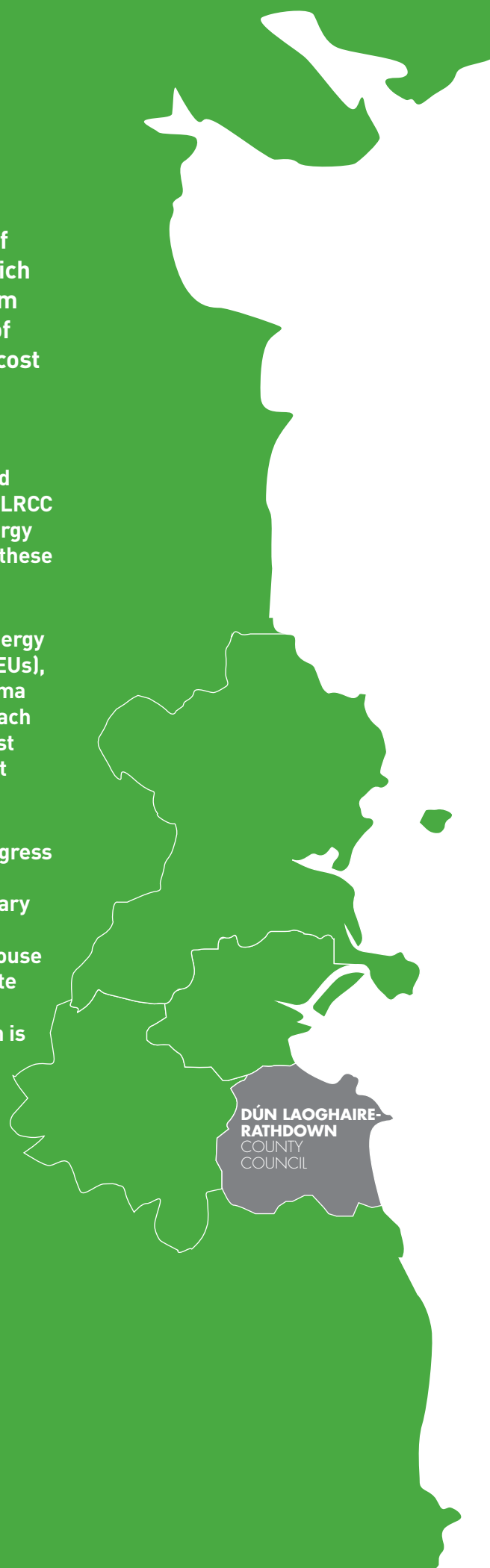
DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL ENERGY REVIEW 2018

codema
Dublin's Energy Agency

dlr
Comhairle Contae County Council

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 2018, 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 these targets between now and 2020.

As part of this process, Codema has analysed DLRCCs total energy use and broken this down into six Significant Energy Users (SEUs), which are explained in detail within this Energy Review. 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 2020 targets.

Additionally, Codema has included a summary of DLRCC's progress in terms of its carbon emissions. DLRCC is a signatory to the Covenant of Mayors programme since 2016, whereby a voluntary commitment is made to implement EU climate and energy objectives. DLRCC has now set a target of reducing its greenhouse gas emissions (GHGs) by 40% by 2030, as outlined in its Climate Change Action Plan (CCAP) 2019-2024. This goes beyond the national target of a 30% reduction in emissions by 2030, which is expected to be set by the Government in the coming months.

PUBLIC LIGHTING

DLR LEISURE & CIVIC CAMPUS

FLEET

CORPORATE SERVICES

LEXICON

BALLYOGAN OPERATIONS DEPOT

Current Status & Obligations

In 2018, DLRCC consumed a total of 49.9 gigawatt hours (GWh) of primary energy; this is the equivalent of 11,164 tonnes of CO_2, and Codema estimates the associated cost of this energy use to be approximately €3.5 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 Communications, Climate Action and Environment (DCCAE). 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 first 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 32.4%, compared to the baseline year of 2009. This amounts to an absolute saving of 7.2 GWh of primary energy or 3,636 tonnes of CO_2, when compared to the baseline. This means that DLRCC must improve its energy performance by 0.6% in its buildings and operations between now and 2020, in order to meet the 33% public sector target. It must be noted that further 2030 public sector targets are soon to be announced, based on the Government's recently published Climate Action Plan 2019 To Tackle Climate Breakdown. It has been signalled that a new target of 50% energy efficiency improvement by 2030 and 30% reduction in CO_2 is to be 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 2018

