FINGAL COUNTY COUNCIL ENERGY REVIEW 2019

Codema
Dublin's Energy Agency

Comhairle Contae Fhine Gall
Fingal County Council

Cover photo courtesy of Fingal County Council

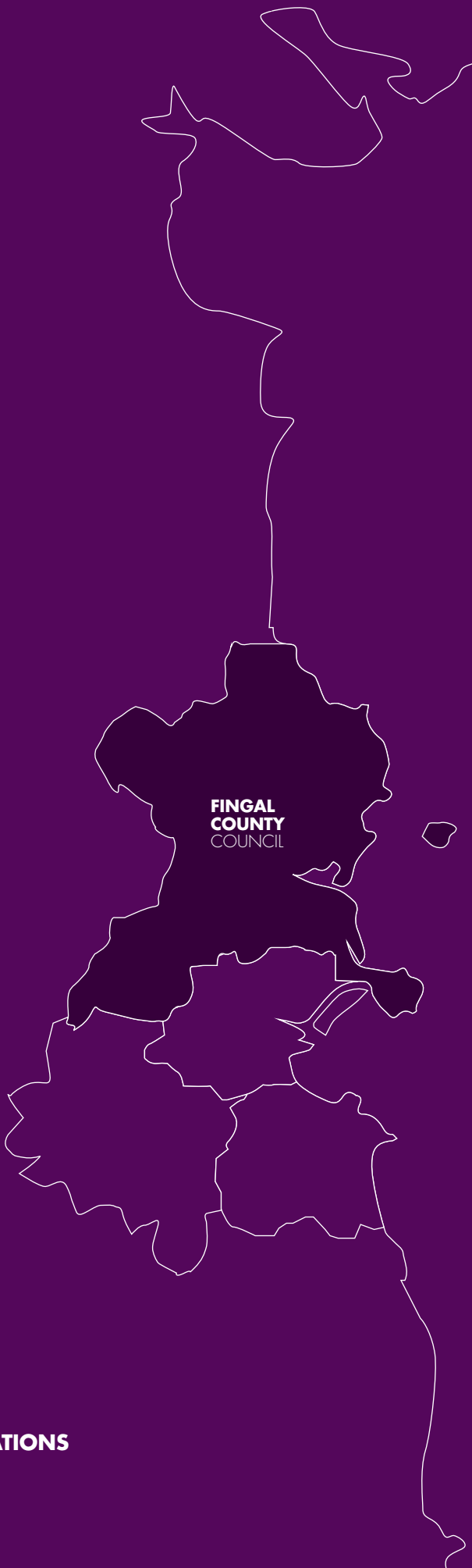
01. INTRODUCTION

Codema has developed this Energy Review on behalf of Fingal County Council (FCC), which is one of the largest local authorities in Ireland. This is the fourth such report to be completed by Codema. The aim of the Energy Review is to highlight the total amount of energy FCC consumed in the past year, along with the total cost and carbon emissions associated with this energy use. Further details relating to years prior to 2019 may be found in FCC's 2016, 2017 and 2018 Energy Reviews.

This Energy Review also aims to clearly demonstrate where energy is used in the Council, what drives its consumption, and where the greatest energy-saving potential is; this will help FCC to identify where it currently is in relation to public sector energy targets, and what areas it needs to prioritise in order to meet both its existing 2020 targets and new 2030 targets.

As part of this process, Codema has analysed FCC's total energy use and has broken this down into five Significant Energy Users (SEUs), which are explained in detail within this Energy Review. Codema revised FCC's SEU areas in 2018 in order to bring them in line with the ISO 50001 energy management standard. Codema gives an overview of the current energy use associated with each SEU, and provides recommendations on the action FCC must take to reduce energy consumption in each SEU area and meet 2020 and 2030 targets.

Additionally, Codema has included a summary of FCC's progress in terms of its carbon emissions. Under the Covenant of Mayors initiative, which FCC signed up to in 2016, FCC has voluntarily set a target of reducing its greenhouse gas emissions (GHGs) by 40% by 2030. This target has also been included in FCC's Climate Change Action Plan (CCAP) 2019-2024, and goes beyond the current national target of a 30% reduction in emissions by 2030, which was set by the Government in 2019. This Government target is likely to be increased to 50%, in line with the new EU Green Deal. From 2021 onwards, these new statutory targets will require carbon emissions to be reported annually to the Sustainable Energy Authority of Ireland (SEAI), alongside energy consumption.




PUBLIC LIGHTING


TRANSPORT


LARGE OFFICES


LIBRARIES


OPERATIONS

Current Status & Obligations

In 2019, FCC consumed a total of 52 gigawatt hours (GWh) of primary energy; this is the equivalent of 9,741 tonnes of CO_2 and Codema estimates the associated cost of this energy use to be approximately €3.6 million. This information comes from Codema's database, which incorporates the data from the Monitoring and Reporting (M&R) system developed by the Sustainable Energy Authority of Ireland (SEAI) and the Department of Climate Action, Communication Networks and Transport (DCACNT). It is important to note that these figures may vary, as changes to data within the M&R system for previous years are accounted for, such as the addition of missing accounts or the removal of accounts that are no longer linked to FCC. These changes are made throughout the system, from the baseline year to date, and don't affect the baseline or reduction target.

Codema has been entering this yearly data into the M&R system on behalf of FCC since 2011, in order to comply with the reporting requirements of the European Energy Efficiency Directive 2012/27/EU. The directive has been transposed into Irish Law as Statutory Instrument S.I. 426 of 2014, which sets out several obligations on public bodies with respect to their "exemplary role" for energy efficiency by achieving savings of 33% by 2020. This is an average reduction target of 3% per year.

To ensure it reaches both its energy efficiency and climate reduction targets and complies with all legal and other requirements in relation to energy efficiency, FCC decided to implement and maintain the energy management system (EnMS) ISO 50001: 2018, the international standard for energy management.

In conjunction with implementing an EnMS, FCC signed up for the public sector partnership with SEAI and has appointed an Energy Performance Officer (EPO) to represent the Council. The main goal of the EPO, in relation to the EnMS, is to ensure that the EnMS is effectively implemented across the organisation and that all elements of the standard are complied with. The EPO also set up an energy team that is represented by all Significant Energy Users (SEUs) across the Council. In December 2019, FCC went through detailed audits by Certification Europe, the certification body for this standard in Ireland, and was awarded certification in February 2020. FCC also passed its first surveillance audit in July 2020.

During the EnMS energy review process, it was noted that community facilities were included in FCC's reporting to SEAI. The main scope of the EnMS is to

FCC Energy Overview 2019

CONSUMED 52 GWH OF PRIMARY ENERGY

9,741 TONNES OF CO_2 EMITTED

€3.6 MILLION ASSOCIATED ENERGY COST

Public Sector Obligations

ACHIEVE SAVINGS OF 33% BY 2020 AND 50% BY 2030

REDUCTION TARGET OF 3% PER YEAR

FCC Progress: Baseline - 2019

IMPROVED ENERGY PERFORMANCE BY 34.5%

4,578 TONNES OF CO_2 SAVED

33% PUBLIC SECTOR TARGET MET, NEED TO LOOK TOWARDS 2030 TARGET

01. INTRODUCTION
(CONTINUED)

Formula for Calculating EnPIs for SEUs

$$\text{ACTIVITY}_0 = \sum_{i=1}^{x} \left(\frac{\text{Subactivity}_i}{\text{Subactivity}_{i,\text{baseline}}} \times \text{Weighting}_i \times 1{,}000 \right)$$

include energy users that the Council has direct control over; however, these community facilities are currently not under the Council's remit and it doesn't have control over their energy use. Taking this into account, a sensitivity analysis was completed to ascertain the effects of excluding the community facilities from FCC's reporting obligations and the EnMS system. This analysis showed a potential swing of 3% energy efficiency improvement in FCC's progress towards its targets to date. A decision was made by the EPO and energy team that these facilities should be excluded from the M&R and EnMS systems, as the Council has no direct control over their energy performance. It is the view of the EPO and energy team that these facilities should be included in the future, and that relationships with centre managers be further developed and support given to drive energy performance improvements within the facilities. A focus on energy performance in these facilities is also important as they are a key link to the public and will drive behavioural change in the region.

To date, as reported by the updated M&R figures, FCC has improved its energy performance by 34.5%, compared to the baseline year, which is an average of between 2006 and 2008. This amounts to an absolute saving of 12.4 GWh of primary energy or 4,578 tonnes of CO_2. This means that FCC has provisionally achieved its goal of 33% energy efficiency savings by 2020, one year ahead of target. As mentioned earlier, further 2030 public sector targets have been set, based on the Government's Climate Action Plan 2019 To Tackle Climate Breakdown. New targets of 50% improvement in energy efficiency from the 2006-2008 baseline and a 30% reduction in CO_2 by 2030 have been set. This will require continued and increased focus on the energy performance of FCC's buildings and operations over the coming decade.

It should be noted that a significant factor in the achievement of the 33% target has been a reduction in the primary energy conversion factor used by SEAI for electricity. This reduction is due to the gradual increase in the efficiency of electricity generation and transmission over recent years. Significant decreases were observed in 2018 and 2019, some of which is due to the Moneypoint coal-fired plant being down due to a fault. Moneypoint is back operating to a fuller capacity in 2020, so we may see a reversal of some of the gains from the previous two years. If the primary energy factor were to return to its 2017 value, and taking into account any additional energy efficiency projects coming into effect in 2020, then FCC would only achieve a 30.2% improvement in energy efficiency, and fail to meet its 2020 target. While it is unlikely that the primary energy factor would worsen to this extent, it shows that FCC's achievement of the 33% target is by no means locked in at this stage.

