DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL ENERGY REVIEW 2019

Codema
Dublin's Energy Agency

dlr
Comhairle Contae County Council

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01. INTRODUCTION

Codema has developed this Energy Review on behalf of Dún Laoghaire-Rathdown County Council (DLRCC), which is one of the largest local authorities in Ireland. The aim of this Energy Review is to highlight the total amount of energy DLRCC consumed in 2019, along with the total cost and carbon emissions associated with this energy use. 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 DLRCC to identify where it currently is in relation to public sector energy targets, and what areas it needs to prioritise in order to meet new 2030 targets.

As part of this process, Codema has analysed DLRCC's total energy use and has broken this down into six Significant Energy Users (SEUs), which are explained in detail within this Energy Review. Codema revised DLRCC'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 DLRCC must take to reduce energy consumption in each SEU area and meet 2030 targets.

Additionally, Codema has included a summary of DLRCC's progress in terms of its carbon emissions. Under the Covenant of Mayors programme, which DLRCC signed up to in 2016, DLRCC has voluntarily set a target of reducing its greenhouse gas emissions (GHGs) by 40% by 2030. This target has also been included in DLRCC's Climate Change Action Plan (CCAP) 2019-2024, and goes beyond the 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


DLR LEISURE & CIVIC CAMPUS


FLEET


CORPORATE SERVICES


LEXICON


BALLYOGAN OPERATIONS DEPOT

Current Status & Obligations

In 2019, DLRCC consumed a total of 49.3 gigawatt hours (GWh) of primary energy; this is the equivalent of 8,800 tonnes of CO_2, and Codema estimates the associated cost of this energy use to be approximately €4.1 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 the Environment, Climate and Communications (DECC). 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 DLRCC. These changes are made throughout the system, from the baseline year to date, and don't affect the baseline or reduction target.

This is the second year that Codema has entered the data on DLRCC's behalf to the system, 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 date, as reported by the M&R system, DLRCC has improved its energy performance by 37.2%, compared to the baseline year of 2009. This amounts to an absolute saving of 17.8 GWh of primary energy or 6,000 tonnes of CO_2, when compared to the baseline. This means that DLRCC has 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 2009 baseline and a 30% reduction in CO_2 by 2030 have been set. This will demand continued and increased focus on the energy performance of DLRCC's buildings and operations over the coming decade. As many of the "low hanging fruit" energy saving actions have already been implemented, this will require the development of more ambitious and innovative energy programmes and projects.

DLRCC Energy Overview 2019

CONSUMED 49.3 GWH OF PRIMARY ENERGY

8,800 TONNES OF CO_2 EMITTED

€4.1 MILLION ASSOCIATED ENERGY COST

Public Sector Obligations

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

REDUCTION TARGET OF 3% PER YEAR

DLRCC Progress: Baseline - 2019

IMPROVED ENERGY PERFORMANCE BY 37.2%

6,000 TONNES OF CO_2 SAVED

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

01. INTRODUCTION
(CONTINUED)

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 has remained operating at a reduced capacity in 2020, so it is unlikely that any reversal in this trend will be observed for the 2020 M&R reporting cycle.

To ensure DLRCC reaches both its energy efficiency and climate reduction targets and complies with all legal and other requirements in relation to energy efficiency, DLRCC decided to implement and maintain the energy management system (EnMS) ISO 50001: 2018, which is the international standard for energy management. This Energy Review was carried out in line with some of the requirements of ISO 50001. DLRCC successfully achieved recertification to the new 2018 standard in February 2020.

Methodology

In order to calculate potential energy savings in DLRCC, 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 DLRCC's energy performance more accurately. This method determines how efficiently DLRCC 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.

In the case of DLRCC, the overall performance indicator is based on a composite metric. Therefore, DLRCC's EnPI is the TPER divided by the floor area of the facilities, the population served for that year, the number of public lights and the percentage of sewage treatment plants that have adapted to the new water treatment standards. In other words, the performance of DLRCC is determined not only by its annual energy use, but also by a rise or fall in floor area, population in the Dún Laoghaire-Rathdown area, and the number of public lights in the same year. Savings are based on cumulative absolute primary energy and carbon savings from the baseline year to 2019.

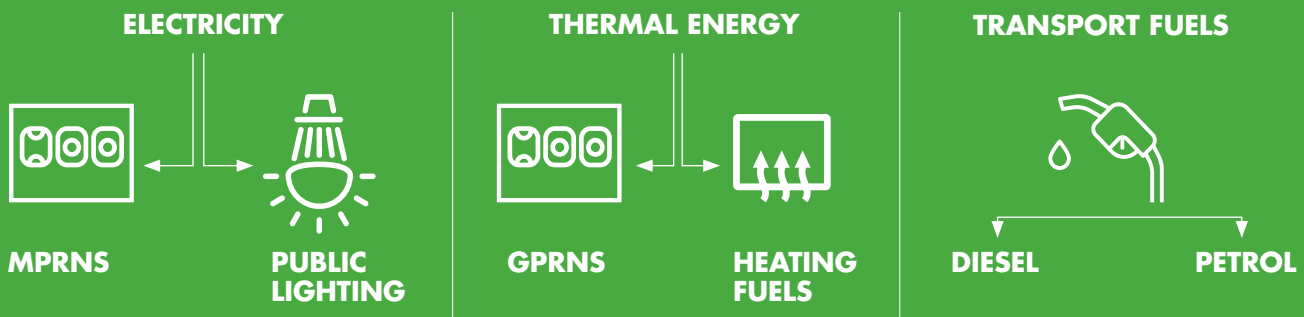
In 2013, water services within the local authorities were transferred to Irish Water. The M&R system and Codema's database have provisions to account for these changes, and therefore accurately track the actual energy performance of the local authority from the baseline year to 2019, which takes proper account of services that have been outsourced.

Formula for Calculating EnPIs for SEUs

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

02. DLRCC ENERGY CONSUMPTION 2019

The energy database shows that DLRCC consumed 49.3 GWh of primary energy and produced 8,800 tonnes of CO_2 in 2019. Codema estimates the costs associated with this energy use to be approximately €4.1 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 DLRCC's buildings and unmetered public lights. Thermal energy consumption consists of metered gas accounts (GPRNs) and heating fuels data from buildings, while transport accounts for all the transport fuels within DLRCC, i.e. diesel and petrol.



02. DLRCC ENERGY CONSUMPTION 2019
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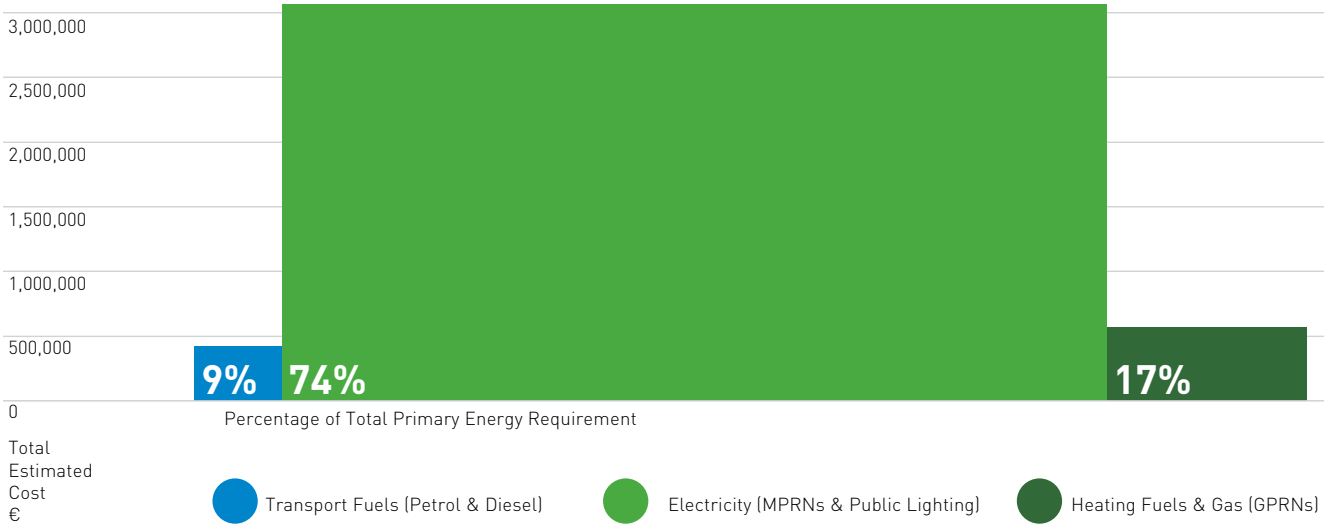


Figure 1: DLRCC Energy Categories - 2019

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 74%. The reasons for this are the large number of public lights in the Dún Laoghaire-Rathdown area and the vast amount of electricity accounts within DLRCC'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 DLRCC improved its energy performance by 37.2% between the baseline year and 2019. This represents an absolute saving of 17.8 GWh of primary energy or 6,000 tonnes of CO_2. This means that DLRCC 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 12.8%, meaning that DLRCC must improve its energy performance by a further 12.8% compared to its original baseline between now and 2030. This is estimated to be a reduction of 9.5 GWh[1] in primary energy. Therefore, an annual reduction of 1 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 DLRCC's absolute energy consumption compared to the baseline year. Figure 3 illustrates DLRCC's normalised annual energy performance compared to the 50% glidepath. This takes into account the rise and fall of the activity metrics, and tracks them compared to DLRCC's TPER of all fuel sources.

