West Northamptonshire Council

Estate Climate Strategy

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1. Contents

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2. Introduction and approach

West Northamptonshire Council's Corporate Plan: Fresh Start Bright Future 2021-2025 provides the vision for making West Northamptonshire a great place to live, work, visit and thrive. The Corporate Plan sets out six priorities that will make West Northamptonshire a place to thrive. The priority Green and Clean, Environment & Wellbeing commits to the following objectives.

- Net zero by 2030
- Climate summit in first few months
- Increased wildlife species & more trees
- Increased electric charging & energy efficiency
- Vibrant towns & villages
- High quality parks
- Accessible green space for all

The Council declared a climate emergency and has pledged, as part of the UK100, to focus on tackling the climate emergency and reducing its carbon emissions. The pledge commits the Council to cutting its own carbon emissions to net zero by 2030 and those of residents and businesses to net zero by 2045. In delivering this objective the Council will deliver economic, and social benefits to residents, employees, and visitors.

The Council has also adopted the United Nations Sustainable Development Goals (SDGs) to provide a wider context to its sustainability efforts. The SDGs help shape the way the Council responds to the climate challenge and thus this Strategy.

The Council is seeking to embed approaches to net carbon zero across all its activities including construction, procurement, transport, highways, waste, nature, and energy management. The purpose of this strategy is to set out the context for change, the current conditions, actions required and how performance will be monitored within Assets & Environment to contribute to the overall net zero objective.

The Council also needs to improve the cost effectiveness of its operations to secure a sustainable financial position. This includes both making operational and procurement savings and generating additional income. In many cases, decarbonising WNC's estate is also an opportunity to reduce costs or generate income.

3. Scope, definitions, and exclusions

3.1 Scope of the strategy

The strategy identifies how the Council will achieve (at least) net zero carbon in its estate whilst maximising savings and income generation.

For these purposes:

'Carbon' means emissions of carbon dioxide and other gases implicated in global warming, measured as equivalent tonnage of carbon dioxide (CO_2e).

'Scope 1' emissions – direct carbon emissions, such as heating and ventilation of WNC buildings and use of fleet vehicles.

'Scope 2' emissions – indirect carbon emissions, such as grid electricity use for power and lighting, where the carbon is largely emitted at power stations.

'Scope 3' emissions – carbon emissions from WNC's supply chains, including the production of goods and services used by WNC, waste, cloud computing, and water use.

'Emissions' means all (scopes 1, 2 and 3) carbon emissions within the following headings:

a. Consumption of electricity, gas, fuel oil, or other sources of energy used to heat, light, or provide power for operations in buildings or on open land but excluding industrial operations carried out by third parties not performing services on WNC's behalf (e.g., commercial tenants' industrial operations).
b. Release of carbon from land due to biological, engineering, or other operations.

'Capture' means the long-term net removal of carbon from the atmosphere by biological or technical means.

'Substitution' means the provision of carbon-free electricity or other sources of energy for use by third parties.

WNC's 'estate' includes:

a. WNC owned or occupied buildings and open land, but excluding:
    i. Buildings where WNC only holds the freehold or superior leasehold of the land and does not own or occupy the buildings on it.
    ii. Land or buildings held by third parties on long leases (defined for these purposes as being leases of 21 or more years in term).
b. Buildings or open land used wholly or primarily for providing services to or on behalf of WNC even though not owned or occupied by it (the 'shadow estate').

'Net zero' means that the direct and indirect emissions of carbon from WNC's estate (see also 3.3) less carbon capture and substitution on or in WNC's estate is zero or less.

For these purposes:

a. The purchase of 'green' energy is ignored, as it does not reflect the reality of the energy supplied. The average UK gas and electricity mix is assumed in calculations. The exception to this is where WNC is itself generating renewable energy or directly receiving renewable energy from a local facility.
b. As information on actual energy use of WNC-owned property which is occupied by third parties is generally not available (and may reflect specific peculiarities of the occupant), typical energy use of such properties is assumed.

This strategy provides an overview of WNC's current estate carbon emissions and carbon capture and identifies how it would deliver net zero in the operations of its property estate.

The strategy identifies a list of opportunities in short, medium, and long term for:

- Reducing carbon emissions
- Carbon capture
- Generating carbon free energy on the WNC estate for use by WNC (thus reducing net emissions) or by others (substitution).
- As part of the above, savings and income generation.

It also considers identification of suitable funding, financing, and commercial arrangements to support action at scale and speed, with appropriate management of risk. Schemes to implement aspects of this strategy will need to be individually approved if not within existing budgets.