Methodology

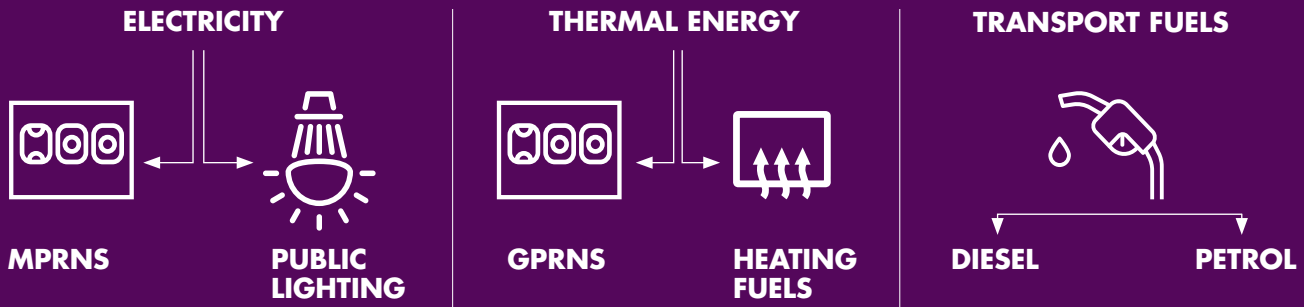
In order to calculate potential energy savings in FCC, it is necessary to analyse changes in other factors that are directly related to the Council's energy use. With this in mind, Codema uses Energy Performance Indicators (EnPIs) to measure FCC's energy performance more accurately. This method determines how efficiently FCC is using energy, as it is normalised to account for changes in the activity level related to the energy use, or the "activity metric", of the local authority. This is a measure of the key activity that has the greatest influence on energy consumption. An EnPI is calculated by dividing the organisation's Total Primary Energy Requirement (TPER) by an activity metric.

When there are multiple variables that drive energy consumption, a composite performance indicator is used. Determining a single performance indicator for complex situations where multiple variables drive consumption can be difficult, because different aspects of the facility consume different amounts of energy and are driven by different variables. In such cases, a composite performance indicator based on more than one variable is used. The scale of each variable's contribution is defined by a weighting scale.

For FCC, the overall performance indicator is based on population served. Therefore, FCC's EnPI is the TPER divided by the population served for that year, and so the Council's performance is determined not only by its annual energy use, but also by a rise or fall in population in the Fingal area in the same year. Savings are based on cumulative absolute primary energy and carbon savings from the baseline year to 2019. In 2010, the Dublin Local Authorities outsourced waste collection within the region. Also, in 2013, water services within the local authorities were transferred to Irish Water. The M&R system and Codema's database have provisions to account for these changes, and therefore accurately track the actual energy performance of the local authority from the baseline year to 2019, which takes proper account of services that have been outsourced.

02. FCC ENERGY CONSUMPTION 2019

The energy database shows that FCC consumed 52 GWh of primary energy and produced 9,741 tonnes of CO_2 in 2019. Codema estimates the costs associated with this energy use to be approximately €3.6 million for the year. This is broken down into three principal energy categories; electricity, gas/heating and transport fuels. Electricity consumption comprises of metered electrical accounts (MPRNs) from FCC's buildings and unmetered public lights. Thermal energy consumption consists of metered gas accounts (GPRNs) and heating fuels data from buildings, and transport accounts for all the transport fuels within FCC, i.e. diesel and petrol.



02. FCC ENERGY CONSUMPTION 2019
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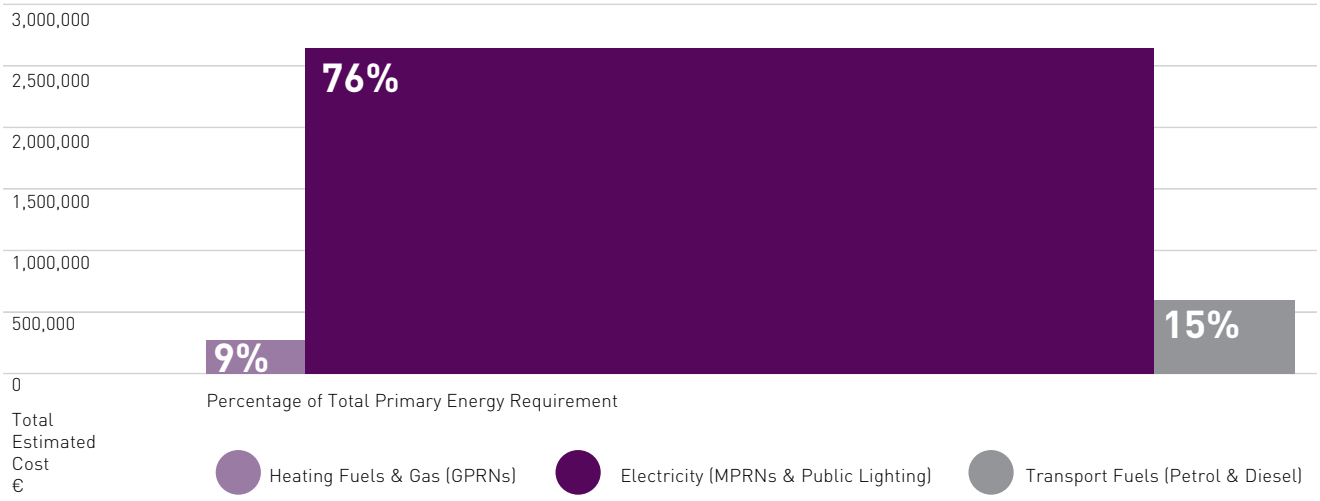


Figure 1: FCC Energy Categories - 2019

Figure 1 above shows the breakdown of the consumption categories. The height represents the total estimated cost of that energy type, and the width of each coloured area highlights what percentage of the overall energy use this energy type accounts for. Electricity accounts for the largest share of energy consumed at approximately 76%. The reasons for this are the large number of public lights in the Fingal area and the vast amount of electricity accounts within FCC's buildings and facilities.

With regards to the energy cost, the analysis is much more complex, as fuel tariffs vary and the various energy accounts have different suppliers. Also, the local authority's targets are measured in energy efficiency, not cost savings. In order to estimate the total cost of energy attributable to the different energy categories, Codema has used average national prices for electricity, heating gas and the different fuel types sourced from SEAI's commercial fuel cost comparison charts.

The energy database shows that FCC improved its energy performance by 34.5% between the baseline year and 2019, which amounts to an improvement of 4.9% on FCC's energy performance in 2018. For 2019, this represents an absolute saving of 12.4 GWh of primary energy or 4,578 tonnes of CO_2, when compared to the baseline. This means that FCC has now achieved its goal of 33% energy efficiency savings by 2020, a year ahead of target. The new targets of 50% improvement in energy efficiency, coupled with a 30% reduction in CO_2 by 2030, must now be tackled.This presents a new gap-to-target of 15.5%, meaning that FCC must improve its energy performance by a further 15.5% compared to its original baseline between now and 2030, in order to meet the 50% energy efficiency target. This is estimated to be a reduction of 12.4 GWh[1] in primary energy. Therefore, an annual reduction of 1.6 GWh of primary energy between now and 2030 is necessary; this equates to the average yearly reduction already achieved since the baseline.

Figure 2 on the next page illustrates FCC's absolute energy consumption. The absolute energy consumption is the energy consumption with no activity metric associated. This is directly looking at the overall reduction of total primary energy from the baseline to 2019. Since the baseline, FCC has seen a reduction of 12.4 GWh of primary energy or 4,578 tonnes of CO_2, as mentioned previously. In 2019, there was a large decrease in energy consumption. This was mainly due to improved energy performance in Public Lighting due to the large LED replacement programme.

Figure 3 illustrates FCC's normalised annual energy performance compared to the 50% glidepath to 2030. The glidepath shows the average annual reduction required to reach the 50% target. This takes into account the rise and fall of the activity metrics, and tracks them compared to FCC's TPER of all fuel sources. In 2019, FCC made good progress and is now running ahead of its glidepath target.

1. Codema calculated this figure using SEAI's gap-to-target tool, which takes into account the potential changes in the conversion factors and percentage increases of the activity metrics up until 2020.

