taken as proof that the installation went ahead, enabling the installer to be paid for the work.

Provided that data on the average costs of PV installations are collected, and a record is kept of the funding being directed into the scheme and the number of installations expected, the existing administration processes could be easily amended to provide all the evidence required to support the proposed offset programme, both in planning appeals and at local plan examination in public.

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[43] that a proposed planning obligation is:

> *(a) necessary to make the development acceptable in planning terms;*
> *(b) directly related to the development; and*
> *(c) fairly and reasonably related in scale and kind to the development.*

The Community Infrastructure Levy Regulations 2010

7. Estimate of pot size and carbon price

Recommended offset charge, assuming an energy metric

The previous study proposed a carbon pricing strategy that was in line both with the Treasury's non-traded price of carbon (following the lead of the Greater London Authority), and (broadly) with the marginal cost of carbon saved by the installation of solar PV at prices that were current at the time of writing (as calculated by Currie and Brown). This figure was £95 per tonne, and the calculated charge to the developer assumed a 30-year period. Should the West of England councils wish to implement a carbon-based scheme this figure would need to be re-calculated, both because small-scale solar PV cost statistics from the Department for Business, Energy and Environmental Strategy suggest that installation costs fell by over 10% from the year 2018/19 to 2020/21 and because the carbon intensity of the grid electricity that the PV-generated power would displace is now lower (see section below). The carbon values in the Treasury's Green Book were also overhauled in 2021 and are now considerably higher. The documents reviewed for this study did not include proposals for the cost of energy credits.

The Energy Hub study from April 2022[44] looked at this and found that the £95 carbon price (£/tCO_{2e}) quoted in our previous study was outdated, and that a higher price of £378 was now justified, but that in terms of the cost paid by developers, the rapid decarbonisation of grid electricity reflected in the revised building regulations largely cancelled out this effect. Notwithstanding these considerations, the Energy Hub report found that the updated carbon cost was not likely to cover the true costs of offsetting carbon.

A suitable payment for energy-based offsetting would cover the costs to enable the power demand that is not met on-site to be met off-site instead. Given the almost universal deploy-ability of rooftop solar and the fact that planning permission is normally not required, we recommend that rooftop solar PV should be the primary technology deployed to achieve compliance across all developments, and therefore that offset costs should be linked to the cost of installing and maintaining this technology type. Further consideration of the relative merits of funding rooftop solar versus standalone solar farms is set out in section 8.

Developers would be expected to demonstrate the proportion of annual energy demand that is to be met on-site (including consideration of local storage where applicable, in line with assumptions incorporated into the SAP 10.2 methodology), and to quantify the shortfall in kWh per year. This figure could then be used to calculate the size of renewable installation (most likely solar PV) that would be required to generate equivalent power elsewhere. A basic calculation for this would be:

[44] Adapting London Plan Offsetting Rates for 2022 Building Regulation Updates - Evidence for B&NES 2022 Local Plan Partial Update (LPPU) - www.swenergyhub.org.uk/wp-content/uploads/2022/05/220323-BNES-Carbon-Offsetting-Note.pdf

$$\mathbf{kW_p}^{45} = \textbf{kWh per annum / (load factor*8760)}$$

For the purpose of simplification, or where the technical details of the new off-site installation (e.g. orientation, PV technology type etc.) are not yet known, an average load factor for South West England of 10.5% could be used[46]. This may be refined where more information on a proposed installation is available.

The Department for Business, Energy and Industrial Strategy (BEIS) releases annual statistics that set out the installed cost of small-scale solar PV (in £ per kW) based on data taken from the Microgeneration Certification Scheme (MCS) Installation Database. Mean and median figures are provided per quarter for each year and for installations that fall within three separate bands according to their scale (see table below). The figures provided include the cost of the solar PV generation equipment itself, the cost of labour to install the technology and the cost of connecting to the electricity supply. They are inclusive of VAT, and upper and lower confidence interval figures are also provided.

Capacity band (kWp)	Mean installation cost (£ per kW)*	Median installation cost (£ per kW)*
0 – 4	1,628	1,429
4 – 10	1,685	1,586
10 – 50	1,088	1,000
* Includes the cost of the solar PV generation equipment, cost of installing and connecting to electricity supply and VAT. The cost excludes any extended warranty or any other material or works.		