CONSUMED 49.9 GWH OF PRIMARY ENERGY

11,164 TONNES OF CO_2 EMITTED

€3.5 MILLION ASSOCIATED ENERGY COST

Public Sector Obligations

ACHIEVE SAVINGS OF 33% BY 2020

REDUCTION TARGET OF 3% PER YEAR

DLRCC Progress: Baseline - 2018

IMPROVED ENERGY PERFORMANCE BY 32.4%

3,636 TONNES OF CO_2 SAVED

0.6% IMPROVEMENT REQUIRED TO MEET THE 33% PUBLIC SECTOR TARGET

01. INTRODUCTION
(CONTINUED)

DLRCC achieved accreditation to the ISO 50001 Energy Management System standard in 2017, and is due to be assessed for recertification in November 2019. Codema is currently assisting DLRCC in its preparations for the recertification process. An important aspect of the ISO 50001 system is an annual review of energy use across the organisation. This report will satisfy this requirement, while also helping to define a structure for the energy management team.

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 2018.

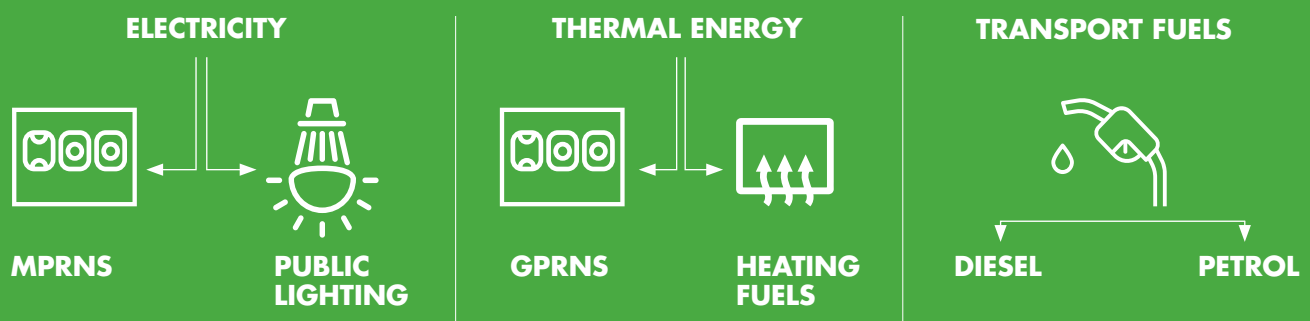
In 2013, water services within the local authorities were transferred to Irish Water. The M&R system and Codema's database have provisions to account for these changes, and therefore accurately track the actual energy performance of the local authority from the baseline year to 2018, which takes proper 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 2018

The energy database shows that DLRCC consumed 49.9 GWh of primary energy and produced 11,164 tonnes of CO_2 in 2018. Codema estimates the costs associated with this energy use to be approximately €3.5 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 2018
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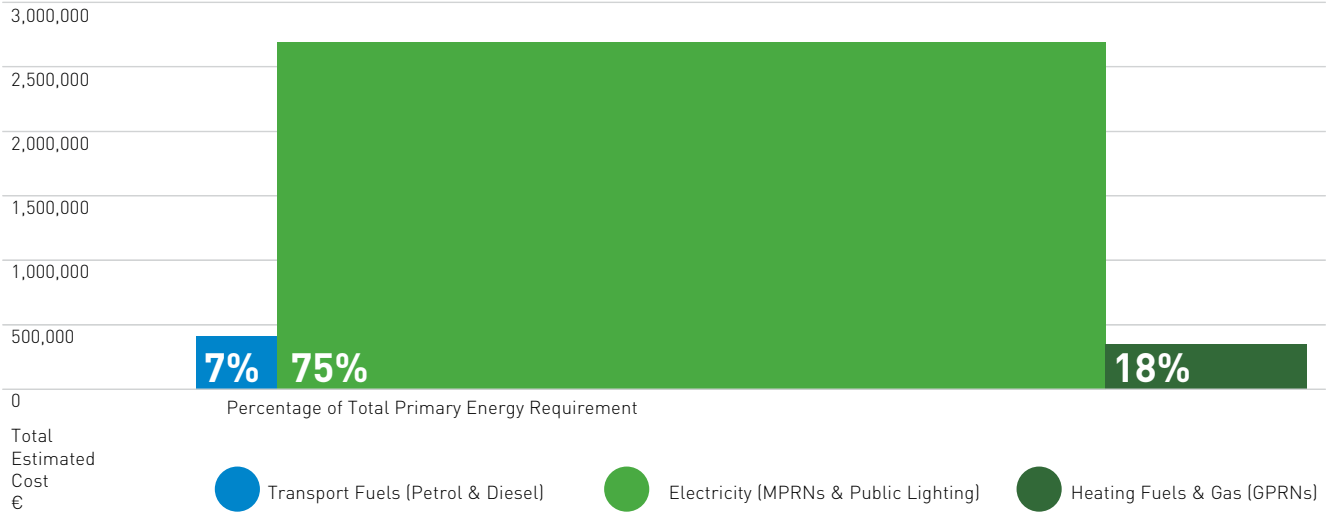