Figures 2 and 3 show a decrease in energy consumption in 2011, which was mostly due to a decrease in Public Lighting. In 2011, the Public Lighting Department transferred a number of accounts back to the National Roads Authority and the savings from this are still accounted for, as the data necessary to remove them was not available. Since 2016, further significant savings have been seen in Public Lighting due to the rollout of LEDs over this period. From 2014 onwards, energy consumption began to decrease across all SEU areas within the Council, and has dropped steadily year-on-year up to 2019. This shows the benefits of an integrated energy management system that monitors energy performance across all SEUs and promotes energy awareness throughout the Council.

1. Codema calculated this figure using SEAI's new gap-to-target tool, which takes into account the potential changes in the conversion factors and percentage increases of the activity metrics up until 2030.

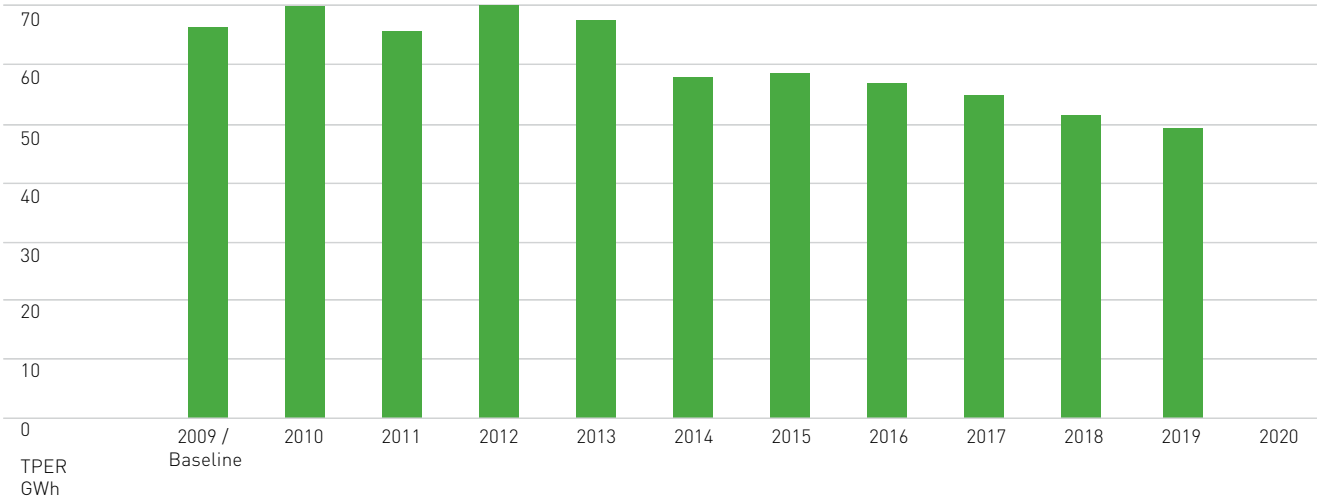


Figure 2: DLRCC Absolute Annual Energy Consumption

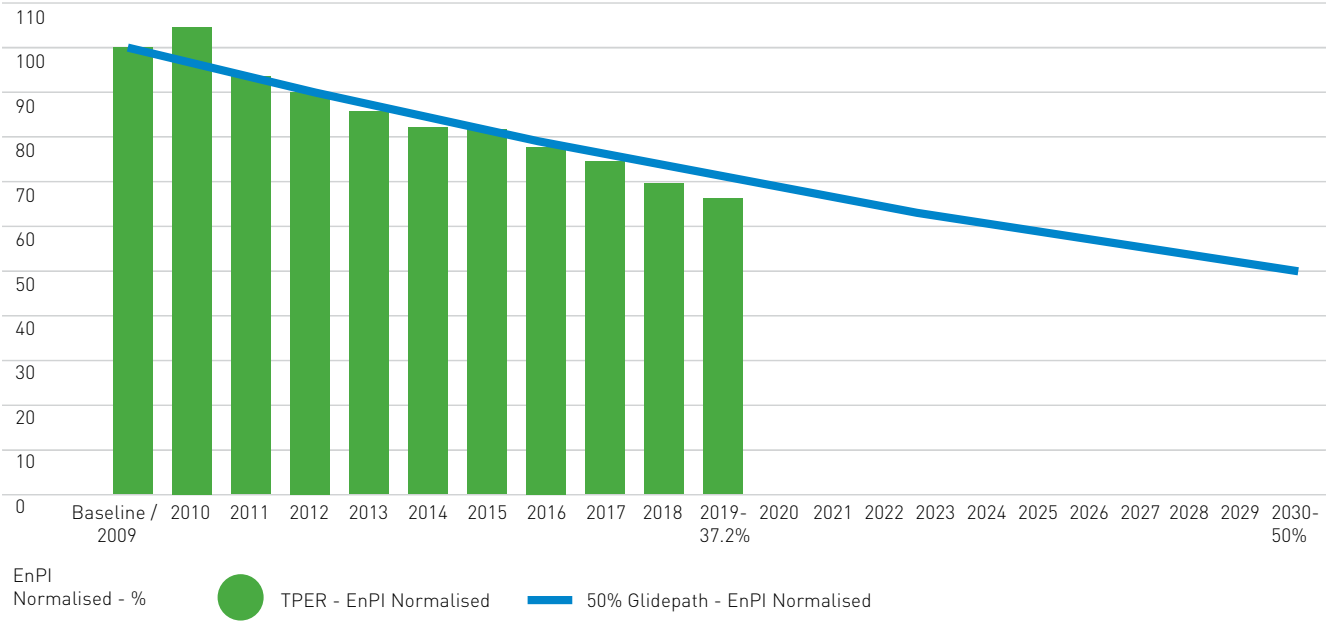


Figure 3: DLRCC Annual Energy Performance Compared to 50% Glidepath

02. DLRCC ENERGY CONSUMPTION 2019
(CONTINUED)

CLIMATE CHANGE ACTION PLAN & CARBON EMISSIONS

In 2018 and 2019, Codema helped to prepare DLRCC's Climate Change Action Plan 2019-2024, in cooperation with the various departments and the Elected Members of Dún Laoghaire-Rathdown 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 Dún Laoghaire-Rathdown a more climate-resilient region 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, DLRCC is well ahead of its glidepath and has already achieved its 40% reduction target, as presented in Figure 4 below. Compared to the baseline year, DLRCC's CO_2 emissions in 2019 had reduced by 40.5% to 8,800 tonnes. The significant savings in 2018 and 2019 are due to the continued retrofit of the public lighting infrastructure to LEDs, combined with updated conversion factors reflecting the significant decarbonisation of electricity supplied through the national grid.