Figure 10: BEIS installed cost statistics for small-scale solar PV by capacity band for year 2020-21[47]

However, residents in Bath & North-East Somerset, Bristol and South Gloucestershire have been able to access government funding for free rooftop solar installations through the Local Authority Delivery Scheme[48] (LADS), managed by Bristol City Council's energy service. CSE has obtained records of the installation costs of 131 domestic rooftop PV projects installed through LADS and this data set better reflects local installation costs than the BEIS figures

The installations ranged from 3 – 6 kW and are representative of the type and scale of rooftop installations which would be funded by the offset regime proposed. The data include the cost of the

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45 kW peak

46 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/647344/Regional_renewable_electricity_2016.pdf.

47 Small scale solar PV cost data - BEIS - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/988668/Solar_Costs_2020-21.xlsx

48 https://westengland-lad-applications.com/

solar PV generation equipment, installing the panels and connecting them to electricity supply and VAT and the management fee of the managing agent, and remedial works (e.g., roof repairs) necessary before the panels can be installed. Bristol City Council's costs for managing the scheme are not included.

Capacity of installations (kW_p)	Mean capacity of installation (kWp)	Median installation cost (£ per kW)*
131 projects ranging from 1.87 – 6 kW_p	3.37	**£2,180**

Figure 11 – average installation costs within West of England Authorities, through LADS funding

The table below provides a breakdown of the recommended offset cost charged to developers, based on this local data. This represents the full costs of administering a self-sufficient energy offsetting scheme, and the costs of installation, but not maintenance costs. An excel spreadsheet at appendix A shows the full data set.

Recommended energy offset charge	
Median installation cost, including management fee of managing agent (£ per kWp)	£2,180[49]
Offset charge £/kWh	£0.08 per kWh (£79.99 per MWh)
Offset price including 15% admin costs (£/kWh)	£0.091 (£90.84 per MWh)

Figure 12 – recommended offset price

To work out cost per kWh, we have modelled how much electricity an average installation can be expected to generate over their lifetime (taken to be 30 years), see Appendix A for more detail. The total average installation cost, (including an administration fee) is then divided by the lifetime generation, giving a cost per kWh. We have framed the charge this way to enable more direct comparison with other carbon offsetting metrics.

Thus, the calculation for a development needing to fund offsite renewable energy to achieve a net zero operational energy balance would be:

Annual residual electrical demand (kwh) X 0.091 (offset rate) X 30 (lifetime)

Bristol energy service advise that a 15% allowance is added to cover administration costs incurred by the city council. Guidance[50] from the GLA supports local authorities in allocating up to 10% of the fund to pay staff to develop and manage identified offsetting projects, and therefore further detail should be set out at examination justifying the 15% administration charge.

The costs represent the realistic project costs incurred installing solar panels through the LAD's funding scheme, based on the council's current contact with their managing agent Ameresco, who sub-contract the work out to local installers. The current contract however comes to an end in July 2022, likely to be replaced by a joint venture between Ameresco and the City Council through the City Leap initiative.

Costs should be reviewed regularly (every 6 months) to ensure that the offset charge matches the average costs per kW of installed solar, both in respect of management costs and fluctuating capital costs.

[49] This includes data for four comparatively large (>4.5kWp) installations that incorporated storage, alongside 126 installations without. The installation cost of these large projects including batteries was no greater than smaller schemes without, so installations with batteries have been included in the average cost calculations.
[50] https://www.london.gov.uk/sites/default/files/carbon_offsett_funds_guidance_2018.pdf

Justification of costs and comparison to BEIS cost statistics

Including costs for an extended warranty

We consider that if viable, it would be justifiable to fold the costs of an extended guarantee into the offset charge developers pay per kw installed solar. As expanded upon in section 8, funding would be directed at low-income households and low-income areas using the same eligibility criteria developed for the Local Authority Delivery Scheme grant programme. This would maximise additionality as these households would be very unlikely to install rooftop solar panels without outside funding.

Similarly, these households would be unlikely to be able to fund significant maintenance or repair costs themselves to keep their panels operational, for example the cost of a replacement inverter. Without these costs being covered on behalf of these households, it is likely that a significant proportion of the installed solar panels would become inoperable within their design lives, with the result that the contributing development will not achieve a net zero operational energy balance, and therefore not achieve net zero operational emissions as the policy requires.

