Setting a Target for Carbon Neutrality for the Borough Council of King's Lynn & West Norfolk

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DISCLAIMER

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Executive Summary

This report aims to identify a realistic target for which the Borough Council of King's Lynn and West Norfolk can achieve carbon neutrality and which strategies are the most cost-effective with significant emission reductions. This report is designed to help my client (Borough Council of King's Lynn and West Norfolk) identify a starting point to begin reducing emissions across scopes one to three and to set a target for which the council can achieve carbon neutrality. Using the 2018/19 carbon audit, areas for potential emissions reductions were identified. Throughout this report, emission reduction strategies for each scope will be discussed, as well as their financial costs or sources of funding, and when these solutions can be implemented by.

Scope One Emissions

Emissions from gas use and emissions from the council's vehicle fleet amount to 1,713.3 t CO_2e. To eliminate gas emissions, the use of a ground source heat pump (GSHP) is recommended. The GSHP will be able to provide a reliable supply of heat to the council's buildings all year round, unlike solar thermal energy. The cost of a GSHP varies from £14,000 - £16,000 with a 15-year payback period. However, the council can apply for the Clean Heat Grant to help cover the cost. The installation of a GSHP should be completed by the end of 2022.

To eliminate emissions caused by the council's vehicle fleet, the switch to an all-electric vehicle (EV) fleet is encouraged. The use of pure EVs is recommended, as the sale plug-in hybrids (as well as petrol and diesel vehicles) are due to banned in 2035. There are grants available for cars and vans which reduce the initial purchase price of a vehicle. The workplace charging scheme provides finance for EV charging infrastructure. Additionally, electricity is cheaper than petrol or diesel, therefore, reducing fuel expenses. The switch to an all-electric vehicle can be complete by 2023.

Scope Two Emissions

Emissions from scope two are caused by electricity use within council buildings, amounting to 1,425.5 t CO_2e. in 2021, the council is switching to a renewable electricity tariff. The introduction of this tariff will see electricity use emissions fall by >85%. The reduce the remaining 15% of emissions, the council should consider installing a solar PV system. The electricity generated from the solar PV system can be used across the council's buildings, and can also help reduce transmission and distribution losses by generation electricity on site.

Scope Three Emissions

Emissions in scope three emit 1,493.9 t CO_2e. Transmission and distribution losses caused by purchased electricity amount to 121.5 t CO_2e. These emissions can be reduced by the solar PV system, which is mentioned in scope two. The on-site electricity generation shortens the distance that electricity will have to travel before it is consumed, which will reduce transmission and distribution emissions. To compensate for remaining emissions, the councils 'Big Plant' 500 tree planting scheme can be used as an offset mechanism.

Emissions caused by water supply emit 26.7 t CO_2e. to reduce wasted water, the council should consider installing a water metre. This will allow the council to identify any potential areas for water reduction and lead to savings of water supply. Many water companies such as Anglia water, often install water metres for free, other water metres can cost up to £150. A water metre can be fitted by the end of 2020. Additionally, the council may consider the use of rainwater harvesting or greywater recycling to reduce the water supply needed for St. James pool and Oasis Leisure Centre. These use of recycled water techniques could be In place by the end of 2021.

Emissions from water treatment amount to 45 t CO_2e. these emissions are particularly hard to reduce. However, the UK water industry has announced its commitment to achieving carbon neutrality by 2030. This could eliminate the 45 t CO_2e emitted from water treatment. In the meantime, the council can look to offset these emissions through tree planting schemes such as the Big Plant' and Norfolk council's one million plant scheme, which the council are expected to be involved in.

Emissions from business travel emit 76.7 t CO_2e. to reduce these emissions, the council can introduce home working for employees to reduce staff mileage and vehicle emissions. Additionally, employees can be encouraged to use EVs for business travel. Homeworking can be implemented in 2020. However, it will take several years to encourage staff to use EVs, as vehicle use is a personal decision for each staff member. Taking this into account, the total reduction for business travel emissions could be until the 2030s. there should be no financial cost for the council to implement these strategies.