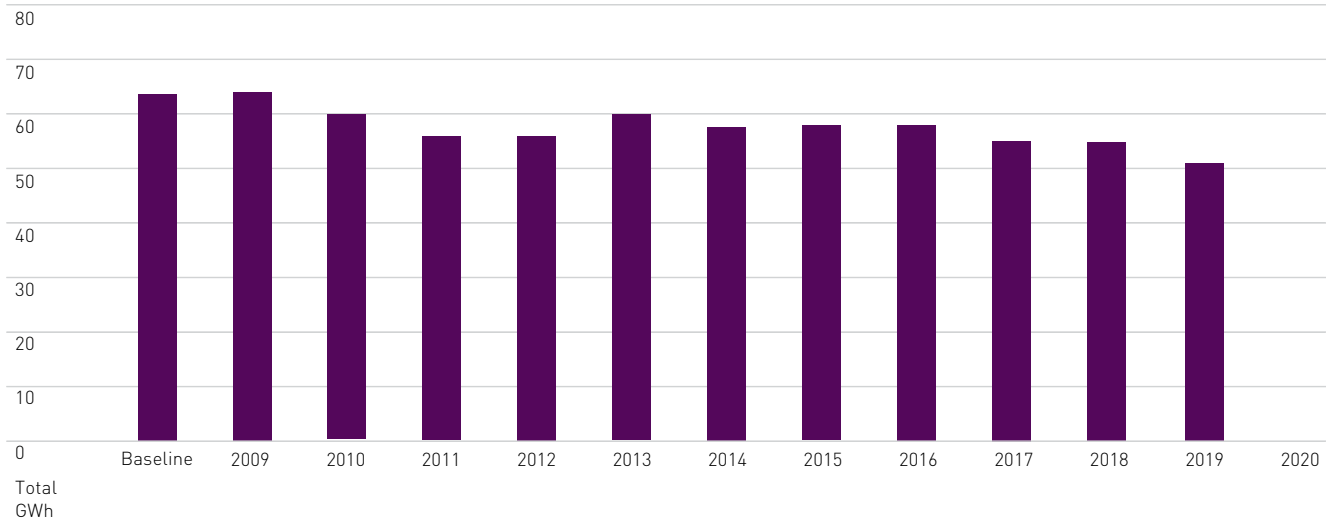


Figure 2: FCC Absolute Annual Energy Consumption

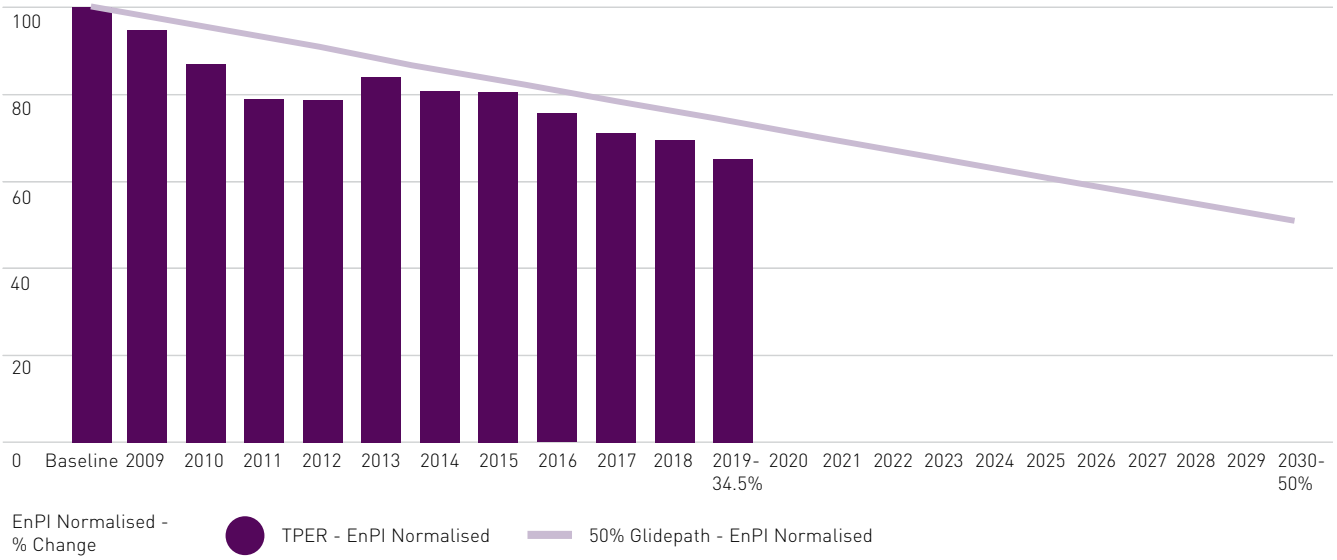


Figure 3: FCC Annual Energy Performance Compared to 50% Glidepath to 2030

02. FCC ENERGY CONSUMPTION 2019
(CONTINUED)

CLIMATE CHANGE ACTION PLAN & CARBON EMISSIONS

In 2018 and 2019, Codema helped to prepare FCC's Climate Change Action Plan 2019-2024, in cooperation with the various departments and the Elected Members of Fingal County Council. This plan sets out how the Council will improve energy efficiency and reduce greenhouse gas emissions in its own buildings and operations, while making Fingal a more climate-resilient area with engaged and informed citizens. This will be achieved by a range of ongoing and planned actions in five key areas, which will be continuously monitored, evaluated and updated to 2030 and beyond. The key targets included in this plan are the statutory 33% improvement in the Council's energy efficiency by 2020, as well as a 40% reduction in the Council's greenhouse gas emissions by 2030.

In terms of greenhouse gas emissions, FCC is already making good progress towards its 40% reduction target and is slightly ahead of its glidepath, as presented in Figure 4 below. The glidepath represents the average annual reduction required to meet this target. Compared to the baseline year, FCC's CO_2 emissions in 2019 had reduced by 35% to 9,741 tonnes. This leaves a gap-to-target of 1,150 tonnes of CO_2 between now and 2030. However, if the Government increases the reduction target to 50% by 2030 as expected, this would leave a gap-to-target of 2,582 tonnes.

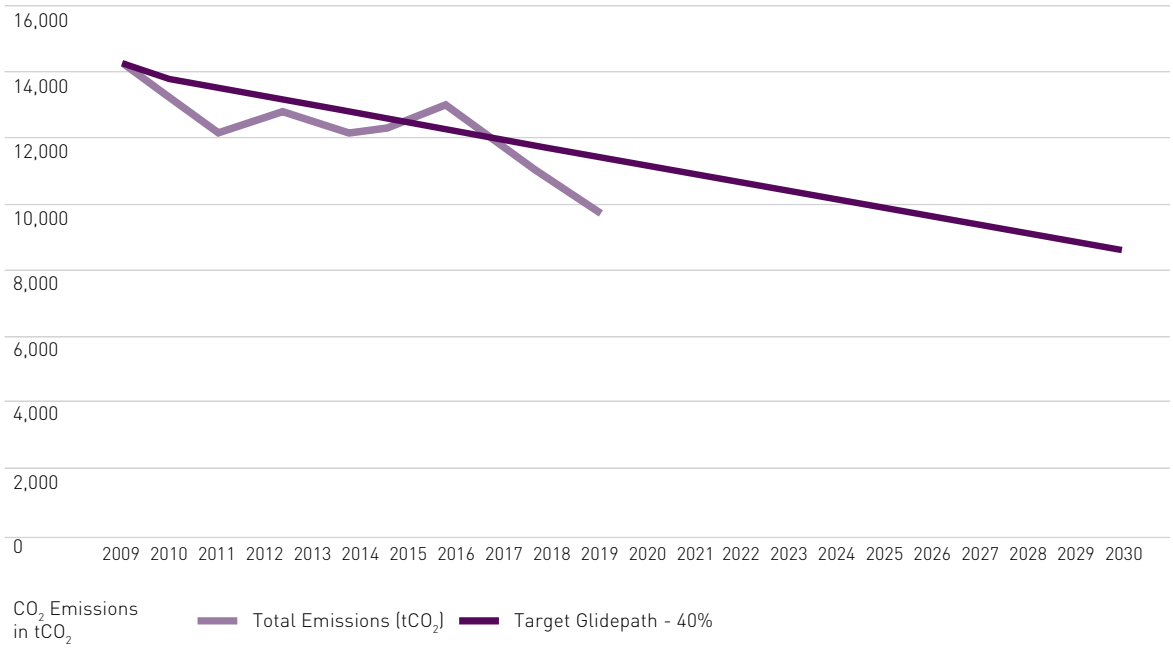


Figure 4: FCC Annual CO_2 Emissions Performance Compared to 40% Glidepath

03. SIGNIFICANT ENERGY USERS

To help better understand FCC's energy use, Codema has broken up the Council's total energy consumption into Significant Energy Users (SEUs). These SEUs help identify the measures that will contribute most effectively to energy savings and will have the most positive impact on energy efficiency targets.

This approach ensures the most efficient use of resources for maintaining and improving energy efficiency in critical areas within FCC. Codema developed these SEUs by creating an energy database, which includes all the data reported in the M&R system, data compiled by Codema through energy audits and direct contact with FCC staff.

Codema compiled all of the Council's electricity and gas accounts and developed a full list of buildings by marrying electrical and gas accounts for each of these buildings. FCC's Transport Department provided all of the fuels data, and all data on public lighting was compiled through contact with the Public Lighting Department and the Unmetered Registrar (UMR).

The database gives a breakdown of each of FCC's SEUs into Total Primary Energy Requirement (TPER), CO_2, and cost year-on-year, and compares this back to the baseline year. Codema also compares this data to an energy performance indicator to track the energy performance of each SEU.

By analysing the energy data, Codema has identified five key areas, or SEUs, within the Council, which account for 91% of FCC's total primary energy requirement. They are broken down as follows:

PUBLIC LIGHTING 55%

TRANSPORT 15%

LARGE OFFICES 11%

LIBRARIES 6%

OPERATIONS 4%

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

Figure 5 on the opposite page shows the breakdown of FCC's SEUs. Public Lighting is the largest SEU, accounting for 55% of the total load. This is followed by Transport at 15%, while Large Offices, which comprises of the County Hall in Swords and the Civic Offices in Blanchardstown, accounts for 11%. Libraries make up 6% of the total, and Operations, consisting of smaller offices and depots, makes up a further 4%. The remainder of the consumption is made up of smaller accounts within FCC, such as heritage centres and miscellaneous accounts.