Figure 1: DLRCC Energy Categories - 2018

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 75%. 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 32.4% between the baseline year and 2018. This represents a cumulative absolute saving of 7.2 GWh of primary energy or 3,636 tonnes of CO_2. This highlights a gap-to-target of 0.6%, meaning that DLRCC must improve its energy performance by a further 0.6% between now and 2020, in order to meet its 33% target. This is estimated to be a cumulative saving of 1.6 GWh[1] in primary energy.

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 33% 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 2018.

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.

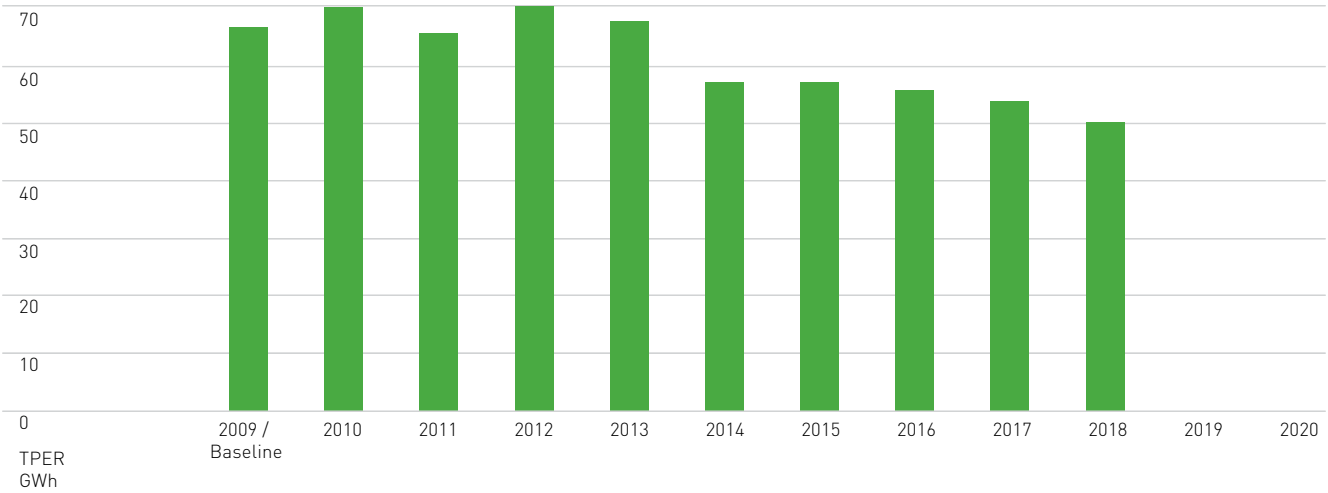


Figure 2: DLRCC Absolute Annual Energy Consumption

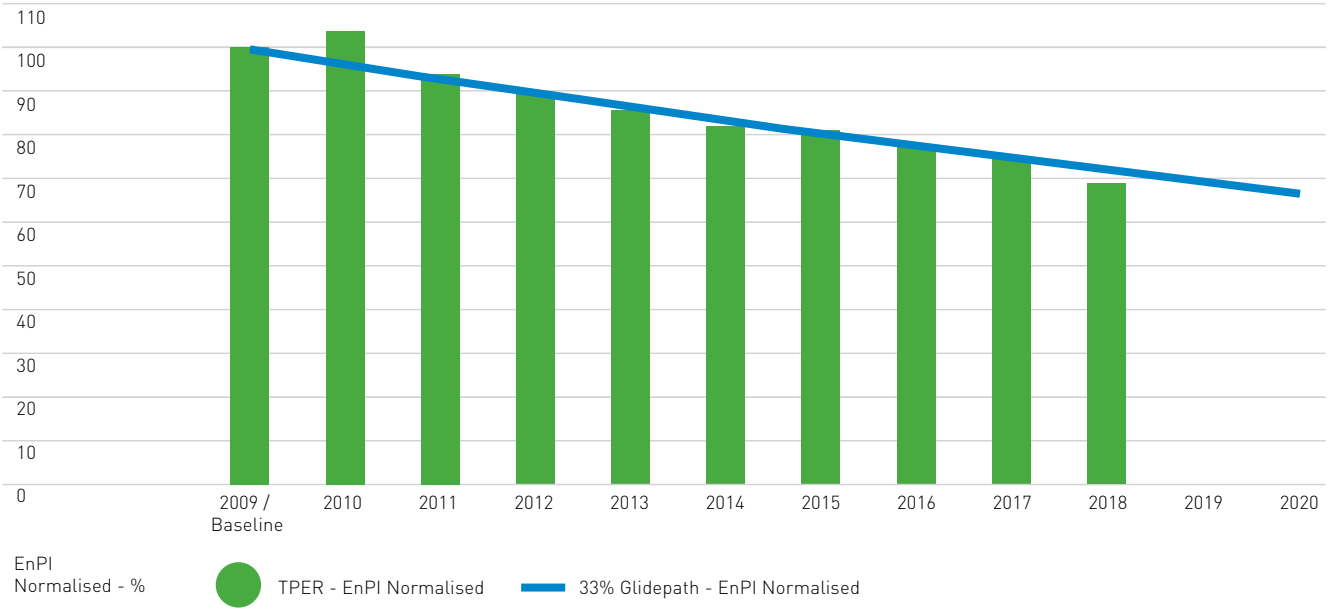


Figure 3: DLRCC Annual Energy Performance Compared to 33% Glidepath

02. DLRCC ENERGY CONSUMPTION 2018
(CONTINUED)

CLIMATE CHANGE ACTION PLAN & CARBON EMISSIONS

In 2018 and 2019, Codema prepared 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 already making good progress towards its 40% reduction target and is ahead of its glidepath, as presented in Figure 4 below. Compared to the baseline year, DLRCC's CO_2 emissions in 2018 had reduced by 24.6% to 11,164 tonnes. This leaves a gap-to-target of 2,284 tonnes of CO_2 between now and 2030.