Lastly, refuse collection vehicles emit 1,222.9 t CO_2e. there is very little development around electric refuse collection vehicles (RCVs), with Westminster council being the only council trialling their use. This is another emission sector that will be hard to for the council to reduce and largely depends on what the next few years of research and development has in store for RCVs. At the current direction, electric RCVs can be expected to arrive in the early 2030s.

<u>Recommended Target</u>

After reviewing the above strategies, and giving the delays from RCV development, the council should aim to achieve carbon neutrality by 2035. By 2035, the strategies mentioned in scopes one to two should have already been implemented; a lot of these solutions can be implemented before 2024. The delay is caused by scope three emissions, which is out of the council's immediate control. However, by 2035, it is highly likely that there would have been technological advances in 'green' technology which will assist the council in achieving carbon neutrality by 2035.

It is important to recognise the impact the current COVID-19 situation may have on the council's ability to reach this target. COVID-19 has already caused delays for the completion of the King's Lynn Re-fit. There is a possibility that work operations and installers of certain solutions may not be readily available for some time and thus, potentially delaying the target years of when solutions can be implemented.

Introduction

In 2019, the UK government revealed its commitment to become net-zero carbon in 2050, this same, the UK's emissions dropped by 29% (The Carbon Brief, 2020). With the UK on the pathway to decarbonising the county, many councils across the UK revealed their plans to become net-zero carbon. Many councils such as Oxford City Council, have announced their commitment to being net-zero carbon by 2030. Therefore, the Borough Council of King's Lynn and West Norfolk are committed to setting themselves a target year to achieve carbon neutrality and how they will be able to achieve this.

To keep on track with the government's 2050 carbon neutral targets, the council are actively looking to decrease their CO_2 emissions. In February 2020, the council supported the 'Big Plant' tree scheme at King's reach. The 500 newly planted trees can help offset CO_2 emissions produced by the council's operations. Additionally, the council plans to involved in Norfolk's one million tree planting scheme. Large-scale tree planting schemes and management of green spaces can be a productive offsetting solution which the council can utilise to offset a proportion of their CO2 emissions. Furthermore, the council have organised a retrofit of council-owned buildings in 2018. The re-fit aims to create carbon savings by dramatically increasing the energy efficiency of buildings and implementing new, 'green' technologies.

Over the past five years, the council has seen a 25% reduction in their total CO_2 emissions, from 6,183.4 t CO_2e in 2014/15 to 4,642.2 t CO_2e in 2018/19. While this 25% reduction in CO_2 emissions is a great achievement, the council are still under pressure to produce larger reductions over the coming years.

This report addresses the emissions within scopes one to three and aims to identify solutions which can produce emissions reductions for the council's operations. Finance options and information are provided to enable the council to implement to the most cost-effective solution for them.

1.0: Scope One *1,713.3 t CO_2 e*

The emissions recorded within scope one are direct emissions from sources which the council own and/or control.

1.1: Gas Emissions; 1,320 t CO_2 e.

The gas emissions within scope one arise from heating the council's buildings. To reduce and/or eliminate gas emissions, three potential heating solutions have been identified:

- **Combined Heat and Power (CHP):** this system captures heat produced by electricity which is then used to heat water to be used for heating. This technology is highly efficient by using wasted heat and has the potential to reduce carbon emissions by 30% (UK Government, 2020)
- **Ground source heat pump (GSHP):** this method circulates a mixture of water and antifreeze around a loop of pipe. The heat from the ground is absorbed into the fluid and then passes through a heat exchanger into the heat pump. This system is

powered by electricity, however, the council are said to be switching to EDF's green tariff in 2021, if implemented after the installation of the green tariff, then GSHPs has the potential to eliminate gas emissions.

- **Solar thermal energy:** uses solar energy to heat a water tank which will then be used within the central heating system to heat the council's buildings. Solar thermal systems generating 90% of solar radiation into heat, compared to only 15% - 20% for solar PV (Lightsource BP, 2014). However, there may be less energy generation during winter months due to increased cloud cover affect solar radiation, and so this may not be the most suitable option.