It is likely that an extended warranty would cost below £1000 per installation, but costs vary depending on the nature of the warranty (a manufacturer's warranty or workmanship warranty) and from supplier to supplier and it is consequently not possible to advise on these costs with any certainty at this stage.

Comparison with BEIS average installation costs

Figure 12 shows significantly higher costs for installing solar PV through the Local Authority Delivery Scheme when compared to the average installation costs from BEIS (figure 11), and therefore some commentary is necessary.

Whilst the two datasets both show installation costs, they are not directly comparable. The BEIS figures primarily represent the cost of solar installations for the "able to pay" market. By contrast the L.A.D.s figures represent a publicly funded intervention to install panels in households who would otherwise be "unable to pay".

Within the BEIS data, most installations will have been initiated by the property owner themselves. At the heart of the offsetting regime is the principle that the installations must be additional to what would have happened anyway. Therefore, a programme needs to be funded, administered, and promoted offering free PV installations to low-income households which would not have installed them otherwise, and these costs are additional to the capital costs of the panels themselves and labour costs. Whilst the administration of the (now closed) L.A.D.S scheme was funded from a separate pot; it is reasonable that the offset regime should be self-financing and not dependent on external funding, with these additional costs being covered by the developer.

Notwithstanding this, the L.A.D.s scheme has found the actual costs of installing rooftop PV higher in low-income households. Whilst the BEIS cost figures solely include costs directly related to the installation of the panels and their connection to the electricity supply, the L.A.D.s figures have in some cases included roof repairs which have been necessary in order that the panels can be fitted.

The low-income households targeted by the LADs are in many cases not able to regularly maintain or repair their roofs.

Costs comparison with the carbon offset charge calculated using a carbon metric

The offset cost in this report has been presented in terms of £/kWh to be more easily comparable with proposals for a carbon-based offsetting scheme, as presented in recent reports produced by the South-West Energy Hub.

For example, the Planning Policy Guidance Note SW002 *Net Zero Energy Offsetting rates* (February 2022) notes that today's 'high' carbon price in the UK Government's Green Book would equate to a price of 9p/kWh and proposes its own price of 11p/kWh for the West of England (note that prices in the Green Book would not reach 11p/kWh until the mid-2030s). For comparison, an example is provided below to compare the possible scale of payment required in a scenario where a developer builds a block of 18 flats and achieves only 75% of the required scale of PV installation on-site (note that in this case both calculations assume that a developer would be compensating for residual demand/emissions as calculated using the approach set out in section 9, rather than following an approach based solely on outputs and assumptions from SAP as has been the case in a number of previous carbon-based schemes and studies).

Whilst a slightly more recent report, written to support the B&NES 2022 Local Plan Partial Update in April 2022, does not directly provide figures in a £/kWh format, it is possible to compare the possible scale of payment required under a similar carbon-based scheme using the same carbon factor[51] but aligning other assumptions (on project cost, exclusion of operational costs, inclusion of 15% admin fee and using a 30-year technology lifetime) with the data collated for this report and implicit in the £0.091/kWh figure proposed.

As can be seen the cost resulting from the offset rate recommended in this report (based on local PV installation costs) closely matches the rate recommended by the SW Energy Hub (based on an updated carbon offset figure) but would be approximately 18% less than the figure recommended by the SW Energy Hub in their Feb 2022 report.

[51] 136 gCO_2/kWh

	Basis of offset rate	
Number of flats		18
Total demand		34,713 kWh/yr[52]
Shortfall if only 75% achieved on-site (assuming 30-year lifespan)		8678.25 kWh/yr
Payment required @ £0.091/kWh	Local PV installation costs from LAD's programme Administered by Bristol City Council	£23,692[53]
Payment required @ £0.11/kWh	SW Energy Hub study – Feb 2022[54]	£28,638
Payment required @ £668.15/tCO_2	SW Energy Hub study – April 2022[55] with assumptions aligned to allow direct comparison with our recommendation	£23,657

Figure 13 – worked example of offset payments with different offset rates

Using the offset charge as a price signal incentivise on-site carbon savings

Much though it would be desirable to set the offset charge at a high level to make it more cost effective to save carbon on-site, the planning legislation[56] doesn't allow for this.