3.2 Exclusions

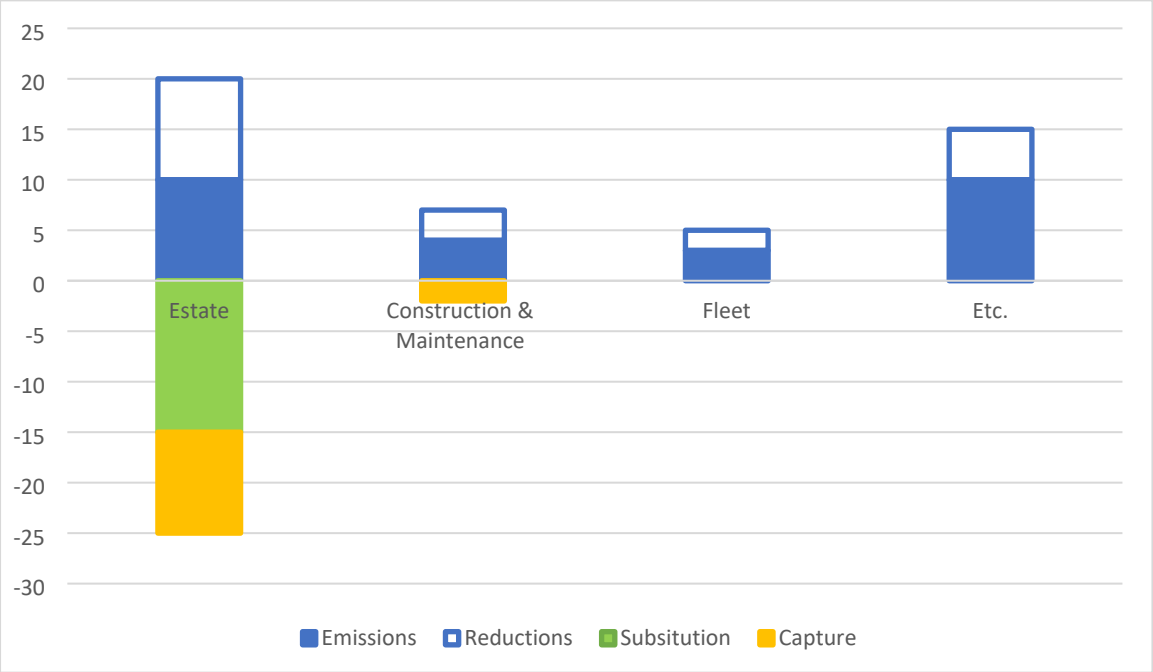
Excluded from the scope of this strategy are:

a) Emissions from sectors of activity which have or will have their own net zero requirements.
b) Construction & maintenance activities relating to WNC's estate (covered by their own climate strategy).

3.3 Cross-strategy implications

Where other climate strategies are unable to achieve net zero within their scope (for example, if WNC's supply chain results in net carbon emissions), these residual emissions will be treated as coming from WNC's estate. That means this strategy will set out the means of offsetting the residual carbon from all other sectors of WNC's operations. This is illustrated in Figure 1, where the illustrative total value of emissions, substitution, and capture equal zero (of course, the numbers used are not the actual figures; this is merely an illustration). Figure 1 also illustrates the importance of reduction in emissions.

Figure 1: Illustration of cross-strategy net zero



3.4 Other definitions

The following terms are also used in the strategy as defined below:

'GWh' is a gigawatt hour, that is one million kilowatt hours or the use of a traditional one bar electric fire for 114 years.

'Offsetting' is the use of carbon capture or substitution to balance emissions of carbon that WNC produces.

'PV' is photovoltaic, for solar cells, which generate electricity when sunlight falls on them.

4. Current situation

4.1 Carbon emissions

The most recent data is for financial year 2022-23. The Council recognises the emissions from business and residential occupiers of its commercial and housing stock within the 2045 net zero target, and all other emission within the 2030 target for its own operations.

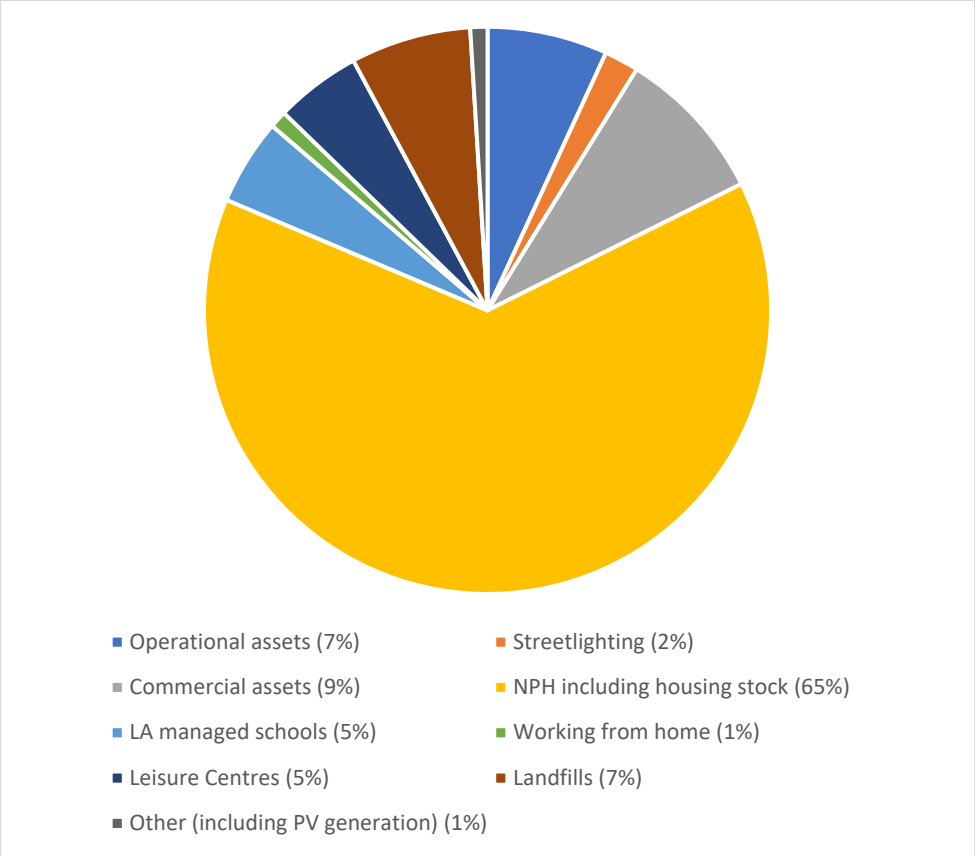
The total net emissions for WNC assets for the baseline year were 57,619 tonnes of carbon. This includes estimates for primary energy use (heating and lighting) in

Council-owned housing and commercial property. The main elements comprising this are shown in Table 1 and Figure 2.

