GUIDANCE ON CARBON SAVING BUILDING IMPROVEMENTS

September 2023

This document was put together by the Future Leap consultancy (contact consultancy@futureleap.co.uk) in conjunction with the Society of Local Council Clerks (SLCC).

It is intended to support local councils in making decisions about carbon saving and contains a checklist of the possible carbon saving measures and accompanying prerequisites together with a review of factors to consider in decision-making.

In order to provide real-world examples of how decarbonisation interventions could be applied in a real-world context, two very different case studies were examined: Banwell Youth and Community Centre in North Somerset, and Newark Town Hall in Nottinghamshire.

The attached assessments of each site are not meant to be exhaustive in terms of options, and any cost or energy savings are purely indicative. In short, every council building in the UK is likely to face a combination of different challenges owing to size, age, construction type and use. There will also likely be planning constraints and financial obstacles to overcome.

It is recommended that net-zero is approached holistically, and this can include adapting how a building is used rather than purely looking to make changes to its fabric or energy systems. Additionally, it is important to consider how people work and travel to and from the building, and whether there is suitable provision to ensure making a more sustainable choice is both practical and attractive.

CARBON SAVING

All consumption activities (gas, electric, travel, waste) incur carbon emissions unless from renewable sources. Reducing consumption or moving to renewable sources of consumption can reduce carbon emissions.

The checklist at Appendix 1 is split out into:

- Behavioral changes by people involved in the operation of sites
- Fabric improvements (micro investments)
- Fabric improvements (macro investments)
- Low carbon technology (micro investments)
- Low carbon technologies (macro investments)
- Services

☒ Implemented

☐ Yet to be implemented

Completing the checklist and gathering the relevant cost prices from (preferably local) suppliers will give councils a set of options to consider.

MAKING THE DECISION

Some decisions are as much about policy as resources, for example:

- Has your council declared any kind of climate emergency?
- Has your council decided to lead on climate action in your local area?
- Is there a groundswell or survey response showing public interest in and support for action in response to climate change?

In terms of resources, there are some obvious points to consider:

- Does your council have current funds that could be allocated?
- Are there grant funds that could be applied for?
- By how much might the parish precept be increased if necessary?
- Is there a concern to reduce council running costs in the short and long term?

At a time of shortened finances, both public and private, there will certainly be a need to look at value for money for any expenditure, for example:

- By how much will any physical changes reduce energy bills?
- When will the net capital expenditure be covered by such savings?
- What other benefits accrue to the community than saving council finances?
- Does the proposed solution involve ethically sourced equipment?

And looking to the longer term:

- Does your building have oil or gas-powered systems that due to Government policy cannot be like-for-like replaced after 2025?
- What does this mean for increased need for electricity in the future?
- Will it be sensible to upgrade now with these factors in mind?
- Do you have power of competence to sell surplus solar energy to the Grid?

Meanwhile, are there any local obstacles to the cost-free behaviour change and supplier reviews suggested in the checklists below?

These points are further expanded in the decision-making checklist at Appendix 2.

EXPERIENCE OF THE CASE STUDY COUNCILS

This guidance has been put together in conjunction with case studies carried out for Newark Town Council, whose Town Hall is a Grade 1 listed building, and for Banwell Parish Council who were considering placing solar panels on their youth and community centre.

More news will be included from Newark after a more detailed survey has been carried out, as well as further discussions with planning officers and a tendering process for a new boiler, so this guidance must be treated as a working document for the time being.

Banwell have shared more detail at Appendix 3 of their approach to the decision about installing solar panels, which seemed a practical approach to their building. The heating engineers' technical survey of their heating options has also resulted in more discussion being needed before a solution is agreed.

The two case studies are attached as separate documents, which may also be updated over time as future decisions are made.

APPENDIX 1 – CHECKLIST OF CARBON-SAVING IMPROVEMENTS

Behavioral Changes

	Recommendation	Operational area	Benefit	Prerequisites and considerations	Options
☐	Switch lights off when a room is not in use.	Energy Use	Reduced electrical consumption from the grid.	None	Introduce a switch off policy that assigns switch off behavior to a person job description
☐	Turn radiators on and off when room is not in use.	Energy Use	Reduced heating consumption	None	Introduce a switch off policy that assigns switch off behavior to a person job description
☐	Set boilers and heating systems on timer.	Energy Use	Reduced heating consumption	None	
☐	Make sure existing low carbon technologies are utilised before combustion alternatives.	Energy use	Reduced grid reliance	None	
☐	Set any hot water storage to 60°C and distribute at 50°C.	Energy use	Reduce heating consumption	None	
☐	Regularly check and maintain heating system health.	Energy use	Maintain efficiency and decrease load on heating system	None	Check and service any boilers, bleed radiators, remove calcite (limescale) build up.
☐	Separate recyclable material from non-recyclable and contract appropriate waste removal services.	Waste	Reduce the amount of waste that goes to landfill	- Are in an area where appropriate services are available	