Instead, the obligation and contribution must be sufficient to fund appropriate mitigation to resolve the problems caused by the development. Obligations must be necessary to make the development acceptable, directly related to the development; and fairly and reasonably related in scale to the development. Taking this into account, the offset charge must be set at a level which allows sufficient additional renewable energy capacity to be installed to achieve a net zero operational energy balance for the development.

[52] Based on LETI standard and floorspace data from the English Housing Survey.

[53] For clarity, the calculation here is: 8678.25 kWh/yr (i.e. annual shortfall of 25% demand, where demand is based on LETI benchmark, and an average floor area of 55.1m^2 from the English Housing Survey) multiplied by 30 years, and then multiplied by the £0.091/kWh offset charge).

[54] SW Energy Hub (April 2022) PPG Note SW002 Net Zero Energy Offsetting rates - unpublished

[55] SW Energy Hub (February 2022) - Adapting London Plan Offsetting Rates for 2022 Building Regulation - Updates Evidence for B&NES 2022 Local Plan Partial Update - unpublished

[56] The Community Infrastructure Levy Regulations 2010

Developments should wherever possible reach a net zero operational balance on-site through energy efficient fabric, renewable heating, and maximising on-site renewables, but this should be secured through the application of the council's planning policies, (and evidenced through the applicant's energy statement) rather than through pricing signals. Planning proposals which fail to reach the required standards should be refused planning permission.

Size of offset Pot, assuming an energy metric

The previous report contained detailed calculations to estimate the potential 'pot size' that a carbon-based offsetting policy might generate in the West of England. Equivalent calculations are outside of the scope of this report, but very high-level estimates of the income that could be generated from a policy based on an energy metric are presented below.

Domestic

Total housing development estimates were provided by WECA to cover Bristol, B&NES and South Gloucestershire over a 20-year period. As these figures have not yet been finalised, three technical growth levels were provided. Equivalent figures for North Somerset were assumed based on the trajectory data in the previous report (taken as the central figure, with lower and upper bands assuming the same percentage change as the WECA figures)[57]. When added together, these growth levels are a) 102,800 dwellings, b) 115,000 dwellings, and c) 127,200 dwellings. The dwelling type split was taken from the breakdown used for Strategic Development Sites in the first study, and average floor areas were taken from the English Housing Survey.

As noted in previous sections, LETI assume that most residential development will be able to achieve net zero on site, however, acknowledging that there may be some cases where it might not be possible to install sufficient renewable generation to match the demand of the building, particularly in the case of a block of flats. As an indication of scale, assuming that the blocks of flats are the most likely not to meet the target, the cost of an offset is assumed to be £0.091/kWh (see previous section).

In a scenario where 10% of flats are only able to install 50% of required generation, but all other dwellings comply, the fund sizes (across all four authorities) could be in the region of:

Growth level	Offset fund (assuming 10% flats are only able to install 50% of generation)	Rooftop solar installations (3 kW) to be funded
Growth level A: 102,800 dwellings	**£4,690,590**	**623**
Growth level B: 115,000 dwellings,	**£5,247,256**	**697**

[57] As figures for North Somerset were taken from the previous strategy trajectory document, these only cover the period up until 2035/36.

Growth level C: 127,200 dwellings	**£5,803,921**	**770**

Figure 14. Scenarios of offset fund size – optimistic scenario

In a scenario where 25% of flats are only able to install 50% of required generation, but all other dwellings comply, the fund sizes (across all four authorities) could be in the region of:

Growth level	Offset fund (assuming 25% flats are only able to install 50% of required generation)	Rooftop solar installations (3 kw) to be funded
Growth level A: 102,800 dwellings	**£11,726,476**	**1,557**
Growth level B: 115,000 dwellings,	**£13,118,139**	**1,741**
Growth level C: 127,200 dwellings	**£14,509,803**	**1,926**

Figure 15. Scenarios of offset fund size – pessimistic scenario

An excel spreadsheet detailing these calculations is attached at appendix B.