Table 1: WNC overall carbon estate emissions

Portfolio	Emissions, tonnes carbon
Operational assets	4,178
Streetlighting	873
Commercial assets	4,902
NPH including housing stock	37,174
LA managed schools	2,621
Working from home	405
Leisure centres	3,035
Landfills	3,795
Other (including PV generation)	636
Total	57,619

Figure 2: WNC overall estate carbon emissions



WNC's estate emitted 58,304 tonnes of carbon and saved 684 tonnes from electricity generated and exported by WNC owned PV systems. The largest emissions are from Northamptonshire Partnership Homes (NPH) (65%), commercial assets (9%), closed landfills (7%), operational assets (7%), leisure centres (5%), local authority maintained schools (5%), and street lighting (2%). The remaining portfolios' emissions are less than 1% of the total. Some of the emissions cannot effectively be

controlled, such as the landfills. However, there is a significant potential to offset these emissions; these are presented in Section 6.

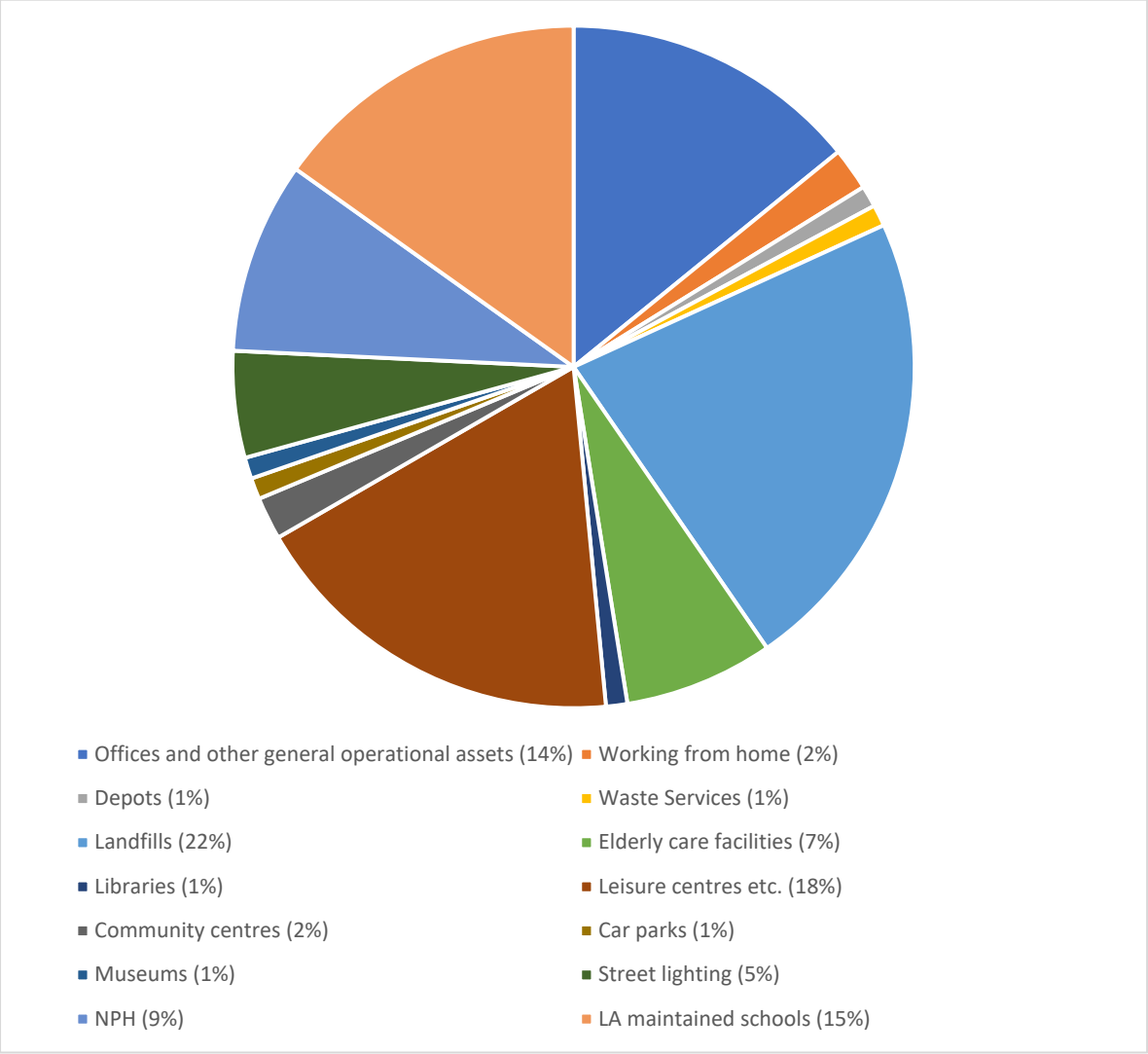
A large proportion of emissions is from assets that the Council lets to third parties, such as social houses and investment properties; together, their emissions share is around 74%. Therefore, it is essential to work with tenants to implement measures and upgrade existing energy systems to decrease the carbon emissions. The remaining WNC emissions are around 17,069 tonnes of carbon per year.

Table 2 and Figure 3 show the emissions of the Council's operational assets.