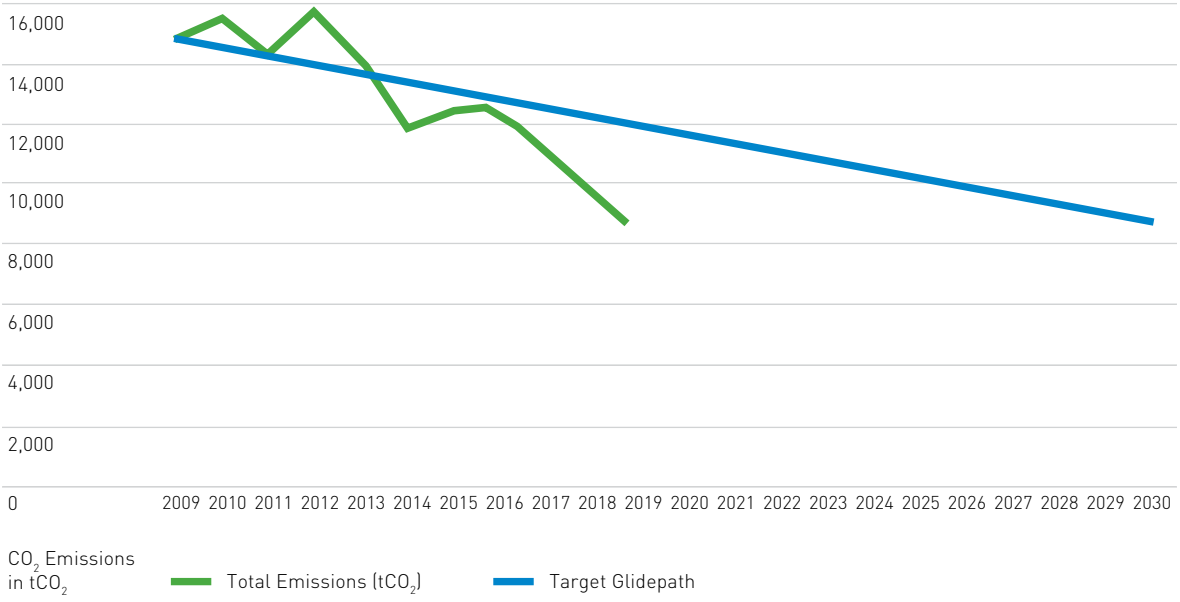


Figure 4: DLRCC Annual CO_2 Emissions Performance Compared to 40% Glidepath

03. SIGNIFICANT ENERGY USERS

To help better understand DLRCC'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 DLRCC. Codema developed these SEUs by creating an energy database, which includes all the data reported in the M&R system and data compiled by DLRCC staff and Codema.

Codema and DLRCC 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. DLRCC'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 DLRCC'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. These EnPIs were generated with help from the SEU managers.

By analysing this data, Codema has identified six key areas, or SEUs, within the Council. These account for 86% of DLRCC's total primary energy requirement and can be broken down as follows:

PUBLIC LIGHTING 47%

dlr LEISURE & CIVIC CAMPUS 17%

FLEET 9%

CORPORATE SERVICES 7%

LEXICON 4%

BALLYOGAN OPERATIONS DEPOT 2%

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

Figure 5 on the opposite page shows the breakdown of DLRCC's SEUs. Public Lighting is the largest SEU, accounting for 47% of the total load. This is followed by dlr Leisure and Civic Campus at 17%, which includes the three leisure centres, Loughlinstown, Monkstown and Meadowbrook, as well as the Samuel Beckett Civic Campus. Fleet makes up 9% of the total load. Corporate Services accounts for 7% of the total load, which comprises of County Hall and Block 1 Harbour Square. The central library and cultural centre, the dlr LexIcon, accounts for 4% and the Ballyogan Operations Depot accounts for 2% of the total load. The remainder of the consumption is made up of smaller accounts within DLRCC, such as smaller offices, depots, and miscellaneous accounts.

The management of energy in these six SEUs is critical for DLRCC to achieve its 50% energy reduction target by 2030. Small energy reductions in these areas have a much greater effect on overall consumption than seemingly large reductions in the less significant areas. DLRCC'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 organisation as a whole.

Figure 6 shows how the SEUs performed in 2019, compared to 2018. With the exception of Fleet and DLR Leisure and Civic Campus, all other SEU areas recorded an improvement in energy performance in 2019, compared to the previous year. Public Lighting decreased its energy consumption by 2.5 GWh, due to the ongoing upgrading of public lights to LEDs. A significant improvement in performance of 21% was recorded in Ballyogan Operations Depot, while the LexIcon improved its energy performance by 1%. Corporate Services, consisting of County Hall and Block 1 Harbour Square, improved its energy performance by 11% in 2019, mostly due to improved energy management practices in the facilities and some energy efficiency upgrades in County Hall. The energy performance of Fleet has remained relatively static with a marginal decrease in energy performance of 0.1% in 2019, due to an increase in diesel consumption. The disimprovement in the energy performance of DLR Leisure and Civic Campus was mostly due to increased gas and electricity consumption at Meadowbrook and Monkstown Leisure Centres.

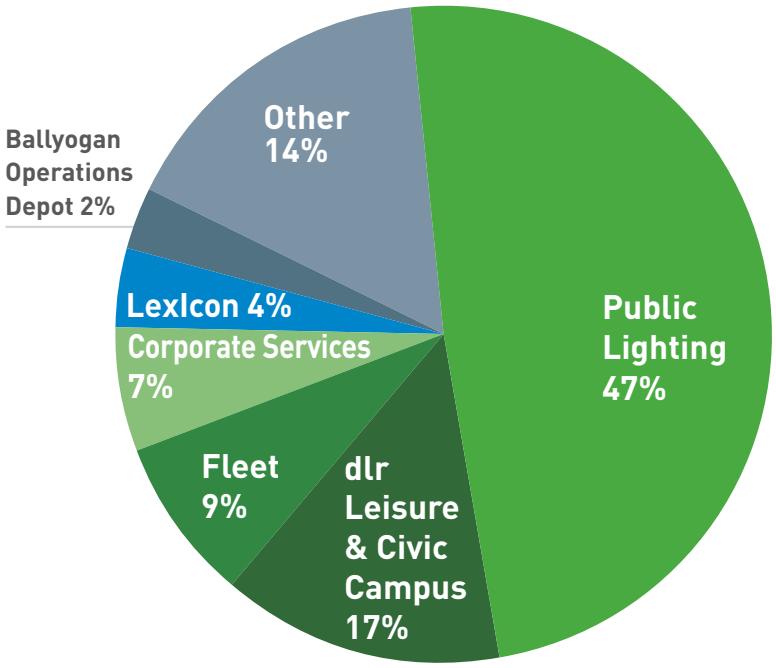


Figure 5: SEU Analysis

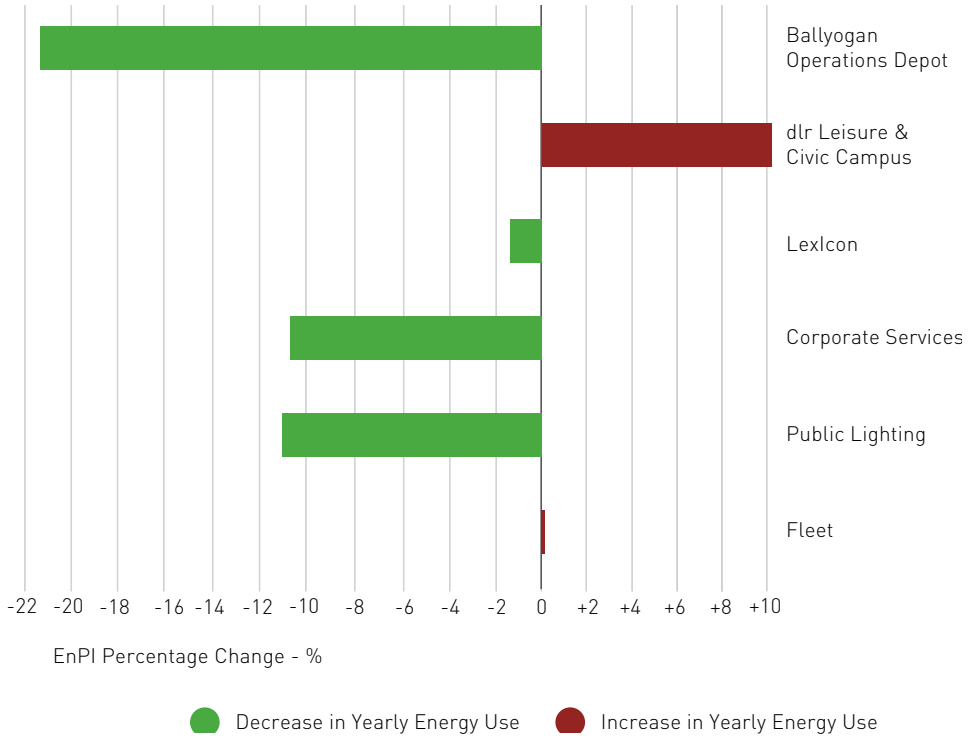


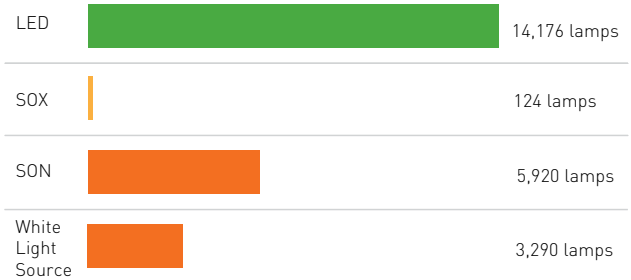
Figure 6: SEU Performance Change Between 2018 & 2019