These estimates are tentative in that whilst evidence from Cornwall Council suggest that residential development up to 6-storeys in height ought to be able to meet all their electrical demand on-site (assuming compliance with LETI Energy Use Intensity targets), the size of the pot is sensitive to the proportion of flats not able to achieve the required level of on-site generation and on the proportion of energy needing to be generated off site and with a new policy framework, both elements are to a degree unknown.

Although in section 2. we have discussed possible backstop mechanisms to ensure that the reliance on offsetting is minimised, nevertheless developers will take some time to get used to the policy framework and to the practice of maximising rooftop solar in scheme design, and therefore the pot size could be considerably larger, at least to start off with. We have therefore modelled two scenarios, that 25% and 10% of flats aren't able to install the required level of generation, with 50% of the required renewable energy generation having to be funded off-site.

As shown above, we have carried out some high-level calculations of the number of rooftop installations that would be required (assuming small 3 kW arrays) to compensate for the energy shortfall from assumed housing growth, to understand whether this scale of deployment would be feasible.

Assuming the scenarios above, the policy framework would result in a requirement for between approximately 600 and 1900 domestic rooftops would need to be fitted with solar panels to compensate for insufficient on-site generation. Even were these predictions to be an underestimate by a factor of 10, it would still be likely to be able to be met from existing domestic rooftops in the west of England area.

Non-domestic

Whilst it is unlikely that a similar policy would be viable for the non-domestic sector in the short term, it may be possible in the future. The following calculations are provided purely as an indication of the scale of a potential non-domestic fund, based on office and school building types.

Assuming LETI's target of 55 kWh/yr/m^2 for office buildings and the average office floor area of 4358m^2 from the WSP study[58], then a non-domestic fund size based on this building type, where only 50% of the target for on-site renewable generation could be achieved, could be in the region of:

1 non-compliant building: £327,177[59]

50 non-compliant buildings: £16,358,843

However, it's important to note that these calculations use an offset charge (£0.091/kWh) that is based on the cost of domestic-scale solar installations. Should a decision be made to implement a non-domestic scheme in the longer term then a cost per kWh figure should be determined based on data collated for real non-domestic installations in the West of England that is as recent as possible (therefore it is advised that the local authorities collate this data in the meantime). Such a cost would likely be lower than that for residential-scale PV installations.

For school buildings, again assuming LETI's EUI target, the average floor area from the WSP study for this building type, the same offset charge and a scenario where 50% of the renewable generation target is achieved, the fund size could be in the region of:

1 non-compliant building: £82,674

5 non-compliant buildings: £413,369

Note that these figures use the same cost for PV as in the residential section above, but that this would likely fall year on year.

Size of offset fund from embodied carbon

The potential for offsetting embodied carbon was not reviewed as part of the original study and this is not an area in which CSE has previous experience, therefore, to provide a robust estimation for the potential size of a fund based on this, further work would be needed. This would involve a thorough review of available documentation and calculation methodologies under standard

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[58] WSP (2021), Evidence base for WoE net zero building policy: Operational carbon for non-domestic buildings

[59] Using the assumptions noted above, the calculation behind this figure is: 55 x 4258 = 239,690 kWh/yr total demand per year. A 50% shortfall would equate to 119845 kWh/yr, which would add up to 3,595,350 kWh over the 30-year time-period. When multiplied by the offset price of £0.91/kWh this gives approximately £327,177 (rounded up).

guidance documents, such as the RICs Whole life carbon assessment for the built environment[60] approach, and the BS EN 15978 methodology.

8. Alternatives to energy / carbon offsetting using the commercial carbon offset market

South Gloucestershire Council have been considering the use of commercial carbon off-setting, using an accredited intermediary to ensure delivery of solutions which would otherwise not happen, and have discussed the potential for Nature Based Solutions, largely with a focus on Carbon but also starting to stack broader benefits.

This is something the Greater Manchester Combined Authority were also considering through the creation of a Greater Manchester Environment Fund with three potential funding sources:

- Green Infrastructure
- Habitat Bank Facility
- Carbon Trading Vehicle

LETI[61] make similar comments about stacking benefits:

"Could carbon offsetting be administratively combined with funds from biodiversity net gain policies – to increase funds available and reduce administrative costs?"