Table 2: Operational assets carbon emissions

Portfolio	**Emissions, tonnes carbon**
Offices and other general operational assets	2,427
Working from home	405
Depots	183
Waste Services	123
Landfills	3,795
Elderly care facilities	1188
Libraries	157
Leisure centres etc.	3,067
Community centres	393
Car parks	160
Museums	239
Street lighting	873
NPH	1,495
LA maintained schools	2,621
Other (including PV generation)	(57)
Total	17,069

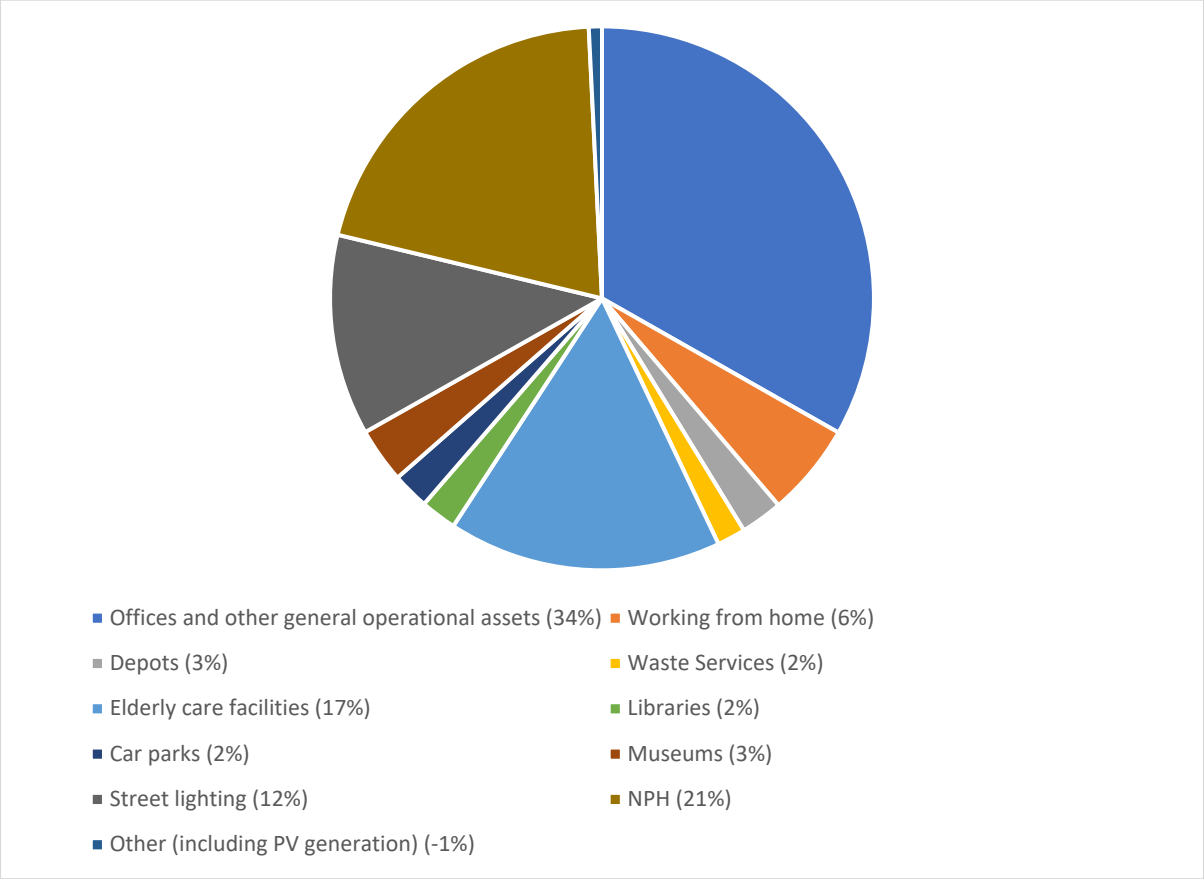
Figure 3: Operational assets carbon emissions



Finally, it is helpful to consider more closely those assets over which the Council has meaningful direct control, its 'core assets'. For these purposes closed landfills, local authority maintained schools[1], leisure centres, and community centres are excluded. This gives a focus on emissions totalling 7,194 tonnes. The results are shown in Figure 4.

[1] As schools convert to academies, they disappear from the Council's carbon emissions without any 'real world' changes occurring. It is thus helpful to remove this artificial effect.

Figure 4: Core assets carbon emissions



For the core assets, emissions from offices, NPH non-dwelling estate, and elderly persons' facilities constitute a significant majority. This means that these are logical areas of focus for energy efficiency and carbon reduction measures.

Below are presented proposals and action plans to mitigate, decrease and offset carbon emissions. The proposed schemes and interventions will require a number of years to be implemented, whilst reaching the 2030 target. In the meantime, however, to support the Council's efforts to decrease emissions and to lead by example, the Council approved purchasing renewable electricity and gas in 2021. This is a temporary measure that comes as close as possible to having the energy consumed by assets and street lighting being net zero while the Council is working on the actions plans presented in this document.

4.2 Estate energy use

The Council's annual electricity and gas usage in 2022/23 is set out in Table 3. Some of this usage was directly incurred by the Council and other usage was by contractors acting on the Council's behalf. This means the emissions fell across scopes 1, 2, and 3.

Table 3: Typical WNC annual electricity and gas usage

Area	GWh
Estate electricity	9.0

Area	GWh
Leisure centre electricity	3.3
Street lighting electricity	4.5
NPH direct electricity	2.1
Estate gas	13.2
Leisure centre gas	13.1
NPH gas	6.0
Total	51.2

The total cost of these supplies purchased by WNC directly (estate and street lighting) in 2022/23 was around £8 million. Whilst the Council's participation in the LASER buying consortium assists, these costs have risen significantly due to global energy prices rising strongly following recovery from the Covid-19 pandemic, the war in Ukraine and other factors. Although the prices have started stabilising, they are still at historic highs; in 2021/22 the cost of these supplies was around £5 million.

5. Objective, aims, and approach

5.1 Overview

Delivering net zero in the Council's estate cannot be divorced from its wider policy goals, including to sustainability in the round. Accordingly, objective and aims of the Estate Climate Strategy are as follows:

> Objective: To reach net zero for the Council's estate by 2030, in ways which support efficient and effective working whilst maximising savings and income generation.
>
> Aims: To…
>
> a) Maximise overall benefits, by seeking solutions which deliver against WNC's wider objectives including those defined in its social value policy.
> b) Maximise efficiency, by using the pressure of net zero to focus attention on efficient shape and use of WNC's estate.
> c) Generate a high degree of sustainable energy locally, enabling an effective reduction in the cost of energy to WNC.
> d) Use offsetting to achieve net zero only where there is not otherwise a practical or economic solution, or the offsetting delivers wider benefits (such as biodiversity gain).