☐	Set up initiatives to encourage circular economic principles.	Waste	Reduce the amount of waste produced	None	Introduce policy and incentives to encourage the reuse of what is initially though of as waste. Examples include ECO bricks, charity shop donations or upcycling.
☐	Consider the environmental impact of your procurement providers. Enquire about any sustainability related action your suppliers have implemented. Where possible, take action to choose suppliers that are actively reducing their emissions.	Procurement	Reduction of scope 3 supply chain emissions	None	Link to supplier survey.
☐	Car-pool where multiple people are taking similar journeys.	Travel	Reduction of travel emissions	None	
☐	Where possible use online meetings rather than in person meeting to reduce the amount of travel.	Travel	Reduction of travel emissions	None	- Consider if an in-person meeting is necessary.
☐	Minimise car and plane travel, opt for public transport, coaches and trains where possible.	Travel	Reduction of travel emissions	None	
☐	Introduce policy that encourages people to take lower carbon modes of transport.	Travel	Reduction of travel emissions	None	

Fabric improvements (micro to mid-level investments)

	Recommendation	Operational area	Benefit	Prerequisites and considerations	Options
☐	Install double glazing / secondary glazing	Energy use	Reduced heat loss from windows	- Appropriate planning permissions if required	
☐	Plug/ fix cracks and holes that allow heat to escape. These can normally be found around window and door fittings	Energy use	Reduce heat loss and load on heating system	none	
☐	Insulate hot water pipes. Especially nearer the heating source where the water is hottest.	Energy use	Reduce heat loss from hot water system	None	
☐	Ensure all seals around doors and windows do not leak.	Energy use	Reduce heat loss	None	
☐	Ensure objects are not blocking radiators and interrupting the convectional flow of heat.	Energy use	Reduce load on heating system	None	
☐	Ensure heating elements such as radiators are appropriately placed. For example, not directly below single glazed windows.	Energy use	Reduce heat loss from windows	None	
☐	Switch to induction hobs for cooking.	Energy use	Reduction of scope 1 combustibles and higher efficiency than electric hobs	Induction compatible cookware (common and inexpensive).	

Fabric Improvements (macro investments)

	Recommendation	Operational area	Benefit	Prerequisites and considerations	Options
☐	Internal wall insulation	Energy use	Reduce heat loss from space heating	- In certain cases, planning permissions may be required. - Floor space will be reduced. - Invasive installation requiring door frames, radiator and skirting to be removed.	
☐	External wall insulation	Energy use	Reduce heat loss from space heating	- In certain cases, planning permissions may be required. - May affect building appearance and so less available to listed buildings or ones in conservation areas.	
☐	Floor insulation	Energy use	Reduce heat loss from space heating	- In certain cases, planning permissions may be required. - May affect underfloor systems such as pipework and heating	
☐	Cavity wall insulation	Energy use	Reduce heat loss from space heating	- In certain cases, planning permissions may be required. - Requires cavity wall space. - May be disruptive during installation.	
☐	Roof insulation	Energy use	Reduce heat loss from space heating	- In certain cases, planning permissions may be required. - Requires roof cavity space.	
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Low carbon technology (micro to mid-level investments)

	Recommendation	Operational area	Benefit	Prerequisites and considerations	Options
☐	LED lighting	Energy use	Reduced energy used for lighting	- New lights have the same fittings as old lights.	
☐	Building management system	Energy use	Zonal heating and	- System is compatible with current heating system	
☐	Sensor dependent lighting	Energy use	Reduced energy usage	- None	
☐	Sensor dependent taps	Water use	Reduced water use	- None	
☐	Low flow taps	Water use	Reduced water use	- Fittings are compatible	
☐	Infra-red space heating	Energy use	Spatial control over heating	- May require permissions depending on the building.	
☐	Electric vehicle charge points	Travel related energy use	Remove barriers to low carbon travel	- May require three phase supply. - Space for vehicle parking while charging. - Could be used in conjunction with on-site renewable generation.	
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Low carbon technology (macro investments)

	Recommendation	Operational area	Benefit	Prerequisites and considerations	Options
☐	Heat pump	Energy use	High efficiency space heating	- Heat pumps require good building fabric to work at high efficiency (EPC B or above). - Ground-source heat pumps require nearby land or expensive boreholes for the ground array. - Air-source heat pumps need to be more than 3 meters away from dwelling rooms due to noise. - Air source heat pumps require area with good air flow. - Space for the unit	- Air to air heat pump (works well with HVAC system) - Air to water heat pump - Ground to water heat pump - Water to water heat pump
☐	Solar photovoltaic cells	Energy use	Reduced reliance on grid electricity	- In order to see good return on investment, South-facing arrays with little to no obstructions are recommended. - Space for the rooftop or onsite array. - A three-phase electricity supply may be required. - Inverter (direct current to alternating.)	- Monocrystalline cells are more expensive but more efficient than polycrystalline.
☐	Battery storage	Energy use	Improve electricity use efficiency	- May require inverter and three phase supply as with solar. - Requires space for the unit	- There are many types of batteries with different benefits and uses, for domestic and commercial storage of energy, lithium-ion batteries are current the most used.