The LETI document has this to say about the commercial offsetting market:

"From an unregulated sector 20 years ago, offsetting is no longer a 'wild west' but self-regulated through an industry standard – the Gold Standard. This places increasing emphasis on technology including remote sensing and blockchain to manage and monitor off setting projects whilst avoiding high administration costs[62]"

Allowing developers to offset their residual emissions through the commercial carbon offset markets would simplify the administration of the council's net zero policies, however such an approach comes with several significant downsides:

Unintended consequences: encouraging offsetting rather than on-site carbon reductions

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[60] Whole life carbon assessment for the built environment – 1st edition, November, 2017 - www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf

[61] Appendix 10 - LETI (2020) Embodied Carbon Primer - https://b80d7a04-1c28-45e2-b904-e0715cface93.filesusr.com/ugd/252d09_8ceffcbcafdb43cf8a19ab9af5073b92.pdf

[62] Gold Standard for the Global Goals: Next Generation Standards Gold Standard 2019 https://www.goldstandard.org/ impact-quantification/gold-standard-global-goals

The primary driver in setting the carbon price for commercial carbon offset schemes is competitiveness with other products on the market. Carbon offsetting is typically a global market, with offsetting typically funding carbon saving initiatives in the global south, see the examples from Gold Standard below, with carbon prices of between $11 and $47 a tonne.