5.2 Approaches

To reach net zero, the Council has four main approaches. These complement each other and all will be required. These approaches are:

a) Estate rationalisation: this entails reviewing Council assets to ensure they are used effectively, repurposed, redeveloped, or disposed of.

b) Efficiency measures: interventions that will transform WNC assets to become energy efficient. This results in decreasing energy consumption and thus decreasing carbon emissions. Eventually, there will be a point where efficiency has been optimised and energy consumption cannot be reduced further.

c) Local sustainable energy generation, notably through PV systems but other approaches may also be applicable.

d) Carbon capture, this is achieved through activities such as tree planting.

The strategy excludes artificial measures which appear to reduce WNC's emissions by transferring assets to others without managing the underlying issues. The strategy links to other strategies and supports where practical WNC's other Corporate Plan goals.

6. Strategic actions

6.1 Estate optimisation

The Council has inherited a large portfolio of assets from the predecessor councils. In some cases, some of these assets are not utilised to their full potential; this means that resources are wasted which leads to unnecessary costs and carbon emissions.

Work is therefore already underway to reshape the Council's estate to focus on the needs of the organisation (including its partners such as NPH and Northamptonshire Children's Trust, NCT). This includes the Office Optimisation project. Data on building energy efficiency is one of the drivers of decisions on the future of the Council's estate.

The Council will:

a) Continue to pursue optimisation of its operational estate, seeking to provide fit for purpose, energy efficient property to support service needs[2], and disposing (by freehold or leasehold, as appropriate) of property which is not required.
b) Optimise its commercial estate, seeking a balance of supporting local economic development and income generation whilst improving the energy efficiency of the overall estate and meeting regulatory requirements.

[2] In some cases, the service need is the preservation and productive use of heritage assets. In these cases, disposal is not the intended outcome, and there is a limit to the degree that such assets can become energy efficient. This one of the drivers of the need for offsetting.

c) Identify its shadow estate and consider how best to optimise this.
d) Continue to use data on energy efficiency to support decisions on estate strategy.

6.2 Carbon saving opportunities

There are a range of solutions that the Council can implement to decrease the energy consumption in buildings. Some require small interventions and provide quick paybacks; these are often described as 'low hanging fruit'. Lighting upgrade to LED is one of these, it can save around one third of the electricity consumption of the building and the payback is on average around three years. There are more complex interventions that can lead to service disruptions, they require significant capital investments and have longer paybacks. Heating decarbonisation is a key example, typically achieved by upgrading heating from gas to electrically-powered heat pumps. In order to decide on interventions, the Council will follow the process set out in the following sections.

6.3 Review and prioritisation of sites

The Council has a large number of assets. Therefore, interventions need to be prioritised, with the aim being to address those which present the greatest opportunity for carbon and cost saving first. Assets will be reviewed to identify which ones need to be prioritised. The review will take into consideration three aspects:

a) Expected future use of the asset and business need (see 6.1).
b) Current energy consumption on a unit area (kWh/m^2) and per occupant. This allows a comparison between assets based on their energy consumption.
c) Whether there is a tactical opportunity. For example, if a building requires refurbishment or a new heating system in any event, making the cost of installing PV, or a low-carbon heating system, less expensive.

Following this review, assets will be ranked and added to the programme. The programme will be reviewed regularly to ensure that it is up to date.

6.4 Decarbonisation reports

Decarbonisation reports will be commissioned for assets identified as high priority in the rankings. The site plans, asset records, maintenance records, and energy consumption will be reviewed. This will be followed by a survey of the asset to investigate the energy systems, equipment, the building fabric, and opportunities to generate energy on site. The collected data will be analysed, and a list of decarbonisation interventions will be proposed with their costings, payback periods, and financial, energy, and carbon savings.

The data collected is essential to support applications for funding from external decarbonisation funds e.g., the Public Sector Decarbonisation Fund, as well as to make informed decisions about investment of WNC's own funds.

6.5 Decarbonisation interventions

6.5.1 Building lighting upgrade to LED

Upgrading lighting to LED typically results in large electricity savings and is one of the 'low hanging fruit' as the payback periods are very short, and the upgrade works are not generally complex, intrusive or disruptive. Depending on the existing lighting stock in a building and the operational hours upgrading the lighting to LED can result in electricity savings of between 25% to 70%. As an example, libraries not using electric heating tend only to have low electricity consuming equipment such as computers and printers. Therefore, most of their electricity is consumed by lighting and upgrading it to LED will typically lead to a decrease of building electricity consumption of around 50% to 70%.

LED lighting also has a further benefit, in that because it is more efficient more of the electricity is converted into light rather than heat. In the summer this can materially improve building comfort by reducing heating where lights need to be on.

Given these benefits, the objective is that all WNC assets should have LED lighting by 2030. The Council will continue its programme of replacing lighting units with LED ones.

6.5.2 Street lighting and traffic signs and signals update to LED

Upgrading street lighting and traffic signals to LED offers similar energy benefits to the use of LED lighting in other situations. The Council has a project to upgrade its street lighting. This will continue and be applied to traffic signs and signals.

6.5.3 Heating decarbonisation

This intervention is complex as it includes different measures that can be intrusive to our buildings and can cause disruptions to operations. However, heating is a major energy use and therefore needs to be addressed.