Prices and Funding

Solution	Price (£)	Payback period (years)
Combined heat and power	£32,000 (large scale)	10.5
Ground source heat pump	£14,000 - £19,000	15
Solar thermal	£5,000 - £10,000	6 – 10

Table 1.0: Displays the costs and payback period for each potential renewable heating solution. Source: (Bionic, 2020) available at: https://bionic.co.uk/business-energy/guides/guide-to-renewable-energy-for-small-businesses/ *(online) [last accessed 30/05/2020]*

Non-Domestic Renewable Heat Incentive (RHI) **Closes to new applicants March 2021**

The non-domestic RHI is a UK government scheme, which has been created to encourage the use of renewable heat technologies among public sector businesses as well as non-public sector business and not for profit of organisations (Energy Savings Trust, 2020. The council will be eligible for the non-domestic RHI if they decide to install any of the solutions mentioned in table 1.0.

The Clean Heat Grant (Commencing 2022)

The CHG is said the commence in 2022, one year after the closure of the non-domestic RHI. The CHG will offer funding support up to £4,000 for a business that implements a clean heat technology (Edie, 2020). The full list of eligible technologies has not yet been released.

Salix Finance

Salix is a company that proved government-funded, interest-free loans for public sector businesses to conduct energy efficiency improvements. Salix offers funding for CHP and solar thermal.

Recommendations for Gas Emissions

- The council should consider installing a GSHP as it will be able to supply significant amounts of heat all year round and would be a reliable heat source.
- The GSHP should be installed after the renewable tariff is in place, to ensure that the GSHP is powered on a renewable electricity supply, avoid any additional emissions.
- The council can look for funding with the Clean Heat Grant in 2022.

- A solar thermal energy system could be considered as it is the cheapest option, however, it is uncertain as to whether this system could provide significant amounts of heat during the winter months.

1.2: Council Vehicle Fleet 393.4 t CO_2

Switch to Electric Vehicles (EVs).

In 2035, the UK government will ban the sale of petrol and diesel cars, as well as plug-in hybrids (UK Government, 2020). With the ban only 15 years away, the sensible option, would be for the council to switch to a pure electric vehicle fleet, which emits zero emissions. Additionally, the pure electric vehicle is exempt from company car tax as of 2020. The use of hydrogen vehicles was also researched. However, it was found that EVs have much more technological development than hydrogen vehicles do; with a range of models, expanding charging infrastructure around the UK as well as a range of funding options available. Whereas, hydrogen vehicles are nowhere near as common within the UK. For example, there are 30,000 EV charging stations across the UK (EDF, 2019) compared to just 13 hydrogen refuelling stations in the UK (Energy Savings Trust, 2020). Thus, EVs are the most suitable option.

Battery or Pure Electric Vehicle

Batter or pure electric vehicles emit zero emissions. These vehicles are becoming very common with Volkswagen, Peugeot, Renault, Honda and Kia, have multiple car and van models available. The range with battery and pure electric typically range between 100 – 300 miles.

Charging a Pure EV

The council has the opportunity to make huge savings on fuel, once switching to a pure EV fleet. EV vehicles typically cost £2 - £4 to fully charge (for a 100-mile range model) in a petrol or diesel car, 100 miles would typically cost between £13-£16 for 100 miles. The introduction of an all EV fleet would call for the development of charging infrastructure for which there is a workplace charging scheme, as can be seen in table 2.0.

Energy Savings Trust Fleet Review

The Energy Savings Trust offer a free vehicle fleet review for businesses, in which they review which vehicles that are in the fleet and which EV models would make the best replacement based on the fleet's operations, i.e mileage, use etc.

Finance Available

Grant	Finance available
Plug-in car grant	Purchase price reduction, up to £3,000
Plug-in van grant	Purchase price reduction of up to £8,000
Workplace charging scheme	£350 per charging socket (up to 40 sockets)

Table 2.0: the list of funding schemes available for the purchase of EVs and EV charging infrastructure. Source: (Energy Savings Trust, 2020) available at: https://energysavingtrust.org.uk/transport/fleet/fleet-management-toolkit/switching-electric-vehicles [last accessed 22/05/2020]

Recommendations for Council Vehicle Fleet

- Changing over the current vehicle fleet to a pure electric vehicle fleet can be done by 2023.
- Make the switch to a pure EV fleet, with the help of the energy savings trust to make sure the most efficient EV models are used.
- The funding options displayed in table 2.0 can be utilised to save the council money on the purchase price of pure electric cars and vans, and reduce the cost of installing charging infrastructure.
- The old vehicles from the current fleet could be sold to scrap or to new owners, to accumulate additional funds for an EV fleet.