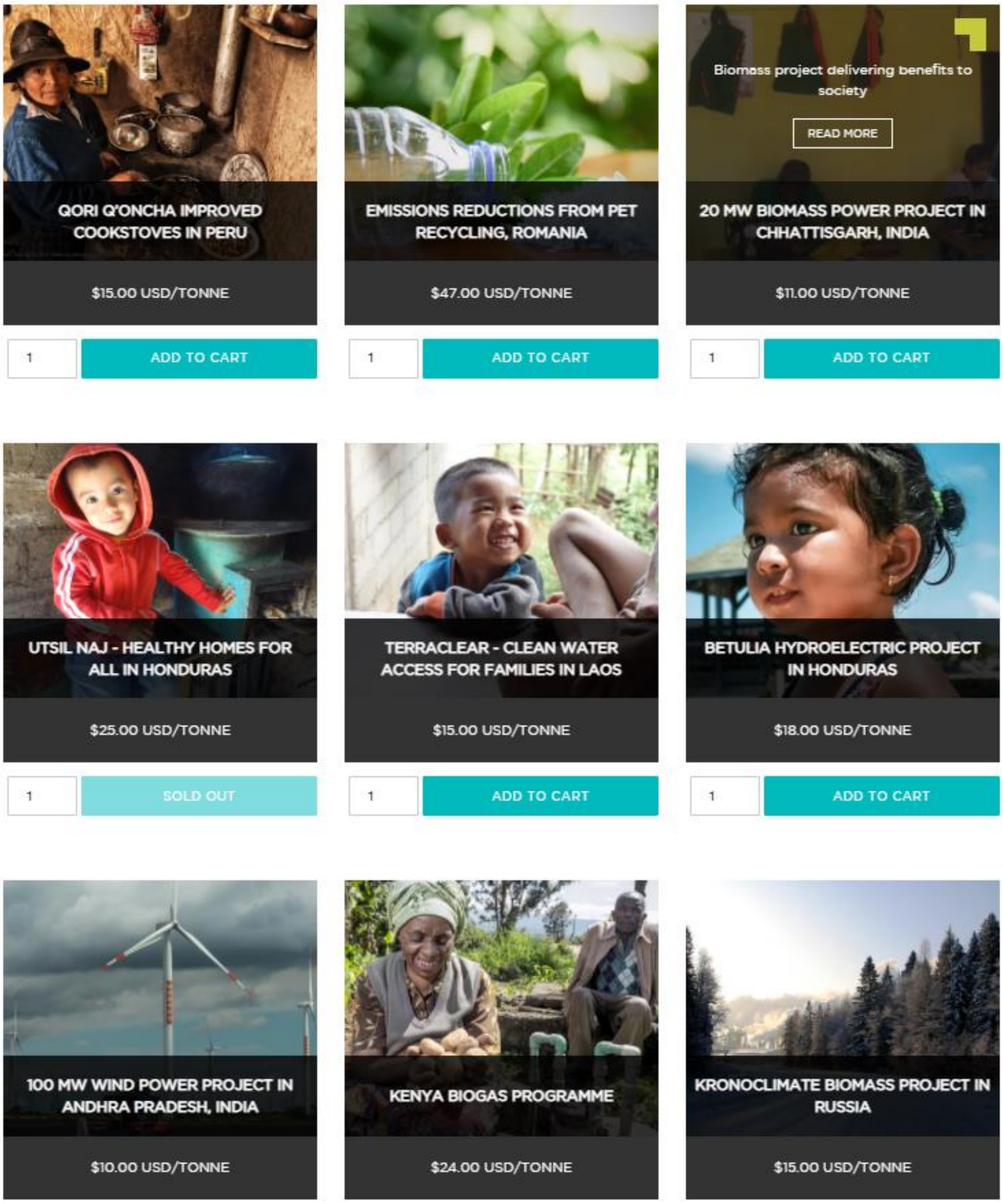

Figure 16 projects funded by Gold Standard, with carbon costs[63]

Climate change is a global problem. Where a tonne of carbon dioxide is emitted or reduced is irrelevant, and therefore funding overseas carbon offset projects could be a legitimate approach, in terms of the central aim of offsetting the residual emissions.

[63] https://marketplace.goldstandard.org/collections/projects

Planning legislation does not allow the carbon price to be used punitively as a pricing mechanism[64]. Nevertheless, if the costs of paying to offset emissions through commercial offsetting are significantly lower than the costs of minimising emissions on site (which is highly likely to be the case if commercial carbon credits are used), a rational developer will choose to offset rather than alter their design to reduce emissions. Thus, unless managed very carefully the use of commercial offsetting could potentially increase rather than reduce emissions by lessening design standards.

Ensuring that the rate at which carbon is saved or offset matches the rate at which it is being emitted

We have stressed the need to ensure that the rate at which carbon is saved or offset matches the rate at which it is being emitted. Moving forward this should apply equally whether a carbon or energy metric is used.

If a commercial offset scheme is used, the period over which the carbon will be saved will be highly variable, depending on what is funded. The use of the commercial carbon offsets does not therefore sit happily with this recommendation. Neither does the use of commercial carbon offsetting align well with the use of an energy metric.

9. How to calculate and demonstrate compliance.

The offsetting policy proposals set out in the previous report relied on the use of SAP 2012 to calculate carbon emissions, specifically the TER (target emission rate) and DER (dwelling emission rate) worksheets. The 'Dwelling CO_2 emission rate' can be found on row 384 of the DER worksheet and the equivalent figure in the TER worksheet can be found on row 273. Copies of these worksheets and a basic calculation demonstrating that standards have been met or confirming the scale of emissions to be offset should be provided to demonstrate compliance.

Cornwall Council's Technical Evidence Base for Policy SEC 1 – New Housing Technical Appendices provides a detailed summary of suggested methods to calculate compliance with the space heating demand target and the EUI target using SAP, noting that the modelling conducted by the authors indicates that the space heating demand calculated in PHPP (typically closer to real world performance) may be anywhere from two to five times as high as the space heating demand

[64] The Community Infrastructure Levy Regulations 2010 passed into law three tests that a proposed planning obligation must pass in order be a legitimate justification for granting planning permission; that the obligation is:
(a) necessary to make the development acceptable in planning terms;
(b) directly related to the development; and
(c) fairly and reasonably related in scale and kind to the development.

As a result, the carbon price must be reasonable and fairly related to the actual costs of saving carbon.

calculated in SAP, and that electricity use calculated in SAP is much higher than in PHPP due to outdated assumptions regarding the efficiency of appliances for new homes.

To identify the need to arrange renewable energy offsets and determining the scale of financial contribution required, it is the EUI calculation that is of relevance. Etude provide three options for converting the total energy use calculated in SAP to a more reasonable figure that is likely to better represent a new home.

Option 3 involves several correction factors, but results in a value that is closest to that calculated in PHPP and could still be carried out with a relatively straightforward spreadsheet-based calculator. The formula for this calculation is as follows:

$$\left[\frac{\left[\frac{Appliances + Pumps\&Fans\ and\ Lighting}{2}\right] + Cooling + Heating\ \times 2 + Hot\ water}{SAP\ floor\ area}\right] - 2 + Z$$

The SAP outputs required to complete this calculation are set out below[65].