The management of energy in these five SEUs is critical for FCC to achieve its 50% energy reduction target. Small percentage energy reductions in these areas have a much greater effect on overall consumption than large percentage reductions in the less significant areas.

FCC's current ISO 50001 Energy Management System uses a structured approach at senior management level and is driven by a dedicated energy management team, in order to carefully plan and execute energy reduction projects and also monitor energy performance in each identified SEU and within the organisation as a whole.

Figure 6 shows how the SEUs performed in 2019, compared to 2018. With the exception of Public Lighting and Libraries, all of the SEU areas recorded a deterioration in energy performance in 2019, compared to the previous year. The energy consumption of Public Lighting decreased by 7%, due to the ongoing upgrading of public lights to LEDs. Transport's diesel consumption increased by over 545 megawatt hours (MWh), reducing its energy performance by 17% compared to 2018.

The Large Offices also saw a decline in performance of 3%, which was caused by a large increase in the gas consumption of the County Hall in Swords. The energy performance of Operations also declined in 2019, with a 3.5% reduction in energy performance compared to 2018. This was due to a rise in energy consumption of 37 MWh in the depots. Libraries saw an improvement in performance of 6.5%.

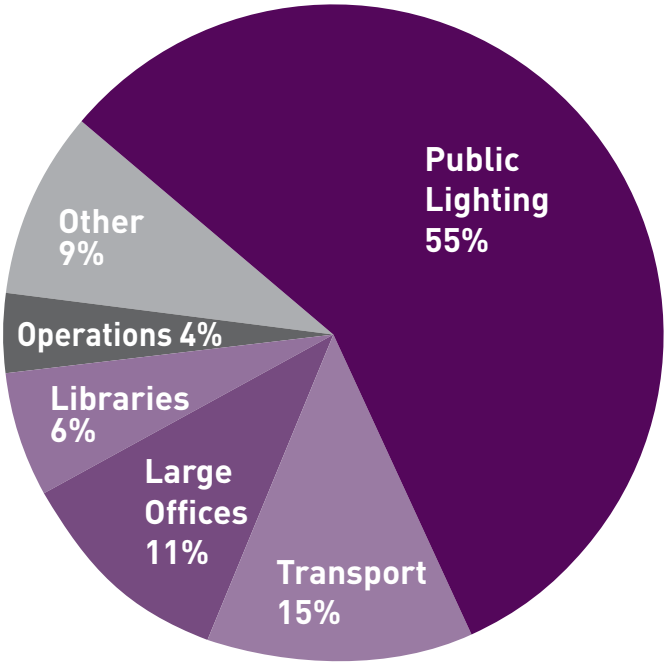


Figure 5: SEU Analysis

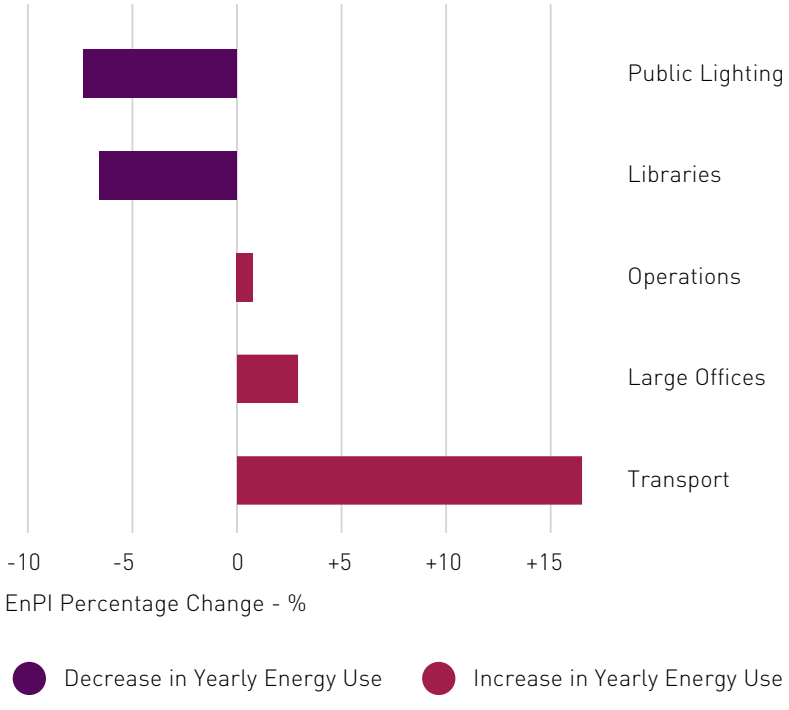


Figure 6: SEU Performance Change Between 2018 & 2019

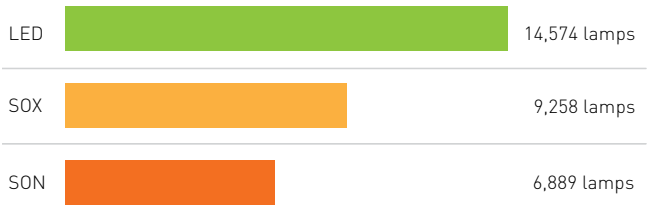
03. SIGNIFICANT ENERGY USERS
(CONTINUED)

PUBLIC LIGHTING

Public Lighting is the largest SEU within FCC. In 2019, Public Lighting accounted for 55% of FCC's primary energy consumption, which amounted to 28.6 GWh of primary energy, 5,004 tonnes of CO_2 and over €1.6 million in energy costs.

Public Lighting consists of almost 31,000 street lamps. Listed below are the main light sources and their associated quantity; they are also listed in order of their efficiency:

- Light Emitting Diode (LED) – 14,574 lamps
- Low Pressure Sodium (SOX) – 9,258 lamps
- High Pressure Sodium (SON) – 6,889 lamps



FCC Public Lighting 2019

CONSUMED 28.6 GWH OF PRIMARY ENERGY

5,004 TONNES OF CO_2 EMITTED

€1.6M ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 25.7% SINCE BASELINE

Identification of Relevant Variables for Public Lighting

In relation to Public Lighting, the relevant variables for the development of EnPIs to track the energy performance are very constant. Public Lighting only consumes electricity and has a predictable load. Public Lighting is charged on a pre-defined number of burn hours per year, and is largely unmetered. Burn hours are reflected seasonally, and don't change from year to year.

One variable that is not consistent, and drives energy consumption in Public Lighting, is the quantity of lights. As the region grows to support a rise in population, the quantity of lights increases. This is reflected in the data received from the Unmetered Registrar (UMR). Therefore, to accurately track the energy performance, Public Lighting is compared to the

number of unmetered public lights for that given year. This formula can be seen below:

Public Lighting EnPI =
kWh TPER / Number of public lights

Energy Performance of Public Lighting

To date, FCC's Public Lighting Department has already retrofitted 14,574 lights with LEDs. The energy database shows that Public Lighting has improved its energy performance by 25.7% since the baseline year, based on its EnPI. This is an absolute reduction of 5.3 GWh of primary energy, and 2,857 tonnes of CO_2. Public Lighting's energy performance has seen a big improvement in recent years. This trend continued in 2019, with a 7% improvement in performance compared to 2018.

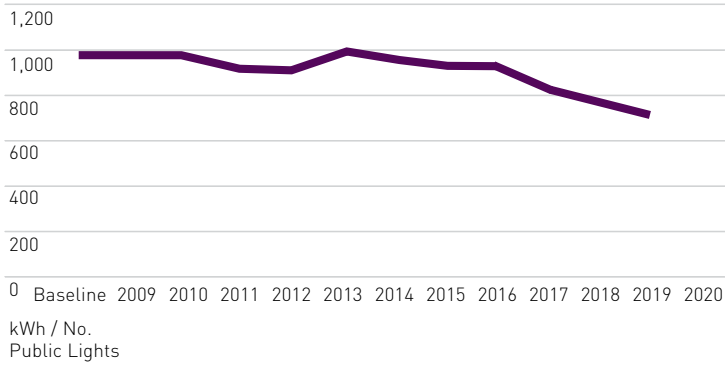
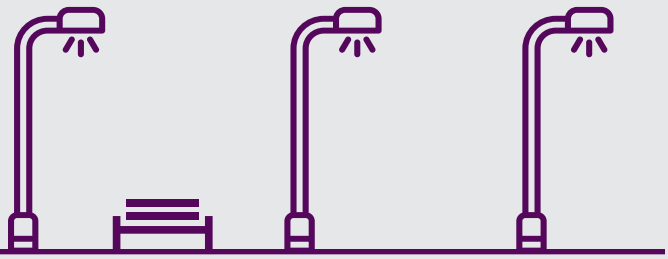


Figure 7: Public Lighting Annual Energy Performance

PUBLIC LIGHTING PLAN TOWARDS 2030



Within FCC's stock of public lighting, there are currently 9,258 SOX lamps. The manufacture of these SOX lamps is in the process of being phased out. FCC is currently rolling out a programme that replaces the lamps that fail across the region with their LED equivalent. This is the case for all lamp types in FCC's stock. An accelerated LED energy efficiency programme has been in place in Fingal County Council since 2019. The plan is to replace approximately 6,000 existing sodium lights with LEDs in 2020 and to continue at this level into 2021. It is envisaged that the majority of FCC's street lighting stock will be converted to LEDs by the end of 2021. Savings from the remaining two years of this programme could amount to 8 GWh of TPER and 1,399 tonnes of CO_2. This would have a significant impact on the Council's 2030 energy efficiency and carbon reduction targets.