☐	Biomass Boiler	Energy use	Lower carbon combustible	- Causes a level of air pollution, not suitable for densely populated areas.	Fuel types: - Pellets (higher associated emissions) - Logs - Chips
☐	New Boiler	Energy Use	Higher efficiency can deliver high quality heat to energy inefficient buildings	- Suitable for straight swap of old boiler	- Hydrogen enabled condensing boiler
☐	Electric vehicles	Travel related energy use	Removal of scope 1 travel emissions	- Require electric vehicles charge point infrastructure	

Service providers

	Recommendation	**Operational area**	**Benefit**	**Prerequisites and considerations**	**Options**
☐	Waste removal service that provides zero to landfill waste removal	Waste	Zero emissions from landfill	- None. - Provider services your area	
☐	True renewables tariff	Energy use	Zero emissions electricity supply	- None.	- Ecotricity - Good energy
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APPENDIX 2 – CHECKLIST OF DECISION-MAKING FACTORS

This checklist to be used once the technical options and costs have been scoped, as above.

Policy and public opinion factors

	Factor	Influence	Benefit	Considerations	Impact score
☐	Has the council declared a climate emergency?	Councillor support	Council likely to agree to building improvements / other responses to climate change	Council needs to be prepared to translate declaration into action	Positive
☐	Is the council leading on climate action within the council area?	Councillor support	Council be seen to be doing something for climate action with the council's own property and operations	Council action could be specific, such as leading the way on solar panels as part of a combined local venture, or a more general good example	Positive
☐	Is there a groundswell or survey response showing public interest in and support for action in response to climate change?	Public support	Public likely to support building improvements / other responses to climate change	Local branches of national bodies such as Friends of the Earth or Transition may already be active in your council area	Positive
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If none of these boxes are ticked, then some preparatory work may be needed to gain support for action.

Financial factors

These considerations should be applied once the potential costs of different improvements are known.

	Factor	Influence	Benefit	Considerations	Impact score
☐	Does your council have current funds that could be allocated?	Affordability	Either cover 100% of any costs, or use as match funding for grant bids	Some reserve funds may already be earmarked for other purposes, so council will need to agree priorities	Positive
☐	Are there grant funds that could be applied for?	Potential affordability	Savings on council funds	Check whether Lottery or other funds may receive bids from local councils – also ensure that the planning authority has your council's aspirations noted against any Section 106 funds	Positive
☐	Might the parish precept be increased if necessary?	Potential affordability	Potential for making repayments to a public works loan	Actual increase will need to be debated, as every year – the council may have decided against precept raises on principle due to the current increased cost of living	Positive
☐	Is there a concern to reduce council running costs in the short and long term?	Budgeting	Introduce the potential for longer-term gains	There is already common practice in matching the cost of solar panels against the expected savings in energy bills over several years – contractors can advise on this	Positive
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If some of these boxes are ticked, then some at least of potential improvements may be taken forward by the council. If none of these boxes are ticked, then any necessary funding may need to be raised by the local community.

Value for money factors

These considerations are particularly relevant to discussions around cost savings.

	Factor	Influence	Benefit	Considerations	Impact score
☐	Will any physical changes reduce energy bills?	Budgeting	Potential argument in favour of the changes	Contractors such as solar panel installers should be able to advise on these calculations	Variable, depending on the figures
☐	Will the net capital expenditure be covered by such savings?	Budgeting	Potential argument in favour of the changes	As well as the sheer period of time before the capital outlay is covered, there may be a simple intermediate benefit of not having to raise the precept to pay rising energy bills	Variable, depending on the figures
☐	Will other benefits accrue to the community from proposed actions than saving council finances?	Human accounting	So-called “co-benefits” can be things like better personal nutrition from allotment-gown food while reducing carbon footprint from lorry deliveries to local shops	Value for money is not always measured in sheer financial terms – some changes to buildings such as improved heating systems may make them simply more comfortable for users.	Positive
☐	Does the proposed solution involve ethically sourced equipment and materials?	Public support	Public are more likely to support improvements that don’t include buying from manufacturers with poor employment practices	Some equipment such as solar panels may offer the highest working efficiency and best value for money, but there may be concerns about the conditions under which they were made.	Positive

If none of these boxes are ticked, then there may be some argument against going ahead with the proposed changes.