Energy End Use	**Source**
Electrical appliance energy use	SAP Appendix L [L12]
Electricity Pumps Fans	SAP Cost Worksheet [231]
Electricity lighting	SAP Cost Worksheet [232]
Space cooling	SAP Cost Worksheet [221]
Heating Fuel	SAP Cost Worksheet [211 + 213 + 215]
Water heat fuel	SAP Cost Worksheet [219]
SAP floor area	SAP Cost Worksheet [4]

[65] The calculation and SAP output tables presented here are taken directly from the Technical Appendices in support of the Cornwall DPD. Factor Z was determined by Etude through a comparison of SAP and PHPP total energy use outputs for the buildings and policy scenarios modelled for the Cornwall evidence base.

Factor Z	If SAP floor area <100 then (SAP floor area – 100)*0.3, otherwise 0.

Figure 17 - SAP outputs to use in Energy statements

The requirement for contributions towards off-site renewable energy generation could be calculated based on the difference between the total energy use figure calculated for the dwelling and the estimate for the energy to be generated by renewable technologies on-site. These calculations should be provided alongside copies of the documents listed in the table above to demonstrate compliance.

Using an energy metric instead of a carbon metric also makes post-occupancy monitoring more straightforward (actual kWh/m^2/yr is easier to measure than carbon emission reductions over a notional building used to assess compliance with Building Regulations). Feedback on in-use performance is valuable information to support efforts to close the performance gap between buildings as-designed and buildings in operation.

Non-domestic calculations were not considered in the first report, however compliance in this sector would rely on the equivalent figures from the SBEM output documentation. Consideration of non-domestic buildings in any depth is outside of scope of the study.

Operationalising energy offsetting through development management

The existing Bristol City Council climate change Practice Note helpfully sets out a standard template for how energy strategies should be expressed to meet your existing policy requirements. This should be updated to reflect the energy framing of the emerging policy, and we would recommend creating a pro forma spreadsheet, annotated with the source of data inputs and pre-loaded with the necessary calculations. We have begun to populate this below.

Space heating demand – must be below 30kWh/m^2/annum	kWh/m^2/annum
Total energy demand (regulated and unregulated emissions)[66]	kWh per annum
Internal floor area	sqm

[66] The outputs from SAP having applied the corrections in the previous section.

Energy intensity (before the application of renewable energy) – must be below 35 kWh/m²/annum	kWh/m²/annum
Contribution from onsite renewable energy generation -	kWh per annum
Net operational energy balance (after the application on on-site renewables) - should be 0	kWh per annum
Residual energy demand - to be met from off-site renewables	kWh per annum
kW / MW installed Solar PV in order to meet the residual energy demand from off-site renewables	kW / MW which needs to be installed **kW_p = kWh per annum/(0.105*8760)**
Contribution towards provision of new renewable energy capacity off-site	**Contribution = kW_p*price per kW**

Figure 18 - template for energy statements

10. Considering Implementation in planning

There are two main legal routes to securing contributions from developers or requiring them to undertake actions.

i. The use of Section 106 legal agreements, with obligations for both the developer and the council.
ii. The use of unilateral undertakings, a one-sided legal agreement, where only the applicant (developer) need be bound by the obligation and the Council is not a party to the agreement.

Where only a cash payment needs to be made, we would recommend maximising the use of unilateral undertakings, and publishing template agreements and calculators for use. This approach would work if the council were to be collecting contributions with the intention of procuring additional renewable energy capacity itself, option 2 as described in section 5.

If on the other hand the council require the developer to undertake other actions, such as make payments to a third party (such as the renewable energy organisation with whom they are commissioning additional renewable energy capacity), a full section 106 legal agreement would be required. It would be possible however to draft template legal clauses which the developer could insert into a legal agreement to secure the contribution.

Further consideration would be needed as to how to ensure through the section 106 agreement that the funded renewable energy development goes ahead within a reasonable timeframe, the extent to which the renewable energy organisation could be tied into such an agreement and the council's recourse should the funded renewable energy project fail to go ahead as planned.

centre for sustainable energy

St James Court
St James Parade
Bristol BS1 3LH

0117 934 1400
www.cse.org.uk
@cse_bristol

Charity 298740