The introduction of central management systems are also being piloted with the aim of achieving further energy savings at times of low vehicular and pedestrian movements. This pilot, if rolled out county-wide, will help with FCC's 2030 energy efficiency targets. EV charging infrastructure is currently on the agenda and the use of public lighting columns to facilitate this new infrastructure. If the public lighting columns are used, this will affect the energy performance of public lighting and also the local authority in general. Methodologies are being developed by SEAI to incorporate these additional charge

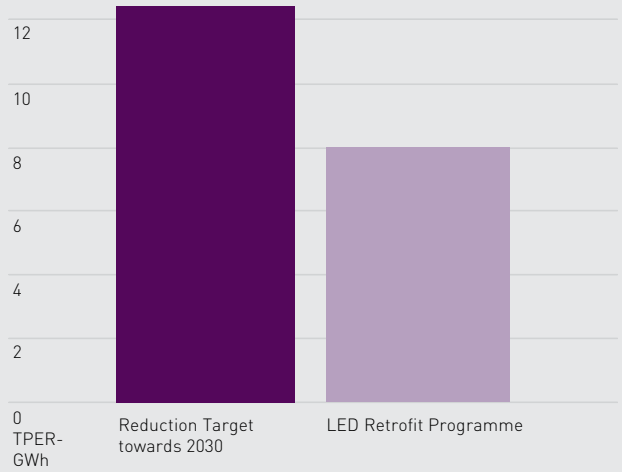


Figure 8: Public Lighting Plan towards 2030, compared to overall reduction target

points into their activity metrics in the M&R system so that the local authorities can account for this additional service and not be penalised for the additional electricity consumed. This will therefore negate the negative impact on the local authorities and their targets. Smart City applications are also looking to use public lighting infrastructure to roll out smart technology that will accommodate different sensors within the public lighting columns.

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

TRANSPORT

Transport is the second largest SEU within FCC, and comprises of fuels used for Council vehicles (including light and heavy vehicles), and fuels used by the park services. In 2019, Transport accounted for 15% of FCC's total primary energy consumption. This amounts to 6.3 GWh of primary energy, 1,512 tonnes of CO_2, or an estimated €597,874 in energy costs. Transport consists of 304 Council vehicles; this includes light, commercial and heavy vehicles. Within Transport, road diesel accounts for 63% of the total primary energy consumption. Marked diesel accounts for 33%, while petrol accounts for just 4%, as it is only used to fuel small equipment. This breakdown is shown in Figure 9 below.

Identification of Relevant Variables

Due to a lack of robust historical data relating to kilometres driven or efficiency of the fleet, Codema previously used the number of vehicles to develop a performance indicator for Transport. A vehicle telematics system is now in place in FCC's fleet, which tracks the distance driven and fuel consumption of the vehicles on an ongoing basis. This data is currently being used by FCC to analyse fleet energy performance on a monthly basis, using the EnPI of kWh of fuel consumed per 100 kilometres travelled. For the 2018 Energy Review and going forward, this indicator is now used as the EnPI for Transport:

Transport EnPI =
kWh TPER / 100 km Travelled

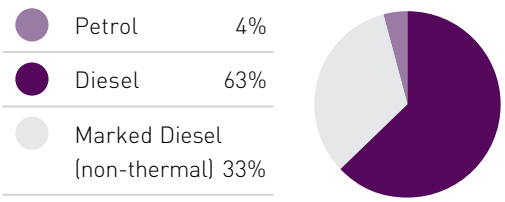


Figure 9: FCC Transport Fuels TPER - 2019

FCC Transport 2019

CONSUMED 6.3 GWH OF PRIMARY ENERGY

1,512 TONNES OF CO_2 EMITTED

€597,874 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 13.4% SINCE BASELINE

Energy Performance of Transport

The database shows that the energy performance of Transport has improved by 13.4% since the baseline year. This is an absolute reduction of 3.3 GWh[2] of primary energy and 596 tonnes of CO_2. From 2010 onwards, there was a significant improvement in the energy performance of the fleet. This could be attributed to the introduction of newer, more fuel-efficient vehicles to replace older vehicles, but without robust historical energy performance indicators, it is hard to identify a definitive reason for this improvement. In 2018, however, this trend was dramatically reversed, with more fuel consumed in that year than any of the previous eight years. Compared to 2017, an increase of 13% was reported, equating to an additional 829 MWh of primary energy and 199 tonnes of CO_2, most of which is attributable to an increase in the consumption of road diesel.

2. The energy database has provisions incorporated to account for the outsourcing of waste collection, and also to take into account the use of Irish Water within the local authority fleet.

Overall in 2019, the energy performance of Transport decreased by 17% compared to 2018. Road diesel consumption reduced somewhat, but it still remained above the levels reported in previous years. This reduction is likely due to the retirement of older, more inefficient vehicles and their replacement with electric vehicles, as well as improved energy management practices and energy awareness amongst drivers. Bulk fuel consumption, on the other hand, increased sharply in 2019. An increase of 80% was reported over the 2018 figure, equating to an additional 545 MWh of primary energy and 130 tonnes of CO_2. Some of this increase in fuel consumption has been attributed to the additional areas in the County for which FCC has taken over responsibility over the past two years. This incorporates more playing pitches and housing estates in particular. From the monthly analyses carried out as part of the EnMS, it is clear that this trend is continuing month on month. Further investigation is required to determine the root cause of this issue and to halt any further decrease in energy performance.

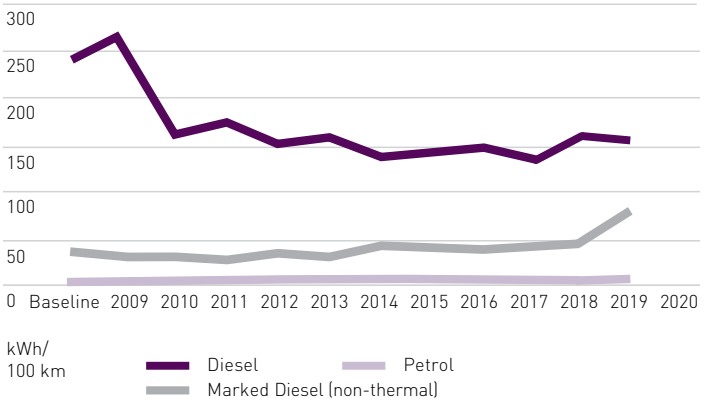


Figure 10: Transport Annual Energy Performance

TRANSPORT PLAN TOWARDS 2030

Fingal County Council is making significant efforts to electrify its fleet, and currently has 26 fully-electric Citroen Berlingo vans, two electric 3.5 ton tippers, five utility vehicles and one zero turn mower in operation. FCC also plans to purchase more vehicles, pending budgetary approval from senior management.

Combining the expected savings from these electric vehicles with continued efforts to improve driver habits, such as FCC's eco-driving programme, an achievable target of 0.6 GWh reduction in primary energy consumption has been set between now and 2020. This should also result in CO_2 savings of over 152 tonnes per year.

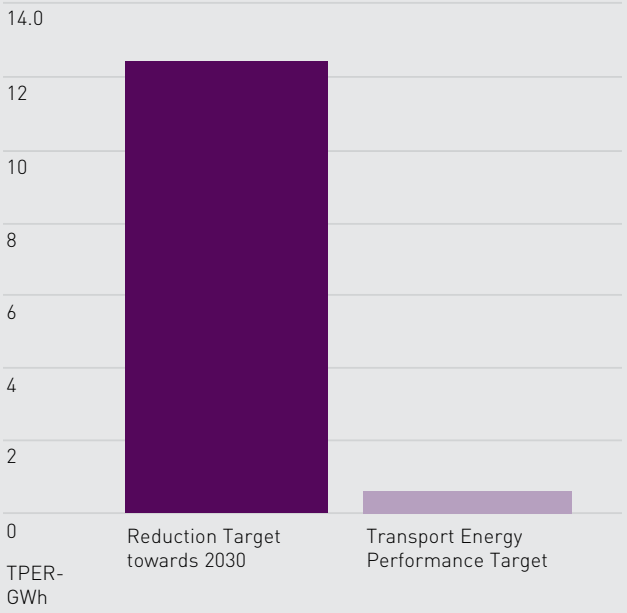


Figure 11: Transport Plan towards 2030, compared to overall reduction target

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

LARGE OFFICES

FCC has two large offices in the region, namely the County Hall in Swords and Civic Offices in Blanchardstown.

In 2019, these facilities accounted for 11% of FCC's primary energy consumption. This is a consumption of 5.9 GWh of primary energy, 1,068 tonnes of CO_2 and an estimated €312,000 in energy spend.

Identification of Relevant Variables for the Large Offices

In relation to the Large Offices, there are two main energy types: electricity and gas. When there are multiple variables that drive energy consumption, a composite performance indicator is used, as mentioned in the methodology section.