Firstly, a building survey will be undertaken to verify the quality of its thermal insulation. This will determine whether there is excessive heat escaping from the building. Good insulation helps with decreasing heat losses, reducing energy consumption and enabling the heating system to be optimised and not having to implement a larger sized heating system than necessary. If the survey identifies excessive heat losses, suitable solutions will be designed. These can include insulation of walls, ceilings, floors, and pipes, and upgrading windows or doors or their casements to removal thermal bridges. Some of these schemes have long payback periods (exceeding 20 years), which may mean other interventions should have higher priority.

Once the thermal insulation of the building has been addressed, the next step is to investigate the heating system and see if it is practical to switch to a low carbon

solution such as heat pumps. Heat pumps are much more efficient because whilst they use energy, most of the heat they provide has been extracted from the environment – typically from the air, a watercourse or water body, or from the ground. Most of the Council's properties have gas heating systems and a small number have oil heating or direct electric systems. A small but increasing number have been moved to heat pumps.

Switching from gas or oil heating to heat pumps is not simple as there are many factors that needs to be taken into consideration such as the type of the building, availability of outdoor areas to install the new system, proximity to other buildings as some of these systems produce noise, type of works needed, the state of the existing heating infrastructure such as heat exchangers, heat emitters, pipes, etc. There are instances where a simple change from a gas boiler to an air source heat pump can be enough, but there are instances where the whole heating infrastructure (including heat exchangers, pipes, and emitters (radiators)) needs to be upgraded. Also, there are instance where the low heating carbon solution is not sufficient on its own and has to be combined with a direct heating system that can be used for topping up the heating during extreme cold periods, which may arise for just a few days in a year.

While the aim is generally to decarbonise the heating by 2030, there is a need to balance the investment – financial and carbon – needed to replace a heating system with the financial and carbon savings from operation of a new system. Generally, it is preferable to replace heating systems as they approach their end of life. This may mean that some offsetting remains required in 2030 and beyond.

Using heat pumps will not fully decarbonise heating unless the electricity used to run the pump is from a renewable source. Therefore, providing PV systems is a helpful complement. As electricity is, per unit of power (e.g., kWh) typically around three times the price of gas, a heat pump has to have a coefficient of performance[3] of 3 in order to make the energy cost comparable. Sometimes this can mean a heat pump installation increases rather than decreases costs. Council owned PV systems are way of avoiding this problem by providing electricity at lower costs.

The Council will pursue heating decarbonisation schemes where these are, at least, overall cost neutral, and will prioritise those which deliver financial savings. This will include seeking external funding such as from the Public Sector Decarbonisation Scheme.

6.5.4 Small scale renewable energy systems

For these purposes, a 'small scale' renewable energy system is one which can be installed on a building or other structure. Often these do not require planning

[3] The coefficient of performance or COP is the ratio of energy used by a heat pump to the heat energy emitted by it. For example, a COP of 3 means that for each 1 kWh of electricity used, 3 kWh of heat energy is emitted.

permission and because the amount of power generated is relatively small, securing grid connections for export of electricity is generally relatively easy.

Such systems will be most financially attractive when they cover the load of the building they are on, or other facilities which can be connected by 'private wire'. This is because the export price[4] to the public electricity grid is much lower (typically around one-fifth) than the input price. Schemes working on this basis typically have a payback period of five to six years. However, this does not rule out systems which generate more than the relevant base load, provided the financial case is still worthwhile.

Where systems are installed on, or with access to, car parks, there is the potential to link them to electric vehicle (EV) charging (the Council has a project to deliver large scale EV charging underway). This offers the opportunity to use the generated power effectively, perhaps enhanced by offering lower charging prices when renewable energy is plentiful.

These renewable generation schemes are currently PV based, but advances in design are now producing small-scale wind generators, some of which form combined systems with PV. This has the benefit of increasing overall electricity production and generating power over a wider range of weather conditions.

As with the schemes described above, the first step is to review the future of the asset. The second step is to analyse the electricity consumption to identify consumption patterns and the base load. This is followed by design and costing. A business case can then be developed to apply for capital funding.

Under this strategy, the Council's portfolio of buildings has been reviewed and appropriate assets identified. There is a potential of generating 2,184 MWh of PV electricity annually. This would lead to reducing annual carbon emissions by 553 tonnes (about 1% of WNC's overall net carbon emissions, but about 5% of its annual gas and electricity power consumption). There is currently a live project at One Angel Square. This site has been prioritised as it is one of the highest consuming sites with a high base load. The asset already has a 150kWp PV system, but it only generates around 15% of the yearly demand; the new system will enhance this significantly.

The Council will:

a) Pursue a programme of small-scale renewable energy generation on buildings and other structures it controls, favouring the most financially attractive sites first.
b) Seek to link local renewable generation with EV charging facilities.
c) Explore the potential of, and if appropriate implement, small-scale renewable generation beyond PV.

[4] The export and import prices are often referred to as export and import tariffs.

6.5.5 Large scale PV systems

It is also possible to deploy PV at larger scales, and it will be necessary to do this if the local renewable generation is to make a substantial impact on the Council's carbon emissions. For this type of intervention, there is a need for large pieces of land or very large roofs. Unlike small scale renewable projects, large scale PV requires detailed feasibility studies that assess various aspects such as environmental impact, electricity grid restrictions, flood zones, and other factors. They all require planning applications and applications for grid connection to the distribution network operator (DNO). This means that it can take a number of years to build and commission a large-scale PV installation.

The Council is working on a programme of large scale PV generation, using land and facilities it owns, and potentially also acquiring sites. The aim is to fully offset the Council's gas and electricity demand. Based on Table 1, this implies a target of 50GWh per year generating capacity, saving around 10,140 tonnes of carbon per year. Together with the small scale schemes in 6.5.4 this would effectively eliminate WNC's fuel and power carbon emissions. The larger sites may include battery storage or potentially green hydrogen[5] generation to better match supply and demand for power.