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

PUBLIC LIGHTING

Public Lighting is the largest SEU within DLRCC. In 2019, Public Lighting accounted for 47% of DLRCC's primary energy consumption, which amounted to 23.2 GWh of primary energy, 3,912 tonnes of CO_2 and just under €2 million in energy costs. Public Lighting consists of 23,510 street lamps, which are broken up into four main different light sources. Listed below is a summary of these main light sources and their associated quantity; they are also listed in order of their efficiency:

- Light Emitting Diode (LED) – 14,176 lamps
- Low Pressure Sodium (SOX) – 124 lamps
- High Pressure Sodium (SON) – 5,920 lamps
- White Light Sources - 3,290 lamps



DLRCC Public Lighting 2019

CONSUMED 23.2 GWH OF PRIMARY ENERGY

3,912 TONNES OF CO_2 EMITTED

€2M ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 35% 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 also charged on a predefined number of burn hours per year, and is largely unmetered. Burn hours are reflected daily, 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, as shown in the formula below:

Public Lighting EnPI =
kWh TPER / number of public lights

Energy Performance of Public Lighting

To date, DLRCC's Public Lighting Department has already retrofitted over 14,176 lights with LEDs, with 4,662 of these replacements taking place in 2019. The energy database shows that Public Lighting has improved its energy performance by 35% since the baseline, based on its EnPI. This is an absolute annual reduction of 9.4 GWh of primary energy, and 3,288 tonnes of CO_2. This is illustrated in Figure 7.

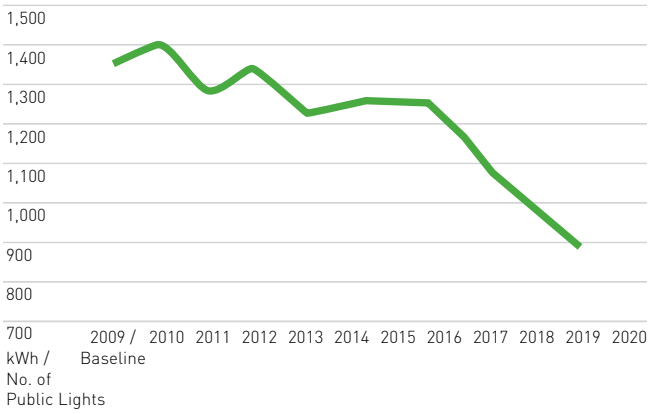
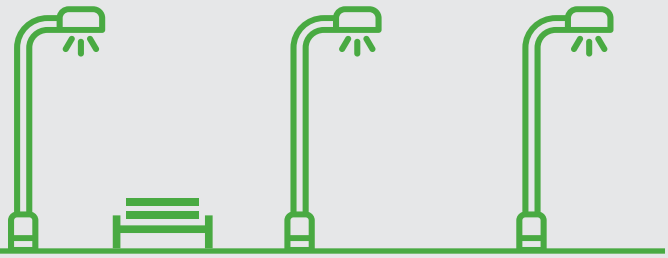


Figure 7: Public Lighting Annual Energy Performance

PUBLIC LIGHTING PLAN TOWARDS 2030



As Public Lighting is key to DLRCC achieving its energy efficiency target, the Council has committed to further energy reductions in this area between now and 2030. Energy reduction in electricity has more impact on the Council's targets than any other energy type, due to the poor primary energy conversion factor.

If DLRCC commits to replacing a further 2,000 lamps with LEDs, this will ensure that approximately 60% of its public lights will be LEDs by the end of 2020. As the vast majority of SOX lights have already been replaced, the bulk of these replacements will come from SON and white light sources. Replacing 2,000 of these lamps by 2020 could produce savings of 1.5 GWh of TPER and 257 tonnes of CO_2. This would have a significant impact on the Council's targets. In addition, an ongoing programme to replace the remaining street lighting with LEDs beyond 2020 is strongly recommended.

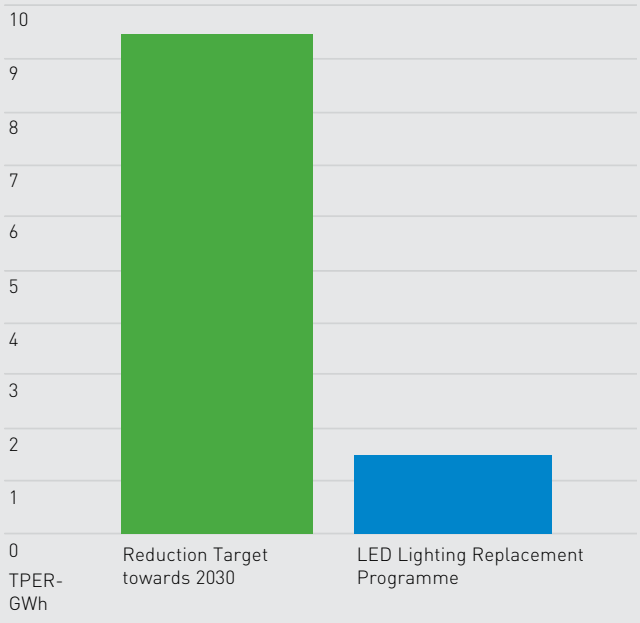


Figure 8: Public Lighting Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

dlr LEISURE & CIVIC CAMPUS

Dlr Leisure and the Samuel Beckett Civic Campus are the second largest energy consumers within DLRCC. DLRCC currently operates three large leisure centres, namely Loughlinstown, Monkstown and Meadowbrook Leisure Centres. Also included in this SEU is the Samuel Beckett Civic Campus. In 2019, these facilities accounted for 17% of the local authority's primary energy requirement. This is a consumption of 8.2 GWh of primary energy, 1,482 tonnes of CO_2, and an estimated €597,000 in energy spend.

Identification of Relevant Variables for dlr Leisure & Civic Campus

In relation to the leisure centres, electricity and gas are the two main energy types. 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 footfall, opening hours, floor area, etc. Gas consumption is mainly dependent on the external temperature. Therefore, the composite performance indicator used to measure dlr Leisure and the Samuel Beckett Civic Campus' energy performance is the energy consumed (kWh TPER) divided by a weighting scale of total floor area (m^2) and heating degree days (HDD), derived from the formula given in the methodology:

dlr Leisure & Civic Campus' EnPI = kWh TPER / (m^2)(HDD)

dlr Leisure & Civic Campus 2019

CONSUMED 8.2 GWH OF PRIMARY ENERGY

1,482 TONNES OF CO_2 EMITTED

€597,000 ASSOCIATED ENERGY COST

DECREASED ENERGY PERFORMANCE BY 20.9% SINCE BASELINE

Energy Performance of dlr Leisure & Civic Campus

The energy database shows that the energy performance of the dlr Leisure and Civic Campus SEU has declined by 20.9% since the baseline, compared to the EnPI. However, this figure is skewed by the addition of the swimming pool at Loughlinstown and the opening of the Samuel Beckett Civic Campus since the baseline year of 2009. When analysing each of the sites individually, using an appropriate baseline for each site, an improvement in energy performance can be seen across all four facilities, although this improvement is very small in some cases. A breakdown by each individual facility is provided in Figure 9.