2.0: Scope Two, *1,425.2 t CO_2*

Scope two emissions are indirect emissions for the generation of purchased energy. The emissions within scope two are caused by electricity use within the council's buildings.

2.2: Electricity use in Council Buildings

To combat these emissions, the council are switching to a renewable electricity tariff provided by EDF Energy, estimated to occur in 2021. The switch to the renewable tariff will help eliminate over 85% of the 1,425.2 t CO_2 e emissions caused by electricity generation.

This switch could leave approximately 213.78 t CO_2 e left to reduce. A solution to eliminate these emissions could be to install additional solar PV systems for on-site renewable electricity generation.

Recommendations for Electricity Use

- Council are already switching to a renewable tariff in 2021, eliminating >85% of scope two emissions
- Implement additional solar PV system to reduce the remaining 213.78 t CO_2 e emissions, this can be installed by the end of 2021.

3.0: Scope Three *1,493.9 t CO_2 e*

Scope three emissions occur from all other indirect emissions which occur in a company's operations

3.1 Transmission and Distribution Losses 121.5 t CO_2 e

Transmission and distribution losses are indirect emissions caused by the transmission and distribution of the council's purchased electricity.

A solution to reduce these emissions would be to generate electricity closer to where it is consumed. It is highly unlikely that the council will be able to generate 100% of their electricity supply, but the council should be able to produce at least 10% via installing renewable energy generating technologies such as solar PV systems. The council could also offset the remainder of emissions through the 500 tree planting scheme, which took place in February 2020.

On-Site Electricity Generation with a Solar PV System

As mentioned in section 2.2, the additional solar PV system can provide renewable electricity generation for the council's buildings, could also help reduce emissions from the transmission and distribution of electricity. As the solar PV system would be generating electricity close to where it is consumed, it would mean that the electricity that the solar PV produces, has very little distance to travel and thus helps decrease transmission and distribution emissions.

Price of a Solar PV System

A typical solar PV system costs between £6,000-£10,000 (4kw system) and a payback of 6 – 10 years.

Recommendations for Transmission and Distribution Emissions

- Generate some electricity on-site with the use of solar PV systems; installation by the end of 2022.
- Offset the remaining emissions through the King's Lynn Big Plant scheme and management of other green spaces.

3.2: Water Supply 26.7 t CO_2e and Water Treatment 45 t CO_2e

To reduce water supply wastage, the council can look to install a water metre. A water metre could help the council identify where reductions can be made and so cut the water supply. Prices for water metres vary from free of cost up to £150, depend on water supplier.

The council own two community swimming pools, St. James' and Oasis. Both of which need a significant water supply. The council can consider the use of greywater recycling or rainwater harvest to reduce their industrial water supply emissions. However, both of these solutions would require the water to be treated again for use within the pools. Although, a study by the Environment Agency (2010) found that buildings using harvested rainwater or treated greywater recycling increased CO_2 emissions in comparison to using mains water.

In March 2020, the water industry their plans to become net-zero by 2030 by cutting greenhouse gases released during water treatment, increasing energy efficiency, the use of renewables and many more improvements (Water UK, 2020). This plan could reduce the 45 t CO_2 e emissions produced by water treatment.

Recommendations for Water Supply and Treatment

- Install a water metre to monitor wastage of water and to identify reductions by the end of 2020
- Consider the use of greywater recycling or rainwater harvesting for St James and Oasis Leisure centre to reduce water supply emissions.
- UK water industry to be net-zero carbon by 2030, should reduce all water treatment emissions by 2030; Able to be net-zero carbon by 2030 at the latest.
- Continue to offset remaining emissions through the Big Plant scheme and Norfolk's one million tree plant plan.