Currently sites likely to deliver around 40GWh per year have been identified as reasonably likely to be deliverable. A small number of additional schemes will therefore be necessary to meet the aim.

The Council will:

a) Continue to pursue a programme of large scale PV systems, seeking to achieve 50GWh per year of electricity production and financial benefits whilst taking into account other environmental and social factors.
b) Explore and where financially attractive implement battery storage, green hydrogen production, or other mechanisms to match supply and demand for power at large scale PV sites.

6.5.6 Grown biofuels

Biofuels are considered as zero emissions fuels as the carbon emitted when they are burned has recently been taken from the atmosphere. They are produced from the fermentation of sugars, starch, or cellulose or by directly burning fuel pellets. These could be extracted from plants harvested on Council owned lands. Building a dedicated facility to transform harvested plants to biofuel is unlikely to be feasible as the quantity to be harvested on the Council's land would not be large enough. However, the Council could still recognise carbon benefits, claim carbon credits, and make money from the harvested plants sold to transformation facilities.

[5] The ways of generating hydrogen are classified by colour. Green hydrogen is generated using renewable electricity.

Nine sites have been identified as having potential for this intervention and a type of plant, Miscanthus, has been selected for evaluation. This is a plant widely used in the UK for producing biofuels. The annual potential production is 730 tonnes and carbon savings would be 33 tonnes of carbon.

The Council has a limited number of assets that can be dedicated for carbon offsetting strategies. More generally, there are many competing uses for land. It is therefore essential to identify which interventions need to be prioritised. Table 4 compares between the potential savings from large scale PV and harvesting Miscanthus in an area of land.

Table 4: Comparison between large scale PV and biofuel production

Annual production per Ha	Type of production	Capital cost[6], £k	Income generated, £k	Carbon savings, tonnes	Payback period
592 MWh	Electricity	626	95	150	6.6
13.99 tonnes	Plant harvest	2	1	1	3.2

As it can be seen from Table 2, harvesting Miscanthus can be a cheap solution with a short payback period. However, it does not have potential to generate large income streams for the Council or reduce the emissions significantly.

Therefore, it is recommended to focus land use for energy production on large scale PV. If this is not possible, then it may make sense to invest in harvesting Miscanthus or other plants that can be processed to produce biofuels.

The Council will therefore investigate the production of plant inputs for biofuels if it appears land cannot be used for PV and the production of biofuel feedstocks is overall the most beneficial use of the land.

6.5.7 Biogas from organic waste

The Council is the recipient of large amounts of organic waste, in the form of garden and kitchen waste. This material can in principle be used to generate biogas, which when cleaned of unsuitable components can be used as vehicle fuel or provided as 'green gas' into the gas grid. Such gas would therefore either reduce the Council's own road vehicle carbon emissions or, if provided to others, qualify as substitution.

As part of its Resources and Waste Strategy, the Council will explore whether biogas production would be financially viable and environmentally beneficial.

6.5.8 Responsible behaviour

Whilst it will not remove the need for major actions as detailed above, it will also be important to reinforce patterns of behaviour among those working for the Council, so that energy usage is not unnecessarily high. Actions may include:

[6] Does not include land value.

a) Regular messaging in corporate communications.
b) Seasonal campaigns such as 'net zero' week.
c) Material in induction package for new starters.
d) Enhanced mandatory learning courses.

6.6 Carbon offsetting

6.6.1 Introduction

Once the measures described above have been implemented, it is likely – especially bearing in mind the Council's estate carbon emissions are deemed to include the residual emissions from all other areas of its functioning, see 3.3 – that offsetting will be required. Offsetting by substitution is covered in sections 6.5.4 and 6.5.5, and potentially in 6.5.6 and 6.5.7. The focus here, therefore, is on carbon capture.

It is unlikely that carbon capture by technological means would be attractive to the Council, even if suitable technologies were sufficiently well developed in the period. They are likely to run at significant costs and generate no or limited ancillary benefits. Therefore, natural means of carbon capture are the focus.

6.6.2 Tree planting

The most obvious means of capturing carbon is the planting and ensuring the subsequent growth of trees. The structure of a tree is largely made of carbon captured from the atmosphere. This applies as long as a tree lives, or if felled and the timber is used for a purpose where it remains intact, for example in construction or making furniture.

The Forestry Commission provides estimates[7] of carbon capture from tree planting over 30 years, ranging from 257 tonnes per hectare (Ha) for thinned broadleaf woodland to 310 tonnes for a managed mixed conifer woodland. Whilst these the capture rate will not be linear, this gives an average annual capture rate per Ha of 8.6 to 10.3 tonnes. Thus, using 10 tonnes per Ha per year, to offset the Council's current core emissions (only) would require in the order of 719Ha (1,778 acres; 0.5% of the area of West Northamptonshire) at a cost of around £17.8m. Planting one Ha is likely to cost in the order of £1,820 per Ha[8], giving a total planting cost of around £1.3m, and thus a total cost of around £19.1m.

It is stressed that the above is not intended outcome. Rather, it illustrates the importance of reducing emissions by other means, and of renewable energy production. Nonetheless, new tree planting is likely to be an important means of dealing with some residual emissions.

[7] Responding to the climate emergency with new trees and woodlands, Forestry Commission (accessed 13 October 2023)
[8] Morewoods, Woodland Trust (accessed 13 October 2023)

Over 30 years 762 Ha of new woodland would have captured 236,000 tonnes of carbon. Based simply on land and planting cost, with no consideration for ongoing costs such as maintenance or income, this gives a price per tonne of carbon captured of around £86. This per-tonne price should be broadly similar at a smaller or larger scale.

It is also important that some tree planting starts as soon as possible, as early years of tree growth will produce less carbon capture than the established trees as they continue to grow.