Meadowbrook Leisure Centre is the largest energy consumer in this SEU group, accounting for 40% of this SEU's total primary energy requirement in 2019. Loughlinstown is next at 25%, followed by Monkstown at 24% and the Samuel Beckett Civic Campus at 11%. Figure 9 tracks the energy performance of these facilities since the baseline year of 2009. Energy performance in Monkstown and Meadowbrook Leisure

Centres has fluctuated from year to year but overall the energy consumption has increased since the baseline, with a decline in energy performance of 7.6% and 17.5%, respectively.

In 2013, Loughlinstown Leisure Centre was reopened following an extensive renovation of the existing dry leisure facilities and the addition of a swimming pool. While a significant increase in energy consumption was seen at the time, efficiency gains in the following years have slowly improved the site's performance. It is now operating 27.6% more efficiently than when it reopened.

In 2019, energy performance within all of the facilities under this SEU group declined, with an overall SEU performance decrease of 10.2% compared to 2018. At Meadowbrook, the combined heat and power (CHP) unit was out of operation for a portion of 2018. This resulted in reduced gas consumption but an increase in electricity consumption. The increase in imported electricity led to an estimated hike in energy costs of over €15,000, despite the energy consumption in the facility actually reducing compared to 2017. This unit is now fully operational again, which explains the large increase in energy consumption compared to 2018.

At Monkstown, electricity consumption increased by 27% compared to 2018, while gas consumption also increased by 6%. The Samuel Beckett Civic Campus recorded a decrease in energy performance of 4% compared to 2018.

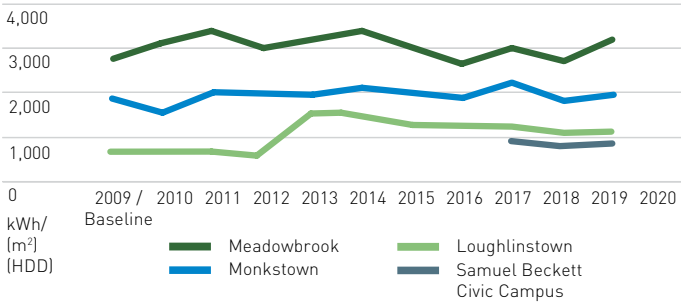


Figure 9: dlr Leisure & Civic Campus' Annual Energy Performance

dlr LEISURE & CIVIC CAMPUS' PLAN TOWARDS 2030

Codema is currently assisting DLRCC in implementing its first Energy Performance Contract (EPC) project involving Meadowbrook, Monkstown and Loughlinstown Leisure Centres. The EPC model puts the responsibility onto the contractor to guarantee energy savings over the lifetime of the contract. Energy savings are verified by a Measurement and Verification (M&V) process developed by both the Energy Service Company (ESCo) and the client.

Looking at the leisure centres, savings of up to 1.7 GWh in primary energy and 329 tonnes of carbon dioxide are expected to be achieved through measures such as:

- New or reconfigured CHP systems
- Upgrades to pumps and HVAC systems
- Improved control systems

The procurement process is currently at an advanced stage and it is envisioned that the contract could be awarded before the end of 2020.

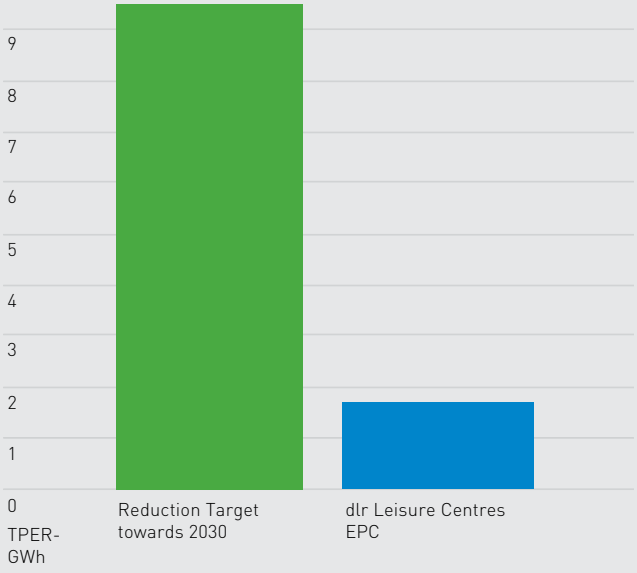


Figure 10: dlr Leisure & Civic Campus' Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

FLEET

Fleet is the third largest SEU within DLRCC, and comprises of fuels used for Council vehicles (including light and heavy vehicles), and fuels used by the park services. At present, the energy consumption of electric vehicles in the fleet is not captured under this SEU grouping. In 2019, Fleet accounted for 9% of DLRCC's total primary energy consumption. This amounts to 4.2 GWh of primary energy, 1,001 tonnes of CO_2, or an estimated €408,000 in energy costs.

Fleet consists of 265 Council vehicles; this includes light, commercial and heavy vehicles. Twenty-one of these vehicles are now electric. Within Fleet, diesel accounts for 99% of the total primary energy consumption, while petrol accounts for just 1%, as it is only used to fuel small equipment. A breakdown of this is shown in Figure 11.

Identification of Relevant Variables for Fleet

The industry standard performance indicator for fleets is fuel consumption per kilometre travelled. Due to a lack of robust historical data relating to kilometres driven or efficiency of the fleet, it has been difficult to define an accurate metric to evaluate the energy performance of this SEU from year to year. A vehicle telematics system has been in place in DLRCC's fleet for over a year now, which tracks the distance driven and fuel consumption of the vehicles on an ongoing basis. Energy consumption of electric vehicles may also be tracked by the system. The data collected by this system, however, has not yet been made available for energy management purposes. In the meantime, Codema has used the estimated number of vehicles in the fleet to develop a rough performance indicator. For the 2019 Energy Review, the performance indicator of fuel consumption divided by the number of vehicles in the fleet will continue to be used. This formula is:

Fleet EnPI = kWh TPER / total number of vehicles

DLRCC Fleet 2019

CONSUMED 4.2 GWH OF PRIMARY ENERGY

1,001 TONNES OF CO_2 EMITTED

€408,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 43.5% SINCE BASELINE

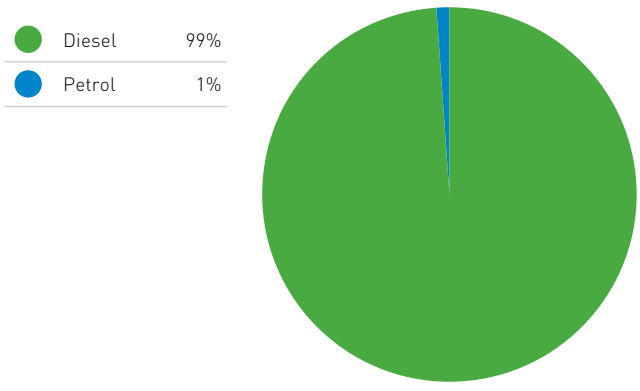


Figure 11: DLRCC Fleet Fuels TPER - 2019

Energy Performance of Fleet

The database shows that the energy performance of Fleet has improved by 43.5% since the baseline year. This is an absolute reduction of 3.2 GWh[2] of primary energy and 772 tonnes of CO_2. As petrol only makes up a very small fraction of the overall total, these savings are due to reductions in diesel consumption. There was a significant drop in energy consumption between 2009 and 2012 which is most likely associated with a reduction in services due to the economic downturn. The gradual decrease in fuel consumption from 2013 to 2016 could be attributable to the introduction of newer, more fuel-efficient vehicles to replace older vehicles. Without the use of a robust energy performance indicator to track this fuel consumption, it is difficult to identify a definitive reason for this improvement over these years. In 2017, 2018 and 2019, however, this trend has reversed, with fuel consumption rising again each year. Since 2016, an increase of 20% has been reported, equating to an additional 694 MWh of primary energy and 165 tonnes of CO_2.