3.3: Business Travel 76.7 t CO_2e

Business travel includes emission created by staff travel for businesses purposes.

Home Working

Staff can be advised to work at home to save business mileage and reduce vehicle emissions. Additionally, MPs who travel to King's Lynn for meetings should hold meetings virtually instead of a 100+ mile plus trip which produces unnecessary emissions.

EV Use

Staff may be encored to purchase EVs rather than petrol or diesel vehicles. Taking into consideration the 2035 ban of the sale of petrol and diesel vehicles, EV usage is something the staff should be considering. Staff can use the workplace charging facilities which may be installed after the switching of the council's vehicle fleet to EVs. Staff may benefit from the EV home charging scheme from the UK government, which offers £350 off the installation fee.

There should be no financial cost for King's Lynn council to implement these two solutions.

Recommendations for Business Travel

- Implement home working; immediate start (2020)
- Encourage the use of EVs among staff members, the start date will largely vary on the willingness for staff to make the switch.
- Look to offset business travel emissions through 'Big Plant 2020' tree planting scheme and management of green spaces.

3.4: Contractor Travel 1,222.9 t CO_2e

The council is currently in an 8-year contract with the contractor for refuse waste collection. Currently, Westminster is the only council trialling a fully electric refuse vehicle. Therefore, it is highly unlikely the council will be able to implement EV refuse collection vehicles within this decade, we will likely begin to see the use of electric refuse vehicles in the 2030s, following further research and development. Until this time, the council will remain in their 8-year contract and optimise collection routes to reduce unnecessary mileage.

4.0: Conclusion

It is recommended that the council achieve net-zero carbon emissions from their operations by 2035. Solutions for scope one and two can be implemented by 2023 at the latest. Scope three emissions from water supply & treatment and business travel can be reduced by the start of 2022, through the implementation of suggested solutions and offsetting. However, contractor travel significantly delays the ability of the council to achieve carbon neutrality within the next few years. This is due to the lack of existing electric refuse vehicles, and so additional years of research and development are needed. vehicles should be widely accessible Therefore, the council can realistically achieve carbon neutrality by 2035.

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Appendix A:

Project Brief

Project Brief 1

Title: Recommend a realistic target for the Borough Council of King's Lynn & West Norfolk to achieve carbon neutrality and the most cost effective policies/strategies to achieve this.

a) ***A summary of the project 'problem' or challenge.***

Our 2018/2019 financial year emissions were 4632.38 tonnes of CO2e. There are certain areas where we can easily reduce these emissions (switching to a green electricity tariff). However, some areas are harder to reduce (vehicle emissions, emissions from water use). Some councils in the district have set targets for their council emissions to be carbon zero by 2030. We are unsure if this will be possible for the BCKLWN, and therefore, what target we should set for ourselves.

b) What you want the student consultant to deliver at the conclusion of the consultancy exercise.

Using our carbon audit as a starting point (available in Jan 2020) we would like the student to identify a realistic target for carbon neutrality for the borough council's operations that takes into consideration how we deal with hard to reduce emissions. We would also like the student to look into strategies to reduce emissions and recommend those they believe are most cost effective and bring in large emissions reductions and potential offsets.

c) ***Any specific skills the student consultant should have*** *(e.g. familiarity with ArcGIS, soil coring, SPSS stats analysis).*

1. Understanding of Excel for use of secondary data sets.
2. Ability to communicate the report in a clear and accessible way to individuals with no prior knowledge of the subject area.
3. Options appraisal (including costs and potential funding/grants sources.)
4. General understanding of UK government climate change targets.

d) ***Any particular resources required from the student consultant*** *(e.g. transport for fieldwork, benthic net).*

e) ***Any particular resources that you will provide*** *(e.g. specified secondary data).*

We will provide secondary data, such as the BCKLWN's 2018/2019 carbon footprint report and official BEIS Local Authority emissions data.

f) ***Additional comments, if relevant*** *(e.g. need for confidentiality agreement)*

Figure 1.0: The project brief for this report.