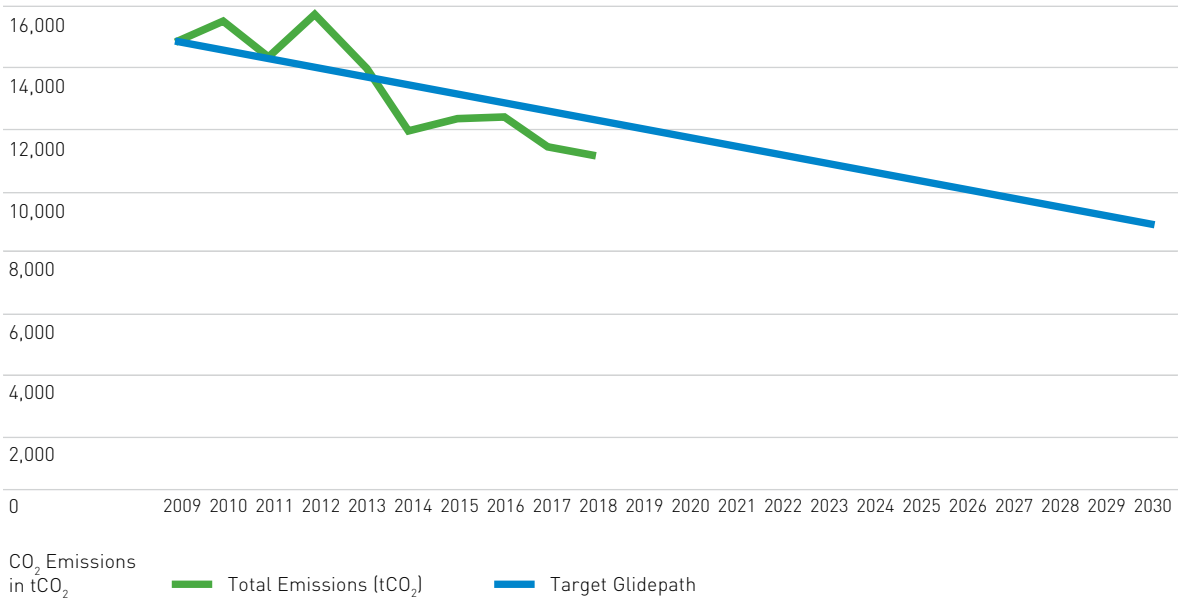


Figure 4: DLRCC Annual CO_2 Emissions Performance Compared to 40% Glidepath

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 85% of DLRCC's total primary energy requirement and can be broken down as follows:

PUBLIC LIGHTING 49%

dlr LEISURE & CIVIC CAMPUS 14%

FLEET 8%

CORPORATE SERVICES 7%

LEXICON 4%

BALLYOGAN OPERATIONS DEPOT 3%

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 49% of the total load. This is followed by dlr Leisure and Civic Campus at 14%, which includes the three leisure centres, Loughlinstown, Monkstown and Meadowbrook, as well as the Samuel Beckett Civic Campus. Fleet makes up 8% of the total load. Corporate Services accounts for 7% of the total load, which comprises of County Hall and Block 1 Harbour Square. The new central library and cultural centre, the dlr LexIcon, accounts for 4% and the Ballyogan Operations Depot accounts for 3%. 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 33% energy reduction target. Small energy reductions in these areas have a much greater effect on overall consumption than seemingly large reductions in the less significant areas. DLRCC is currently accredited to ISO 50001. ISO 50001 is an internationally-accredited energy management system that aids the local authority in a structured approach to improve its energy efficiency and achieve energy targets.

Figure 6 shows how the SEUs performed in 2018, compared to 2017. With the exception of Fleet, all of the SEU areas recorded an improvement in energy performance in 2018, compared to the previous year. Public Lighting decreased its energy consumption by 2.4 GWh, due to the ongoing upgrading of public lights to LEDs. dlr Leisure and Civic Campus improved its energy performance by almost 15%, or 783 megawatt hours (MWh), due to improvements in energy management in the facilities. A significant improvement in performance of 18% was recorded in Ballyogan Operations Depot, while the LexIcon improved its energy performance by almost 12%. The energy savings in these two facilities are partly due to reported reductions in biomass consumption, which at present is based only on deliveries received throughout the year, and as such are not the most robust figures. Corporate Services, consisting of County Hall and Block 1 Harbour Square, improved its energy performance by 10% in 2018, mostly due to improved energy management practices in the facilities and some energy efficiency upgrades in County Hall. The energy performance of Fleet has declined by almost 2% in 2018, due to an increase in diesel consumption.