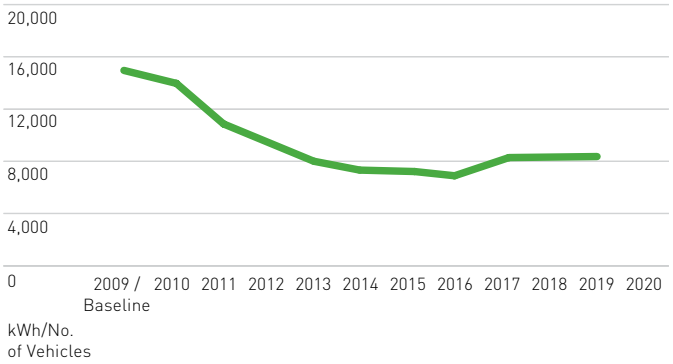


Figure 12: Fleet Annual Energy Performance

FLEET PLAN TOWARDS 2030

Dún Laoghaire-Rathdown County Council now has a vehicle telematics system installed across its fleet, which allows for regular analysis of the energy performance across this SEU and among its subdivisions. Following on from an external audit on fleet fuel cards, a written procedure is now also being put in place, which should ensure improved control and monitoring of fuel card usage. Combined with driver training and education initiatives such as the eco-drive programme and the issuing of a DLR Driver's Handbook, significant efficiency gains should be possible. In addition to this, a new procurement strategy in line with the EU Clean Vehicles Directive, which comes into place in 2021, is in development. This will ensure that all future fleet replacement programmes prioritise the most fuel-efficient, low-emission vehicles available, including electric vehicles where possible.

Combining the expected savings from these actions, an achievable target of 0.2 GWh reduction in primary energy consumption has been set for 2020. This should also result in CO_2 savings of over 50 tonnes per year.

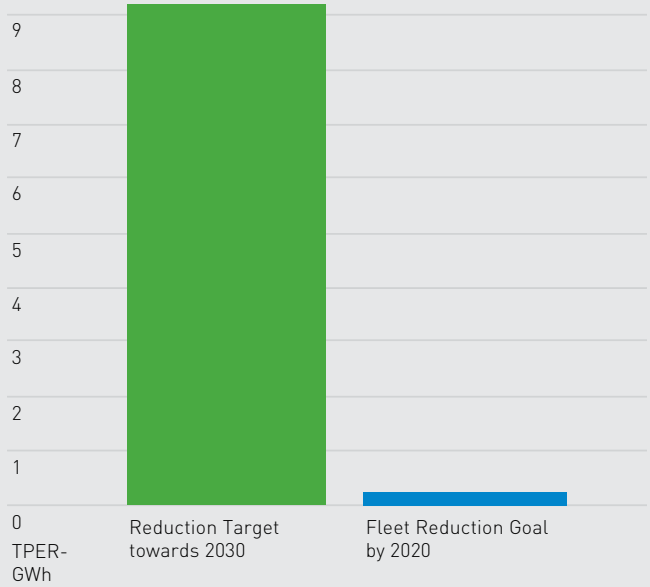


Figure 13: Fleet Plan towards 2030

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.

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

CORPORATE SERVICES

The Corporate Services SEU comprises of County Hall on Marine Road and Block 1 Harbour Square, also on Marine Road.

In 2019, these facilities accounted for 7% of DLRCC's primary energy consumption. This represents a consumption of 3.4 GWh of primary energy, 593 tonnes of CO_2 and an estimated €267,000 in energy spend.

Identification of Relevant Variables for Corporate Services

In relation to the Corporate Services facilities, 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 described 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 mainly dependent on the external temperature. Therefore, the composite performance indicator used to measure the Corporate Services' energy performance is the energy consumed (kWh TPER), divided by a weighting scale of Heating Degree Days (HDD) and the number of full time employees (FTE) and the total floor area (m^2). This is derived from the formula given in the methodology, as shown below:

Corporate Services' EnPI = kWh TPER/(m^2)(HDD)(FTE)

DLRCC Corporate Services 2019

CONSUMED 3.4 GWH OF PRIMARY ENERGY

593 TONNES OF CO_2 EMITTED

€267,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 37.6% SINCE BASELINE

Energy Performance of Corporate Services

The database shows that the Corporate Services facilities have improved their energy performance by 37.6% since the baseline year. This is an absolute reduction of 2.1 GWh of primary energy and 548 tonnes of CO_2 when comparing 2019 against the baseline year. The savings achieved to date are illustrated in Figure 14.

In 2019, gas consumption in County Hall decreased by 22% compared to 2018, while electricity consumption also decreased by 2%. These improvements appear to be due to improved energy management in the facility. In Block 1 Harbour Square, gas consumption increased by 19% in 2019, with electricity consumption decreasing slightly by 2%. This increase in energy consumption cannot be attributed to weather effects, and requires further attention.

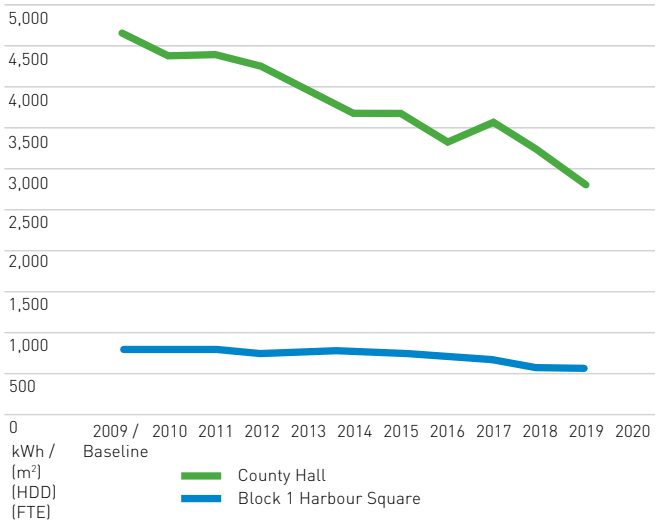


Figure 14: Corporate Services' Annual Energy Performance

CORPORATE SERVICES' PLAN TOWARDS 2030

In 2019, an energy audit was carried out on County Hall and Block 1 Harbour Square to identify the possible energy savings measures and associated energy and carbon savings achievable from these measures across both facilities. From this energy audit, savings of almost 1.8 GWh in primary energy and 325 tonnes of CO_2 are expected to be achieved through measures such as:

- New LED lighting
- Replacement of boiler with heat pump in County Hall
- Installation of solar photovoltaic (PV) panels at County Hall
- Improvements to HVAC systems
- Upgrades of control systems

The audit also identifies the possibility of significant building fabric upgrades at County Hall. These measures would require significant upfront capital expenditure with very little return on investment in relation to the savings that these measures would generate. For this reason, these measures have not been included in the Corporate Services Plan. Additional savings of up to 415 MWh of primary energy or 77 tonnes of CO_2 could be achievable through measures such as:

- Improve wall insulation to the same level as what was achieved during the IT refurbishment project.
- Upgrade glazing to the same as what was achieved during the IT refurbishment project.
- Add 100mm of closed cell insulation with protective fleece and gravel ballast on top of the existing roof.

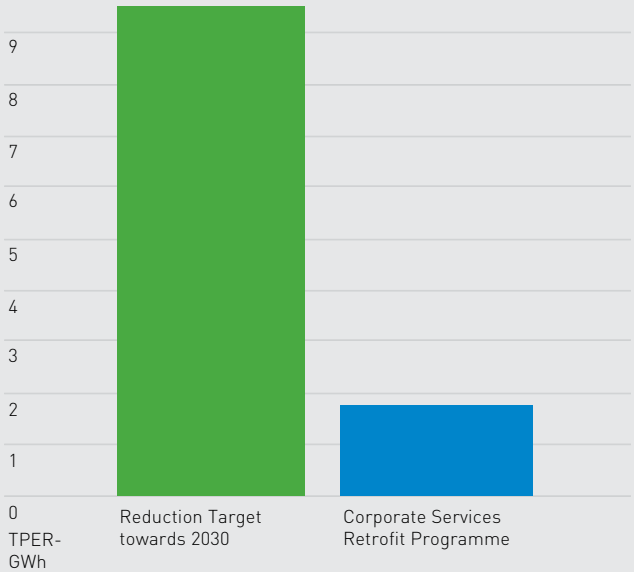


Figure 15: Corporate Services' Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

LEXICON

The dlr LexIcon, the Central Library and Cultural Centre, opened in 2015. dlr Libraries, along with the Arts Office, form part of the Community and Cultural Development Department in Dún Laoghaire-Rathdown County Council. The County has eight branch libraries serving the educational and recreational needs of all who live, work or study in the Dún Laoghaire-Rathdown area.

In 2019, the LexIcon accounted for 4% of DLRCC's primary energy consumption. This represents a consumption of 2.1 GWh of primary energy, 345 tonnes of CO_2 and an estimated €173,000 in energy spend.