Future-proofing factors

	Factor	Influence	Benefit	Considerations	Impact score
☐	Does your building have oil or gas-powered systems that due to Government policy cannot be like-for-like replaced after 2025?	Budgeting	Advantage of looking ahead	This may be of particular relevance to councils in rural areas with buildings unsuitable for heat pumps.	Variable, depending on the situation
☐	Does this mean an increased need for electricity in the future?	Budgeting	Advantage of looking ahead	This may mean, for example, looking at a greater number of solar panels than those needed to cover immediate bills	Variable, depending on the projections
☐	Will it be sensible to make changes now with these factors in mind?	Budgeting	Advantage of looking ahead	Preventing future precept increases	Positive
☐	Do you have the general power of competence?	Income	Selling surplus solar energy to the National Grid	The local sub-station will also need to be able to manage what you generate	Positive

Resistance to change factors

	Factor	Influence	Benefit	Considerations	Impact score
☐	Are there no local obstacles to cost-free behaviour change?	Behaviour	Behaviour changes can be promoted as standard	Some individuals have a natural resistance to being told to do the simplest things	Positive
☐	Are there no local obstacles to supplier reviews?	Councillor support	Can go ahead to find the best quotations	Sometimes local suppliers may be supported on principle, despite cost	Positive

Poor results to these two boxes mean some more preparatory work may be needed to gain support for action.

APPENDIX 3 – APPROACH BY BANWELL PARISH COUNCIL

The proposed installation of the solar panels at the Youth and Community Centre (YCC) raised some important questions, the answers to which would help us plan and execute the correct strategy.

1. **Energy Consumption**: What is our current energy consumption? To understand our solar energy requirements, we needed to analyse our historical energy usage and determine our average monthly energy consumption and add in any future energy requirements.

2. **Net-Zero vs. excess energy**: Net-zero means we generate enough solar energy to meet our consumption needs throughout the year. On the other hand, generating excess energy allows us to contribute surplus energy back to the grid, generating income which can be used for community projects.

Knowing the amount of energy we needed to generate would tell us how many panels we needed to generate it and what type of power system we needed to manage it.

We needed to define the future energy needs of the YCC. To do this, we used current and historical data to give us a base and then added in additional future energy requirements. For the YCC, this might have been switching some of our gas usage to electricity, adding electric vehicle charging points and increased usage of the centre.

Some localities may have a desire to generate additional income for the centre through the 'selling-back' of generated energy to the grid and this raises a number of additional questions.

- Is it possible to sell the excess energy back to the grid? Some areas with older substations aren't able to accept excess energy and this needs to be explored with the National Grid.
- Also, how much income needs to be generated and at what average price/KwH? The amount of excess energy needed to be generated would then be added to their forecast to determine the number of panels required to generate the desired energy.

It is important to recognise that the energy generated may need to be stored in appropriate batteries as it will not always be needed when it is generated. This is particularly true in places where energy can't be sold back to the grid and/or the objective is not to generate excess energy. This would mean energy generated isn't immediately lost if there is nowhere for it to go.

Finally, it's important to understand what power management system the centre has and whether it can handle the energy generated by the solar panels.

A single-phase system is commonly used for residential and small-scale commercial premises, while a 3-phase system would be used in settings requiring higher power demands. Roughly speaking, the threshold between the two is around 100 kilowatts, so any energy generation requiring a larger capacity would potentially need a 3-phase system - however advice should be sought from National Grid and the solar panel company who will advise on the system requirements. If a 3-phase system is available but not connected, the connection will incur additional project costs.

In summary, to determine the number of panels we needed to generate the amount of energy we forecast would be used, we needed to understand what our total forecasted energy requirements would be based on current and future usage. If we generated excess energy, we would need to have batteries to store it for use when it is needed. If we wanted to sell the excess energy, we needed to know if the grid could accept it and that we have the power distribution system connected to the centre that can manage the additional energy (single phase vs. 3-phase) - and if not, whether it is financially viable to have such a system installed.

These considerations together with other options for heating the building was the subject of a comprehensive review by heating engineers in Autumn 2023. The nature of our metal roof however raised some technical concerns:

- Using the new solar tiles might produce a heat impact on the roof, and in addition wind shear tests had only been carried out by the tile manufacturers for when attaching the tiles to wooden roofs.
- Attaching more traditional solar panels might also disrupt the integrity of the roof so that it was no longer weather-proof.

We are now following up the engineers' suggestion of putting panels on the roof of an adjacent building and sharing the subsequent energy.