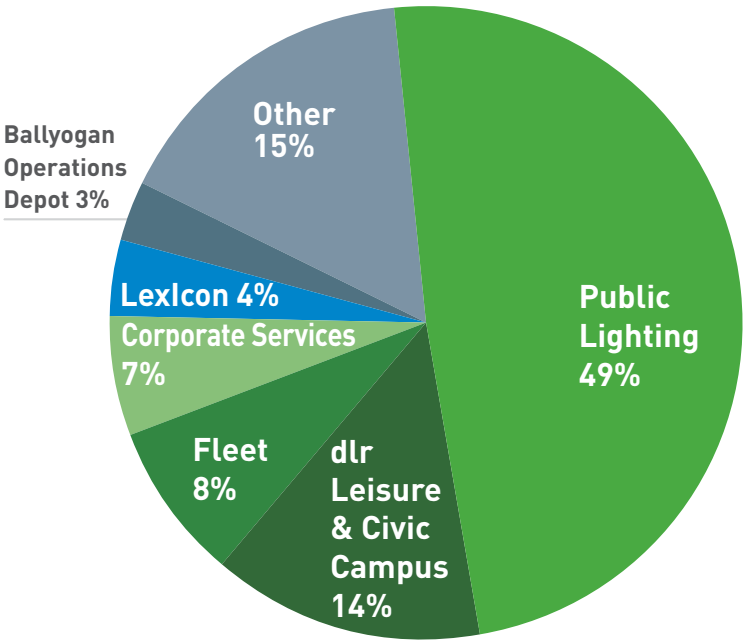


Figure 5: SEU Analysis

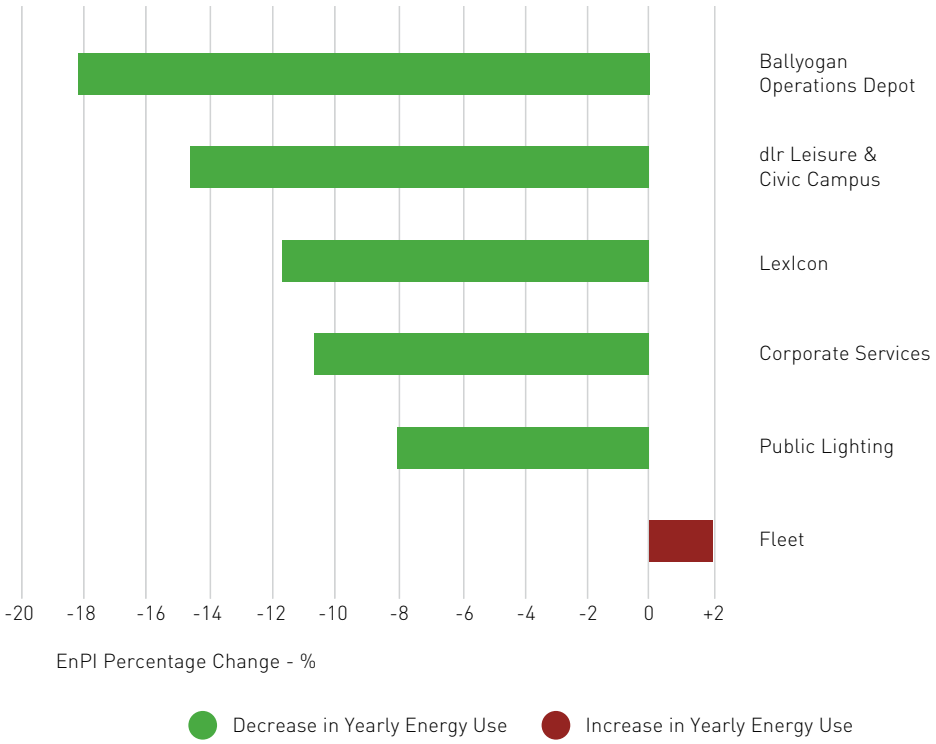


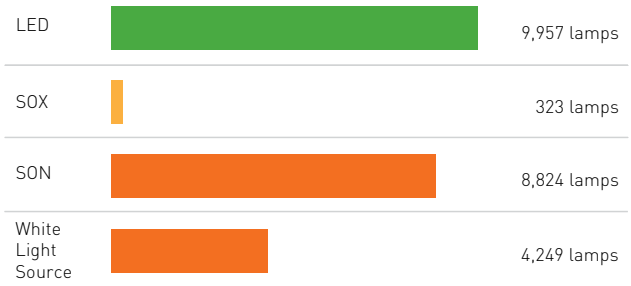
Figure 6: SEU Performance Change Between 2017 & 2018

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

PUBLIC LIGHTING

Public Lighting is the largest SEU within DLRCC. In 2018, Public Lighting accounted for 49% of DLRCC's primary energy consumption, which amounted to 24.9 GWh of primary energy, 5,545 tonnes of CO_2 and just under €1.6 million in energy costs. Public Lighting consists of almost 23,500 street lamps. The street lamps 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) – 9,957 lamps
- Low Pressure Sodium (SOX) – 323 lamps
- High Pressure Sodium (SON) – 8,824 lamps
- White Light Sources - 4,249 lamps



DLRCC Public Lighting 2018

CONSUMED 24.9 GWH OF PRIMARY ENERGY

5,545 TONNES OF CO_2 EMITTED

€1.6M ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 27% 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 9,957 lights with LEDs, with 2,561 of these replacements taking place in 2018. The energy database shows that Public Lighting has improved its energy performance by 27% since the baseline, based on its EnPI. This is an absolute annual reduction of 6.5 GWh of primary energy, and 1,649 tonnes of CO_2. This is illustrated in Figure 7.