6.6.3 Woodland: a productive approach

Given the costs of carbon capture through tree planting, it makes sense for the Council to seek multiple benefits through strategic choice of planting sites and seeking combined benefits on them. In addition to carbon capture, these could include:

- Biodiversity gain. This would include potentially allowing the Council to sell biodiversity net gain credits to other developers, or use them itself.
- Public access and enjoyment. Whilst public access needs to be managed, the Forestry Commission has shown it is possible to combine public access with productive woodland.
- Flood risk mitigation. Suitable location(s) may allow the woodland to slow the passage of water and cause some of it be to absorbed into the land or be taken up by the trees, thus reducing flood risk downstream.
- Production of wood for use in furniture and construction. Whilst it is likely to be some decades before trees are ready for use in structural building components, smaller elements such as shingles or fence posts may be available sooner, as would those for use in furniture.

Productive use of the woodland is particularly valuable as it allows the same land to be used repeatedly to capture carbon, which is then locked up in buildings, other structures, furniture, and other wooden items.

Creation of local productive woodland will need its own business case, demonstrating that it is viable and cost-effective. The aim would be to substantially reduce the net cost through the combined benefits. Additionally, grants are often available to support tree planting; these would be sought wherever suitable.

The Council will:

a) Prepare a business case for productive woodland.
b) Seek to create new woodland as soon as possible, so that impact on carbon capture is being delivered by 2030.
c) Seek grants and other external funding for tree planting.

This work will be done in alignment with work on the Council's Tree Policy & Strategy and Local Nature Recovery Strategy.

6.6.4 Other organic capture

There are other actions that the Council can take to remove carbon from the atmosphere through interventions in soil management and other types of vegetation growth. These will be considered as part of work on the forthcoming Local Nature Recovery Strategy.

6.6.5 Carbon price

It will be necessary across the WNC group to set an internal carbon price, so that the Council can decide when to prevent carbon being emitted and when to offset on a balanced and cost-effective basis. This carbon price will be based on the cost to the Council of creating and managing its highest-cost carbon offsetting measures (because it is those which would not be incurred if the carbon in question was not emitted). These will probably be those involved in tree planting (6.6.2, 6.6.3) or potentially other organic capture (6.6.4). However, if the Council is unable to fully offset its carbon emissions internally, the internal price will need to reflect the cost of purchasing carbon credits externally.

7. Conclusions

The main outcomes of this strategy should be:

- The ability of the WNC group to deliver on the 2030 net zero target in practical and cost-effective ways.
- Maximised wider benefits from carbon reduction and offsetting work.
- Enhanced awareness and cultural change in which everyone takes responsibility for decarbonisation.

8. Review

This strategy and action plan will be subject to annual review. If changes to the Strategy appear to be merited, they will be prepared and submitted for approval in the usual way.

Appendix A: Estate Climate Strategy Action Plan

This section sets out our ongoing carbon reduction activities for WNC. This plan will undergo regular review and refinement as part of the overall management review cycle. The abbreviations for service areas are 'A&E' for Assets & Environment, 'HR' for Human Resources, 'HW' for Highways, 'WS' for Waste.

No.	Service areas	Source	Action	Target delivery date	Resources
1.	A&E	6.1(a), (d)	Optimisation of operational estate	Ongoing	Staff time, consultancy costs
2.	A&E	6.1(b), (d)	Optimisation of commercial estate	Ongoing	Staff time, consultancy costs
3.	A&E, commissioning services	6.1(c)	Identification of shadow estate	2024	Staff time
4.	A&E, commissioning services	6.1(c), (d)	Optimisation of shadow estate	Ongoing	Staff time, consultancy costs
5.	A&E	6.3	Review and update programme of property priorities for decarbonisation	Every six months	Staff time
6.	A&E	6.4	Preparation of decarbonisation reports and funding submissions	Ongoing	Staff time, consultancy costs
7.	A&E	6.5.1	Programme of LED lighting replacement	Ongoing to 2030	Staff time, scheme costs
8.	HW	6.5.2	Programme of street lighting and traffic signs and signals upgrade to LED	Ongoing to 2030	Staff time, scheme costs
9.	A&E	6.5.3	Programme of building heat decarbonisation	Ongoing to 2030	Staff time, consultancy costs, scheme costs
10.	A&E	6.5.4	Programme of small scale renewable electricity generation, linked to EV charging where appropriate.	Ongoing to 2030	Staff time, scheme costs
11.	A&E	6.5.5	Programme of large scale PV, including battery storage etc. where financially attractive.	Ongoing to 2030	Staff time, consultancy costs, scheme costs
12.	A&E	6.5.6	If applicable and the optimal use of land, investigate production of plants for biofuel manufacture.	Ongoing to 2030	Staff time, scheme costs

No.	Service areas	Source	Action	Target delivery date	Resources
13.	WS, A&E	6.5.7	Assessment of whether biogas production from organic waste would be worthwhile (linked to Resources and Waste Strategy).	2024	Staff time, consultancy costs
14.	A&E, HR	6.5.8	Development and implementation of programmes to encourage carbon responsible behaviour	2024 and ongoing	Staff time
15.	A&E	6.6.3(a)	Developing business case for West Northamptonshire productive woodland.	2025	Staff time, potential consultancy costs
16.	A&E	6.6.3(b)	Identify opportunities for early tree planting	2024	Staff time, land purchase and planting costs
17.	A&E	6.6.3(c)	Seek grants and other external funding for tree planting	Ongoing	Staff time, potential consultancy costs
18.	A&E	6.6.4	Consider opportunities for other organic carbon capture	2025	Staff time, consultancy costs
19.	A&E	6.6.5	WNC internal price of carbon established.	2028	Staff time
20.	A&E	7	Residual carbon being fully offset.	2030	Offsetting costs, staff time