Identification of Relevant Variables for the LexIcon

In relation to the LexIcon, there are three main energy types: electricity, gas and biomass. When there are multiple variables that drive energy consumption, a composite performance indicator is used, as described 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 and biomass consumption is mainly dependent on the external temperature. Therefore, the composite performance indicator used to measure the LexIcon's energy performance is the energy consumed (kWh TPER), divided by a weighting scale of Heating Degree Days (HDD) and total floor area (m^2). This is derived from the formula given in the methodology, as shown below:

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

DLRCC Lexicon 2019

CONSUMED 2.1 GWH OF PRIMARY ENERGY

345 TONNES OF CO_2 EMITTED

€173,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 10.6% SINCE BASELINE

Energy Performance of the LexIcon

The database shows that the LexIcon energy performance has improved by 10.6% since the baseline year. This is an absolute decrease of 0.4 GWh of primary energy and 95 tonnes of CO_2 when comparing 2019 against the baseline year. The energy consumption decrease to date is clearly illustrated in Figure 16, with a breakdown by energy type provided in Figure 17.

In 2019, the energy performance of the dlr LexIcon improved marginally. This was attributable to a decrease in electrical consumption in the facility, partially as a result of LED lighting upgrades in the car park area of the facility. This decrease in electrical energy was overshadowed by an increase in gas and biomass fuel consumption. A metering system was installed on the biomass system in 2019. This metering system is aiding dlr LexIcon and the energy management team to develop detailed energy performance indicators for the biomass consumption to ensure efficient use of this fuel within the facility.

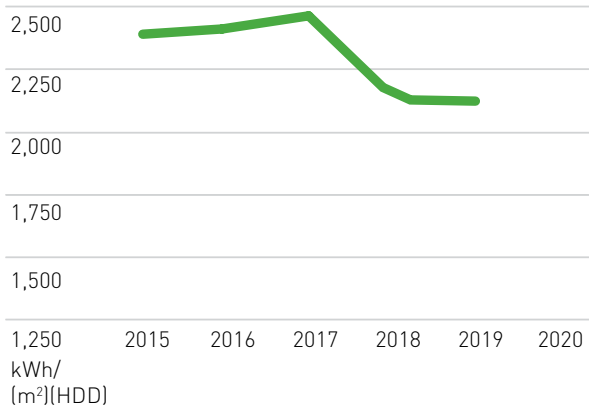


Figure 16: The LexIcon's Annual Energy Performance

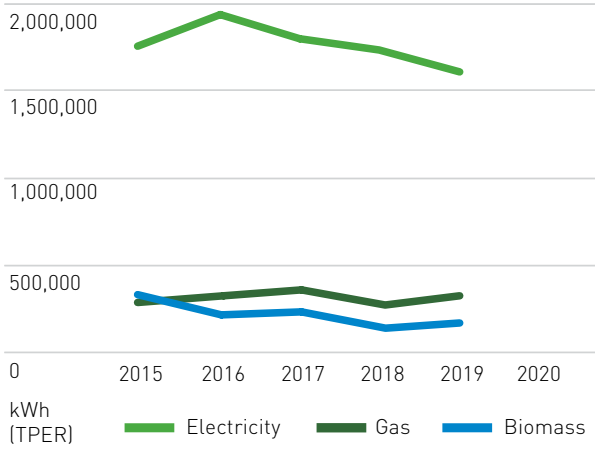


Figure 17: The LexIcon's Primary Energy Consumption by Type

THE LEXICON'S PLAN TOWARDS 2030

As the LexIcon is a relatively new building, there are no major opportunities for energy efficiency upgrades to the building fabric or plant. However, in 2019, a detailed energy audit was carried out on the facility to establish if there are potential energy saving opportunities, particularly in relation to operational management and controls. The energy audit identified a number of operational and control related measures, which may be implemented to increase the efficiency of the HVAC and BMS systems within the facility, requiring only a small capital investment. These measures include the installation of new sensors to help identify issues related to the operation of the AHUs, as well as operational and control measures that include only operating the biomass boilers during the winter months. By implementing these energy savings measures, this could save 0.3 GWh of primary energy and 47 tonnes of CO_2 annually.

In 2020, Library Management also aims to create an energy awareness team within the DLR Library Facilities. This team will have representation or energy champions from each of the DLR Library branches. The team will aim to raise awareness on energy efficiency amongst both staff and the public. The libraries will lead by example in order to reduce energy consumption and carbon emissions within their facilities, while raising awareness amongst the general public.

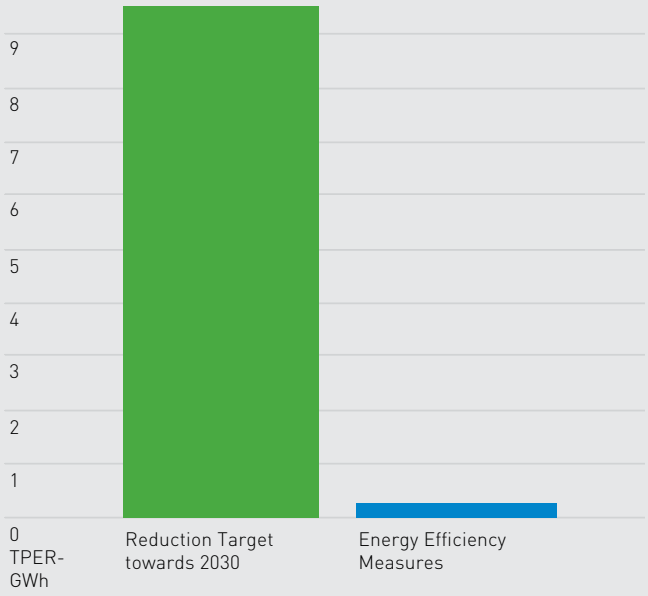


Figure 18: The LexIcon's Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

BALLYOGAN OPERATIONS DEPOT

The Ballyogan Operations Depot is a purpose-built, shared service facility that incorporates the Water, Cleansing, Transportation and Drainage Departments. The operations centre opened in 2012 and experienced significant growth and development of operations in its formative years. The compound comprises of an operations yard, mechanical garage, goods stores, utility building and a three-storey administration building. The centre is effectively a 24/7 operation, due to the on-call emergency response nature of services on site. In 2019, the Ballyogan Operations Depot accounted for 2% of DLRCC's primary energy consumption. This represents a consumption of 1.1 GWh of primary energy, 184 tonnes of CO_2 and an estimated €90,000 in energy spend.

Identification of Relevant Variables for the Ballyogan Operations Depot

In relation to the Ballyogan Operations Depot, there are three main energy types: electricity, gas and biomass. When there are multiple variables that drive energy consumption, a composite performance indicator is used, as described 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 and biomass consumption are mainly dependent on the external temperature. Therefore, the composite performance indicator used to measure the Ballyogan Operations Depot's energy performance is the energy consumed (kWh TPER), divided by a weighting scale of Heating Degree Days (HDD) and total floor area (m^2). This is derived from the formula given in the methodology, as shown below:

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

DLRCC Ballyogan Operations Depot 2019

CONSUMED 1.1 GWH OF PRIMARY ENERGY

184 TONNES OF CO_2 EMITTED

€90,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 13% SINCE BASELINE

Energy Performance of the Ballyogan Operations Depot

The database shows that Ballyogan Operations Depot's energy performance has improved by 13% since the baseline year of 2013. This is an absolute decrease of 184 MWh in primary energy terms and 18 tonnes of CO_2 when comparing 2019 against the baseline year. The energy performance improvement to date is illustrated in Figure 19.

The formative years between 2013-2015 saw a steady progression towards the establishment of a fully realised operations depot and administration building on site. In 2016, DLRCC committed to adopting the ISO 50001 energy management standard, which was a turning point for driving positive energy performance on site.

In 2018, there was a significant saving in energy consumption. This was attributable to both gas and electrical savings at the depot. In relation to the gas, the reduction can primarily be attributed to the reinstatement of the biomass boiler in October,

which was made possible as a result of an extensive maintenance project on this asset. Savings in electrical consumption have been brought about in-part by improved procedures relating to the usage and set-points of flood lighting in the operations yard, refinement of the lighting management system to better utilise PIR and solar cell technology, the establishment of a facilities management team on site and planned preventative maintenance and reporting. Biomass consumption is currently estimated based on deliveries received throughout the year. A biomass metering system is being investigated for this site.