In terms of the electrical consumption, it is difficult to find a single significant driving factor for the energy consumption, as there are many variables that determine this, such as the number of employees, opening hours, floor area, etc. Gas consumption is largely dependent on the external temperature. Therefore, the composite performance indicator used to measure the Large Offices' energy performance is the energy consumed (kWh TPER), divided by a weighting scale of the total floor area (m^2) and Heating Degree Days (HDD). This is derived from the formula given in the methodology, as shown below:

Large Offices EnPI = kWh TPER / (m^2) (HDD)

FCC Large Offices 2019

CONSUMED 5.9 GWH OF PRIMARY ENERGY

1,068 TONNES OF CO_2 EMITTED

€312,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 24.6% SINCE BASELINE

Energy Performance of the Large Offices

The database shows that the Large Offices have improved their energy performance by 24.6% since the baseline year. This is an absolute reduction of 2 GWh of primary energy and 685 tonnes of CO_2. There have been significant decreases in the energy consumption of both the County Hall and Civic Offices, compared to the baseline. These decreases are clearly illustrated in Figure 12 and are mainly due to the improved energy management practices within both of these facilities. In 2019, there was an improvement in the energy performance in the Civic Offices in Blanchardstown, but a decline in the performance of County Hall in Swords. In County Hall, this decrease in energy performance is due to an increase in gas consumption. In the Civic Offices, the electricity consumption decreased marginally, but there was a large decrease of almost 13% in gas consumption compared to 2018. This is due to issues with the BMS controls throughout 2018 being rectified by facilities management.

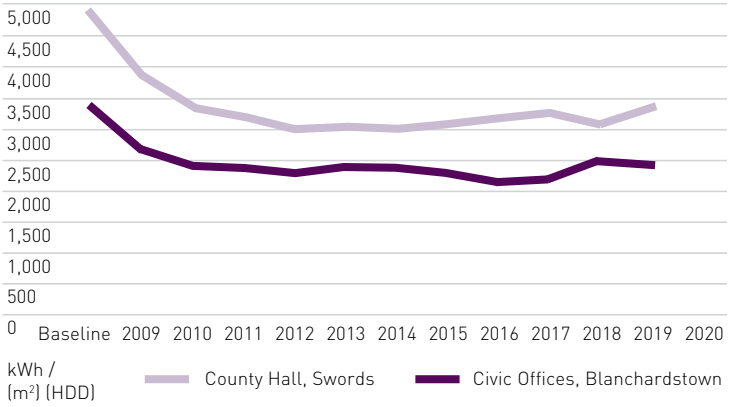


Figure 12: Large Offices' Annual Energy Performance

LARGE OFFICES' PLAN TOWARDS 2030

FCC's Facilities Management, with the assistance of Codema, is currently in the process of procuring an Energy Performance Contract (EPC) project and has carried out detailed energy audits of County Hall in Swords and the Civic Offices in Blanchardstown.

The project will also include the Draíocht Arts Centre and Blanchardstown Library, due to their close proximity to the Civic Offices.

The EPC is currently within the competitive dialogue stage of the procurement phase and it is hoped that the contract will be awarded and the works commenced before the end of 2020.

By implementing an EPC project in these buildings, there is the potential to save 1.05 GWh of TPER and 190 tonnes of CO_2.

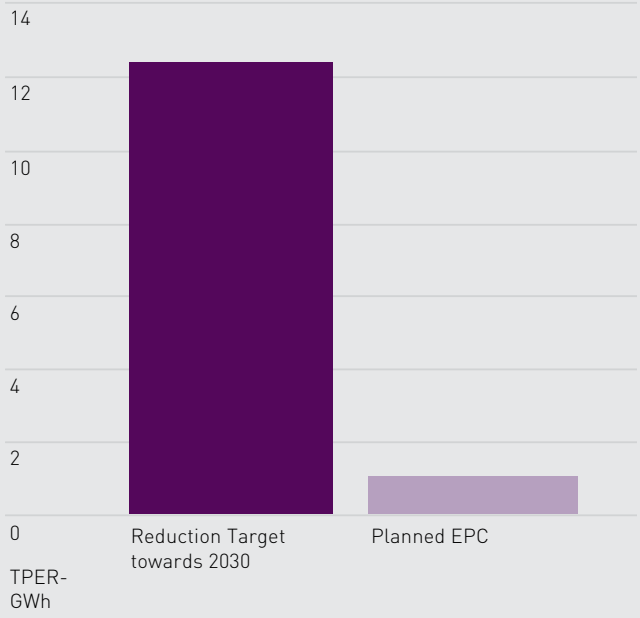


Figure 13: Large Offices' Plan towards 2030, compared to overall reduction target

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

LIBRARIES

Libraries are the fourth largest energy consumer within FCC. FCC currently operates 10 libraries in the region, as well as a mobile library depot, which together accounted for 6% of the Council's primary energy requirement in 2019. This is a total consumption of 3.1 GWh of primary energy, 557 tonnes of CO_2, and approximately €195,000 in energy spend.

Identification of Relevant Variables

In relation to Libraries, electricity and gas are the two main energy types. These facilities have multiple variables that drive energy consumption, so a composite performance indicator is used to determine their overall performance. Within Libraries, various factors such as footfall, opening hours and floor area determine the overall energy consumption. Gas consumption is based on external temperature. Therefore, the composite performance indicator used to measure the facilities' energy performance is the energy consumed (kWh TPER) divided by a weighting scale of the total floor area (m^2) and Heating Degree Days (HDD). This is shown in the formula below:

Libraries EnPI =
kWh TPER / (m^2) (HDD)

Energy Performance of the Libraries

The Energy Database shows that there has been an improvement of 12.3% in the energy performance of the Libraries since the baseline year, based on the EnPI. This is an absolute energy reduction of 488 MWh and 212 tonnes of CO_2. Of these facilities, the Blanchardstown Library and Draíocht Arts Centre are the largest energy consumers, accounting for 55% of the total. Balbriggan Library is the next largest consumer at 13%, followed by Rush and Malahide Libraries at 11% and 8% respectively.

The energy performance of the libraries improved by 6.5% in 2019 compared to 2018, as depicted in Figure 14. Figure 15 shows a breakdown of this energy consumption by each individual site back to its baseline, including the significantly higher energy consumption of the Blanchardstown and Draíocht account. The main savings were achieved by a reduction in energy consumption in Blanchardstown Library and Draíocht Arts Centre, which saw a 17% improvement in energy performance in 2019 compared to 2018. Other libraries that saw an improvement in performance were Skerries, Swords and the mobile library service. Some of these gains were cancelled out by decreases in energy performance in three other libraries. Baldoyle in particular saw a huge deterioration in energy performance of over 170%. Balbriggan, which was already one of the worst performing libraries, reported a decrease in energy performance of 61% in 2019 compared to 2018. At Rush Library, energy performance continued to decline in 2019 and it is now the

FCC Libraries 2019

CONSUMED 3.1 GWH OF PRIMARY ENERGY

557 TONNES OF CO_2 EMITTED

€195,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 12.3% SINCE BASELINE

second worst performing library after Balbriggan. Combined, these three libraries account for approximately 30% of the total Libraries' energy consumption. These three Libraries saw faults in the heating systems in 2019, which resulted in this deterioration in energy performance due to the increased use of mobile electrical heaters in the facilities. The fluctuations in energy performance of the Libraries since the baseline illustrates the operational nature of these facilities and how their operations can change over the years in relation to opening hours for the public.

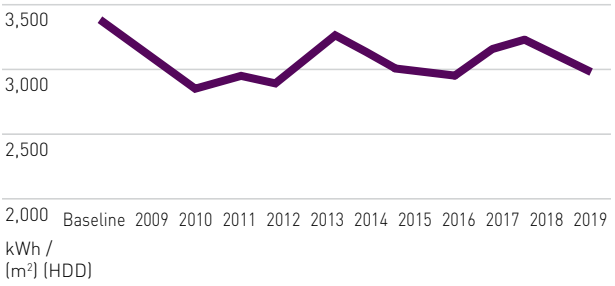


Figure 14: Libraries' Overall Annual Energy Performance

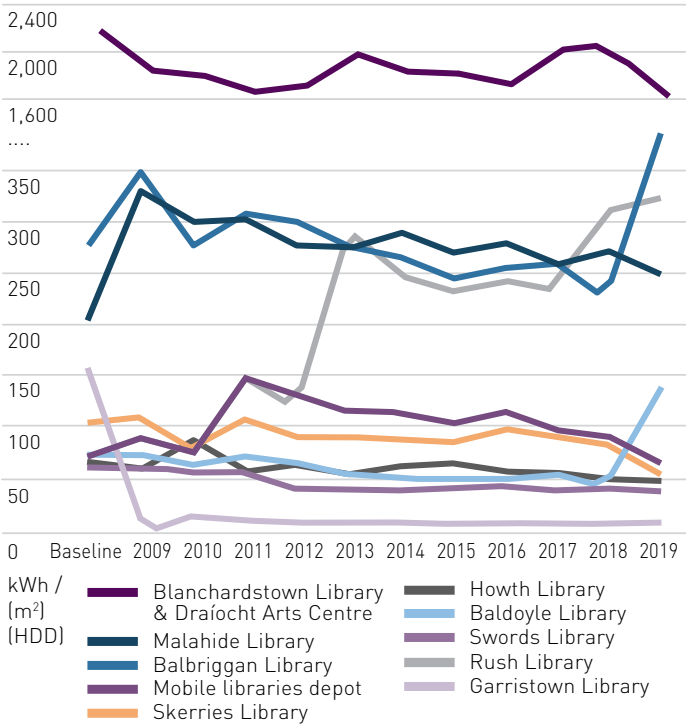


Figure 15: Libraries' Individual Annual Energy Performance

LIBRARIES' PLAN TOWARDS 2030

FCC's Facilities Management, with Codema's assistance, is currently engaged in the procurement of an EPC project and has carried out detailed energy audits of County Hall in Swords and the Civic Offices in Blanchardstown. The project will also include the Draíocht Arts Centre and Blanchardstown Library, due to their close proximity to the Civic Offices. The EPC is currently in the competitive dialogue stage of the procurement phase of the project and it is hoped that the contract will be awarded and the works commenced before the end of 2020. By implementing this EPC project, there is the potential to save 0.34 GWh of TPER and 62 tonnes of CO_2.