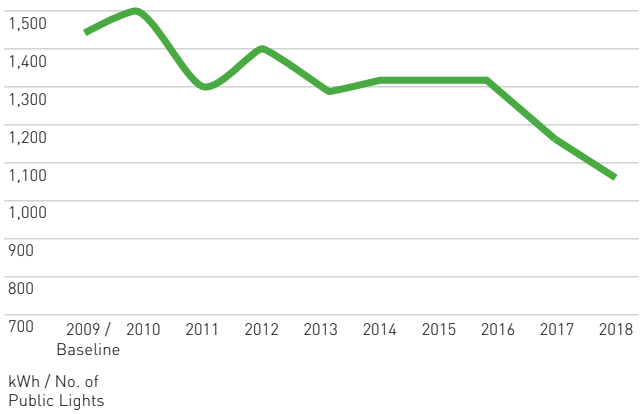
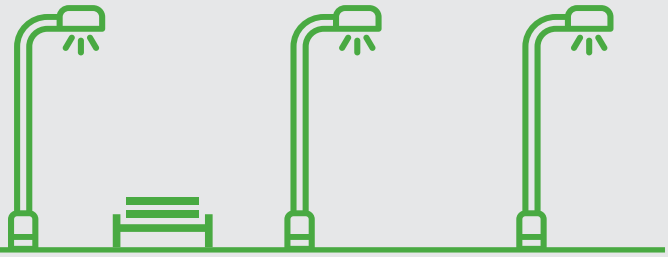


Figure 7: Public Lighting Annual Energy Performance

PUBLIC LIGHTING PLAN TO 2020



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 2020. 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 3,200 lamps with LEDs before 2020, this will ensure that approximately 56% of its public lights will be LEDs by 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 3,200 of these lamps by 2020 could produce savings of 2.1 GWh of TPER and 464 tonnes of CO_2. This would have a significant impact on the Council's 2020 targets. In addition, an ongoing programme to replace the remaining street lighting with LEDs beyond 2020 is strongly recommended.

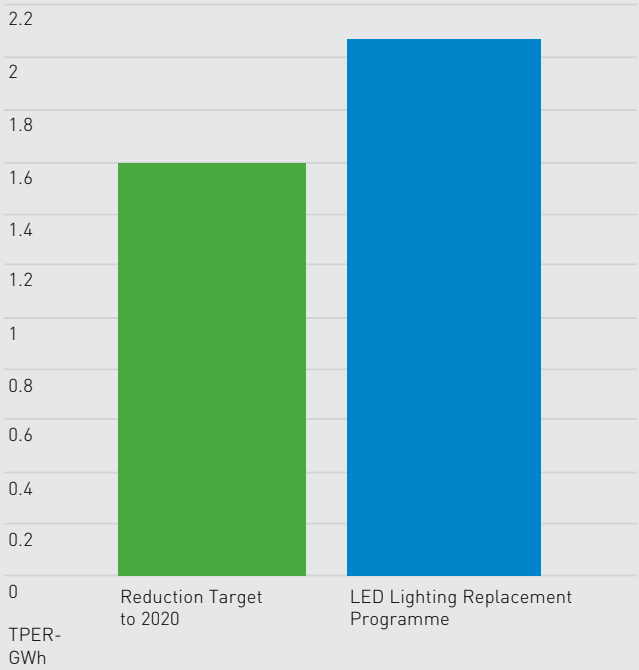


Figure 8: Public Lighting Plan to 2020

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

dlr LEISURE & CIVIC CAMPUS

dlr Leisure and 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 2018, these facilities accounted for 14% of the local authority's primary energy requirement. This is a consumption of 7.4 GWh of primary energy, 1,473 tonnes of CO_2, and an estimated €395,000 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 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 2018

CONSUMED 7.4 GWH OF PRIMARY ENERGY

1,473 TONNES OF CO_2 EMITTED

€395,000 ASSOCIATED ENERGY COST

DECREASED ENERGY PERFORMANCE BY 12.3% 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 12.3% 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 37% of the total primary energy in 2018. Loughlinstown is next at 27%, followed by Monkstown

at 24% and the Samuel Beckett Civic Campus at 12%. 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 barely changed since the baseline, with increased performance of 1% and 0.2%, 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 25% more efficiently than when it reopened.