In 2019, a further improvement in energy performance was achieved. An overall performance improvement of 21% or 259 MWh compared to 2018 was delivered. Reduced consumption across all primary energy sources was observed while continuing to meet energy demand on site. Continual improvements in strategic operational control measures and monitoring protocols played a key role in driving this improved performance. A number of energy projects were identified in 2019. A key project undertaken was to improve the DALI lighting control and monitoring system, which has led to more efficient use of the lighting system via PIR sensors, dimmable functionality and set point refinement.

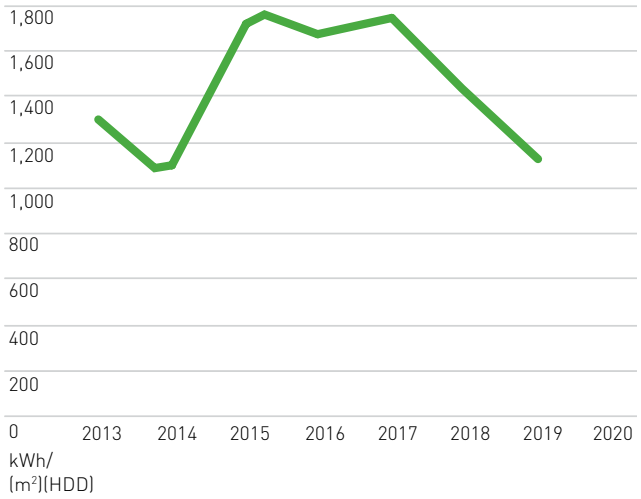


Figure 19: Ballyogan Operations Depot Annual Energy Performance

BALLYOGAN OPERATIONS DEPOT PLAN TOWARDS 2030

An energy audit of the depot has been commissioned with the intention of identifying energy performance improvement opportunities. The outputs of this audit will be used to populate a register of opportunities and provide a roadmap of future energy projects and operational measures that will steer us towards the achievement of our 2030 targets. A number of LED lighting upgrade projects have already been identified in the yard, garage and stores. The installation of energy metering on the biomass boiler will lead to efficiency gains via improved analysis and fuel source selection. A number of EV charging points are already installed at the depot and are metered under the same account as the main facility. It is expected that the EV fleet will be expanded in the coming years, which may lead to increased electricity consumption on site. Energy management requirements and oversight are to be expanded as part of the facilities management tendering process.

In addition to this, the Ballyogan Operations Depot will be included in a DLRCC energy awareness campaign, currently being developed with the support of Codema. Between these actions, a reduction target of 0.2 GWh in primary energy has been set, which should equate to a saving of 84 tonnes of CO_2 annually.

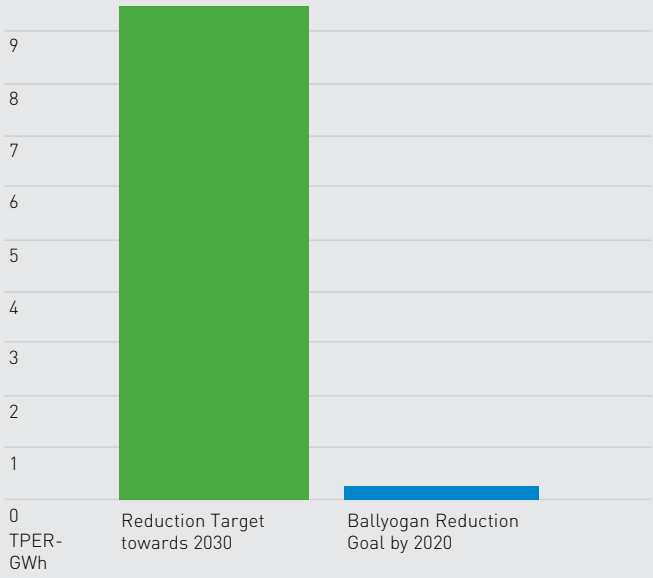


Figure 20: Ballyogan Operations Depot Plan towards 2030

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 120 DLRCC buildings, 65 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 €2.4 million. If all the available roof space on these facilities was utilised, the total combined electricity generation from these 65 sites could amount to 0.9 GWh per year. LED retrofits could save a further 1.4 GWh in primary energy. This could potentially reduce DLR's carbon emissions by 280 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 DLRCC, and the effect it may have on the Council's energy efficiency and emissions targets. The study was limited to just the 20 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 1,394 tonnes is predicted, at a total cost of €5.5 million. In reality, the actual savings would probably be closer to 880 tonnes of CO_2 per year, due to overestimations inherent in the BER calculation methodology.

05. CONCLUSION

DLRCC has achieved energy savings of 37.2% between the baseline year and 2019. While these savings are substantial, and DLRCC has now provisionally achieved its 2020 energy efficiency target, the Council still needs to look towards 2030 and the new 50% energy efficiency target and the expected increase to 50% in the carbon reduction target. These targets will require the Council to achieve a further 12.8% improvement in energy efficiency. Additionally, the required 50% improvement in building energy performance and minimum BER B standard for public buildings set out in the Government's Climate Action Plan 2019 will require significant planning and investment in a building retrofit strategy.

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 six key SEUs in this report will contribute towards this, and set DLRCC on the right path towards achieving its 2030 energy efficiency and GHG 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 DLRCC'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 DLRCC 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 DLRCC 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 21 and 22 illustrate DLRCC's gap-to-target model to 2030 for both energy efficiency and CO_2 emissions. As stated earlier in this report, DLRCC 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. It should be noted that the methodology for assessing public bodies in relation to the new 2030 targets has yet to be finalised, and the Council's status in relation to these targets is therefore liable to change.

The gap-to-target in terms of energy reduction stands at 9.5 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. The introduction of binding national five-

05. CONCLUSION
(CONTINUED)

year carbon budgets, as proposed in the forthcoming Climate Action and Low Carbon Development Bill, may also add further impetus to the need for early action on the new public sector targets. As a result of these energy efficiency measures and the projected decarbonisation of the national electricity supply, it is now clear 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. The projects already outlined in this report will contribute significantly towards the achievement of a 50% reduction in GHG emissions, as shown in Figure 22.

SEU AREA	ACTION	ESTIMATED SAVINGS
PUBLIC LIGHTING	LED LIGHTING REPLACEMENT PROGRAMME	1.5 GWH
DLR LEISURE & CIVIC CAMPUS EPC	DLR LEISURE CENTRES EPC	1.7 GWH
FLEET	DRIVER TRAINING & EDUCATION INITIATIVES, ROLL-OUT OF COUNCIL EVS	0.2 GWH
CORPORATE SERVICES	CORPORATE SERVICES RETROFIT PROGRAMME	1.8 GWH
LEXICON	LEDS & ENERGY MANAGEMENT	0.3 GWH
BALLYOGAN OPERATIONS DEPOT	OPERATIONAL CONTROLS & ENERGY AWARENESS PROGRAMME	0.2 GWH

Figure 21: DLRCC Energy Efficiency Plan towards 2030

Figure 22: DLRCC Carbon Reduction Plan towards Proposed 2030 50% Target

06. APPENDICES

SEU Summary

Table 1 SEU Summary

SEU	TPER - GWh	Tonnes CO_2	Cost	% +/- since baseline
Public Lighting	23.2	3,912	€2,007,056	-35%
dlr Leisure & Civic Campus	8.2	1,482	€597,000	+20.9%
Fleet	4.2	1,001	€408,000	-43.5%
Corporate Services	3.4	593	€267,000	-37.6%
LexIcon	2.1	345	€173,000	-10.6%
Ballyogan Operations Depot	1.1	184	€90,000	-13.3%
Total	42.2	7,517	€3,542,056	

Project Plan towards 2030 Summary

Table 2 Project Plan Summary

SEU	TPER - GWh	Tonnes CO_2
Public Lighting	1.5	257
dlr Leisure & Civic Campus	1.7	329
Fleet	0.2	50
Corporate Services	1.8	325
LexIcon	0.3	47
Ballyogan Operations Depot	0.2	84
Total	5.7	1,092

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Abbreviations

BER	Building Energy Rating
CO_2	Carbon Dioxide
CHP	Combined Heat and Power
DECC	Department of the Environment, Climate and Communications
DLAs	Dublin Local Authorities
DLRCC	Dún Laoghaire-Rathdown County Council
EnPIs	Energy Performance Indicators
EPC	Energy Performance Contract
ESCo	Energy Service Company
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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