A further five libraries have been identified as possibly being suitable for a combined LED retrofit and rooftop solar PV project, as detailed later in the "Non-SEU Project" section. If this projected is developed, it could result in a reduction in primary energy consumption in libraries of 0.16 GWh and a CO_2 reduction of 27 tonnes per annum. As mentioned earlier, some of the smaller libraries have experienced issues in relation to aged heating systems. The libraries in question were Balbriggan, Baldoyle and Rush. These libraries saw faults in their current heating systems. The libraries' management plan is to utilise the current maintenance contracts to rectify the heating system faults. It is recommended that library management utilises the procurement process to ensure the new system operates efficiently.

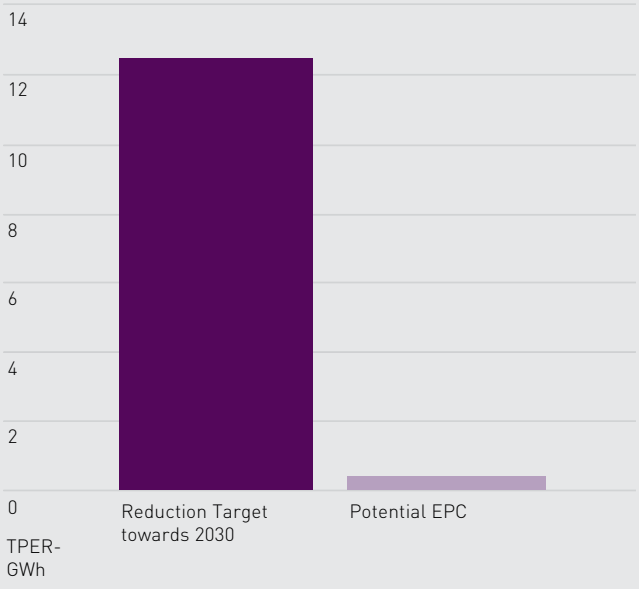


Figure 16: Libraries' Plan towards 2030, compared to overall reduction target

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

OPERATIONS

Operations is the fifth largest SEU within FCC, and comprises of small offices and depots. The depots account for 91% of the energy consumed within this SEU, while the small offices account for the remaining 9%. In 2019, these facilities accounted for 4% of FCC's total primary energy consumption. This is amounted to 2.1 GWh of primary energy, 376 tonnes of CO_2 and an estimated €183,000 in energy spend.

Identification of Relevant Variables for Operations

In relation to Operations, there are two main energy types: electricity and gas. When there are multiple variables that drive energy consumption, a composite performance indicator is used, as mentioned in the methodology section.

In terms of the electrical consumption, it is difficult to find a single significant driving factor for the energy consumption, as there are many variables that determine this, such as the number of employees, opening hours, floor area, etc. Gas consumption is once again largely dependent on the external temperature. Therefore, the composite performance indicator used to measure the Operations' energy performance is the energy consumed (kWh TPER), divided by a weighting scale of the total floor area (m^2) and Heating Degree Days (HDD). This is derived from the formula given in the methodology, as shown below:

Operations EnPI = kWh TPER / (m^2) (HDD)

FCC Operations 2019

CONSUMED 2.1 GWH OF PRIMARY ENERGY

376 TONNES OF CO_2 EMITTED

€183,000 ASSOCIATED ENERGY COST

DECLINE IN ENERGY PERFORMANCE BY 0.5% SINCE BASELINE

Energy Performance of Operations

The database shows that the energy performance of Operations has declined by 0.5% since the baseline year, although the absolute primary energy consumption has actually decreased marginally over this period by 22 MWh. Annual CO_2 emissions have decreased by 109 tonnes, mostly due to the decarbonisation of electricity production and transmission on the national grid.

In 2018, the energy performance of Operations declined by a significant margin of 9% compared to 2017. There was a further decrease again in 2019 of 3.5%. Figure 17 clearly shows that

this is due to substantial increases in energy consumption in the depots category since 2015. The energy performance of the depots has declined by almost 39% over this five-year period, which is a cause for concern. Further analysis of the energy data from the individual depots shows that the decrease in energy performance can be attributed to Malahide Castle, and in particular its newly-installed Butterfly House, which has led to a sharp increase in electrical consumption at this depot.

The energy performance of the small offices, on the other hand, has been slowly improving since the baseline, although small declines in performance have been noted in the past two years. Despite this, the energy performance of the small offices has improved by 27% since the baseline year.

Figure 17: Operations' Annual Energy Performance

OPERATIONS' PLAN TOWARDS 2030

While steady energy savings have been made in the small offices since the baseline, progress in the depots, which account for the majority of the energy use in this SEU, has been far slower. To counter the poor energy performance in the depots due to the installation of the Butterfly House at Malahide Castle, management has engaged a consultant to help design a more energy efficient solution to supply heat to the facility.

By targeting the energy management systems of the depots in particular, an ambitious yet achievable target of a further 0.5 GWh of primary energy savings, corresponding to 90 tonnes of CO_2, has been set for this SEU by 2020.

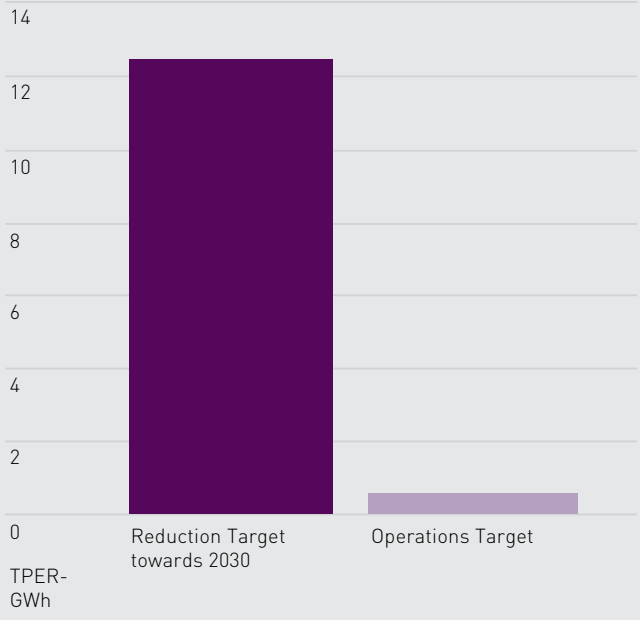


Figure 18: Operations' Plan towards 2030, compared to overall reduction target

04. NON-SEU PROJECTS

NON-SEU PROJECTS

In early 2020, Codema conducted an analysis to determine the potential for the installation of solar PV on Council buildings. From a shortlist of 30 FCC buildings, 12 were deemed as potentially suitable. Before considering renewables, improvements in energy efficiency should always be targeted first. With this in mind, LED lighting upgrades would be recommended as a key component of any PV project. The full cost of such a project might be in the region of €750,000. If all the available roof space on these facilities was utilised, the total combined electricity generation from these 12 sites could amount to 275,000 kWh per year. LED retrofits could save a further 420,000 kWh in primary energy. This could potentially reduce FCC's carbon emissions by 139 tonnes of CO_2 per year.

Codema has carried out similar assessments for all four Dublin Local Authorities (DLAs), and in March 2020 submitted an expression of interest for funding for a combined project under the 2020 Climate Action Fund.

The Climate Action Plan 2019 to Tackle Climate Breakdown set out a requirement for all public buildings to achieve a minimum Building Energy Rating (BER) of B by 2030. A study was recently completed by Codema to determine what this will require of FCC, and the effect it may have on the Council's energy efficiency and emissions targets. The study was limited to just the 15 buildings that currently have Display Energy Certificates (DECs).

If these buildings were upgraded to achieve the B BER standard, a theoretical reduction in CO_2 emissions of 696 tonnes is predicted, at a total cost of €4.2 million. In reality, the actual savings would probably be closer to 650 tonnes of CO_2 per year, due to overestimations inherent in the BER calculation methodology.

05. CONCLUSION

FCC has achieved energy savings of 34.5% between the baseline year and 2019. While these savings are substantial, and FCC has now provisionally achieved its 2020 energy efficiency target, the Council still needs to look towards 2030 and the new 50% energy efficiency and 40% carbon reduction targets. These targets will require the Council to achieve a further 15.5% improvement in energy efficiency and an annual reduction in CO_2 of 1,150 tonnes. Further increases to these targets may be expected, in line with the EU Commission's proposed 2030 Climate Target Plan, which targets a minimum of 55% reduction in greenhouse gas emissions by 2030.

As many of the "low hanging fruit" energy saving actions have already been taken, achieving these targets will require the development of significantly more ambitious and innovative energy programmes and projects.

The energy efficiency projects detailed within each of the five key SEUs in this report will contribute towards this, and set FCC on the right path towards achieving its 2030 energy efficiency and carbon reduction targets. Further continued improvement should be sought, not just in energy performance but also in the use of the current energy management system. The EnMS is key to maintaining the current level of energy performance and also identifying opportunities for improvement and communicating FCC's progress in relation to its energy efficiency and carbon reduction goals and achievements.

In terms of the smaller accounts, which are not highlighted in this report, it is recommended that FCC develops a framework of contractors for the implementation of energy saving measures within these facilities. This framework will incorporate the maintenance and upgrade of energy-related systems, with a focus on performance guarantees where suitable. Codema will support FCC with the development of this framework, which will focus on the smaller energy consumers within the Council. This is important, as it highlights the "exemplary role" to the public, as set out in S.I. 426 of 2014.

Figures 19 and 20 on the next page illustrate FCC's gap-to-target model to 2030 for both energy efficiency and CO_2 emissions. As stated earlier in this report, FCC has provisionally achieved its 33% energy efficiency target one year ahead of the target deadline of 2020 and is also ahead of its glide path towards achieving both its 50% energy efficiency and 40% carbon reduction targets by 2030. To ensure that this trend continues, the Council will need to actively identify further energy efficiency and carbon reduction measures.

The gap-to-target in terms of energy reduction stands at 12.4 GWh, which will need to be tackled over the coming decade. This will be a major challenge, and must be addressed now. It is the cumulative effect of GHGs in the atmosphere which determines the extent of global heating, so given the urgency of the climate emergency, these actions cannot be put off until the latter part of this decade. As a result of these energy efficiency measures and the decarbonisation of the national electricity supply, it is likely that the 40% GHG reduction target set by the Council will comfortably be met. It would be advisable to review this target upwards in an effort to show leadership on climate action, and in anticipation of the expected increase of this target to 50% by the Government.

04. CONCLUSION
(CONTINUED)

SEU AREA	ACTION	ESTIMATED SAVINGS
PUBLIC LIGHTING	PUBLIC LIGHTING REPLACEMENT PROGRAMME	8 GWH
TRANSPORT	PARTIAL ELECTRIFICATION OF THE FLEET AND CONTINUED ECO-DRIVING PROGRAMME	0.6 GWH
LARGE OFFICES	EPC IN COUNTY HALL IN SWORDS AND THE CIVIC OFFICES IN BLANCHARDSTOWN	1.05 GWH
LIBRARIES	EPC PROJECT IN LIBRARY AND DRAÍOCHT ARTS CENTRE IN BLANCHARDSTOWN	0.34 GWH
OPERATIONS	ENERGY EFFICIENCY PROGRAMME	0.5 GWH

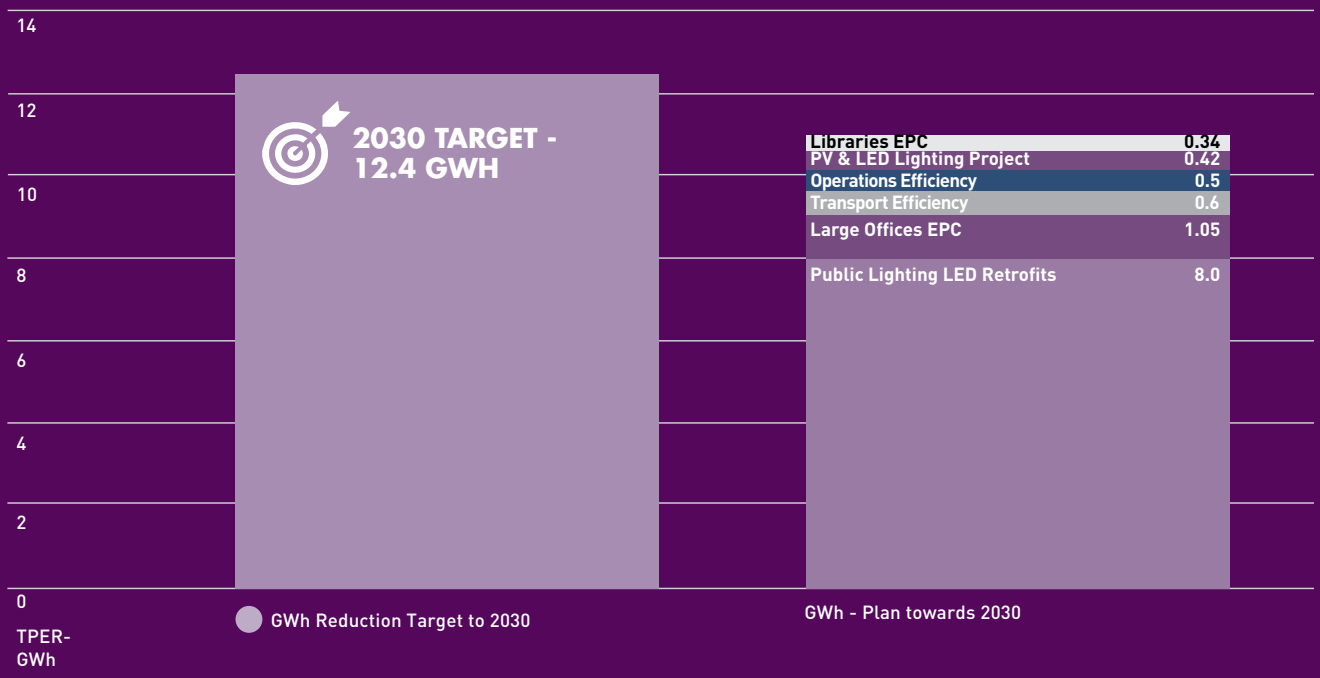


Figure 19: FCC Energy Efficiency Plan towards 2030

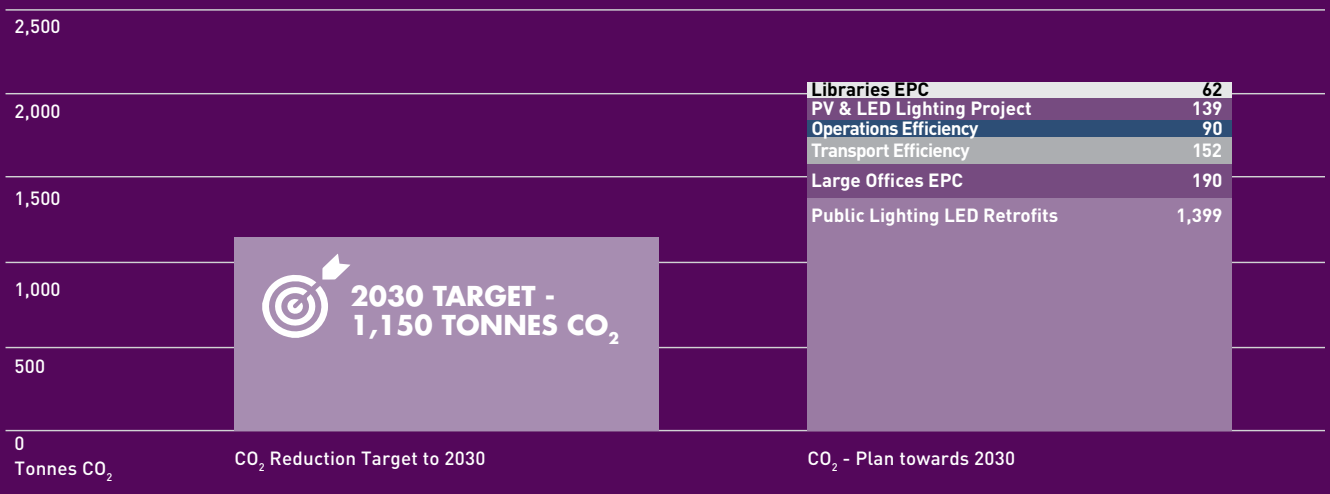


Figure 20: FCC Carbon Reduction Plan towards 2030 Target

06. APPENDICES

SEU Summary

Table 1 SEU Summary

SEU	TPER - GWh	Tonnes CO_2	Cost	% +/- since baseline
Public Lighting	28.6	5,004	€1,619,270	-25.7%
Transport	6.3	1,512	€597,874	-13.4%
Large Offices	5.9	1,068	€311,895	-24.6%
Libraries	3.1	557	€ 194,516	-12.3%
Operations	2.1	376	€183,735	0.5%
Total	46	8,517	€2,907,290	

Project Plan towards 2030 Summary

Table 2 Project Plan Summary

SEU	TPER - GWh	Tonnes CO_2
Public Lighting	8.0	1,399
Transport	0.6	152
Large Offices	1.05	190
Libraries	0.34	62
Operations	0.5	90
Non-SEU Projects: PV & LED Projects	0.42	139
Total	10.91	2,032

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Abbreviations

BER	Building Energy Rating
CO_2	Carbon Dioxide
DCACNT	Department of Climate Action, Communication Networks and Transport
DEC	Display Energy Certificate
DLAs	Dublin Local Authorities
EnMS	Energy Management System
EnPIs	Energy Performance Indicators
EPC	Energy Performance Contract
FCC	Fingal County Council
FTE	Full Time Employees
GHG	Greenhouse gas
GPRNs	Metered Gas Accounts
GWh	Gigawatt hour
HDD	Heating Degree Days
kWh	Kilowatt hour
LED	Light Emitting Diode
m^2	Metres Squared
M&R	Monitoring and Reporting
M&V	Measurement and Verification
MPRNs	Metered Electrical Accounts
MWh	Megawatt hour
PV	Photovoltaic
SEAI	Sustainable Energy Authority of Ireland
SEUs	Significant Energy Users
SON	High Pressure Sodium
SOX	Low Pressure Sodium
TPER	Total Primary Energy Requirement
UMR	Unmetered Registrar

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