In 2016, the overall energy performance of the SEU improved further due to the addition of the energy-efficient Samuel Beckett Civic Campus during the year. However, as the facility was only open for a part of this year, the indicated energy performance looks better than it actually was in reality. Using 2017 as a baseline, as this was the first full year of operation, the facility has already improved its efficiency by 9% in 2018.

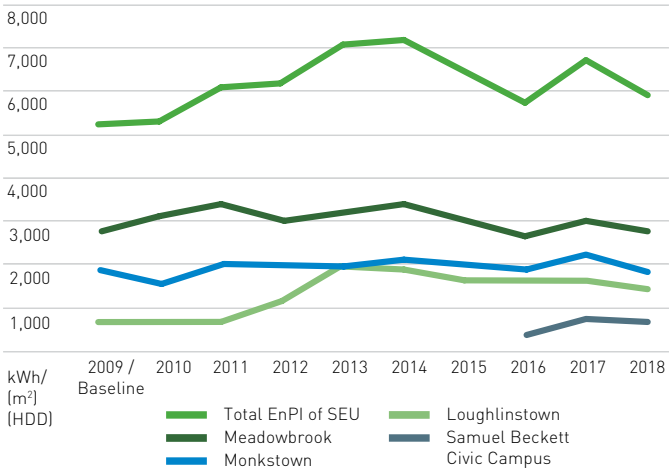


Figure 9: dlr Leisure & Civic Campus' Annual Energy Performance

dlr LEISURE & CIVIC CAMPUS' PLAN TO 2020

In late 2018 and early 2019, LED lighting upgrades were carried out at all three leisure centres. Theses actions are predicted to save 530 MWh in primary energy and 118 tonnes of CO_2. The effect of these upgrades should be clearly noticeable in the 2019 reporting cycle.

Codema is currently assisting DLRCC in implementing its first Energy Performance Contract (EPC). 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. This contract will include the three leisure centres, as well as County Hall and Block 1 Harbour Square. Looking just 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

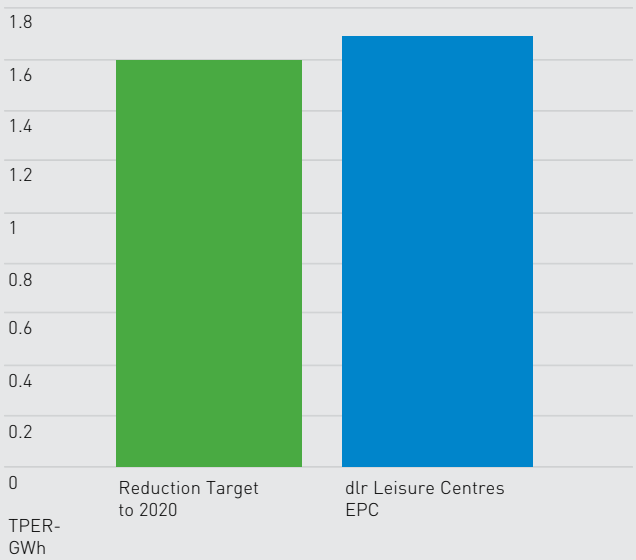


Figure 10: dlr Leisure & Civic Campus' Plan to 2020

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. In 2018, Fleet accounted for 8% of DLRCC's total primary energy consumption. This amounts to 4.2 GWh of primary energy, 1,000 tonnes of CO_2,or an estimated €409,000 in energy costs.

Fleet consists of approximately 500 Council vehicles; this includes light, commercial and heavy vehicles. 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

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. Codema has used the number of vehicles in the fleet to develop a rough performance indicator. A vehicle telematics system is now in place in DLRCC's fleet, which tracks the distance driven and fuel consumption of the vehicles on an ongoing basis. The data collected from this telematics system has yet to be analysed from an energy performance perspective, but progress is being made in this regard and the data is expected to be made available in the coming months. In the meantime, for the 2018 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 2018

CONSUMED 4.2 GWH OF PRIMARY ENERGY

1,000 TONNES OF CO_2 EMITTED

€409,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 57.5% SINCE BASELINE

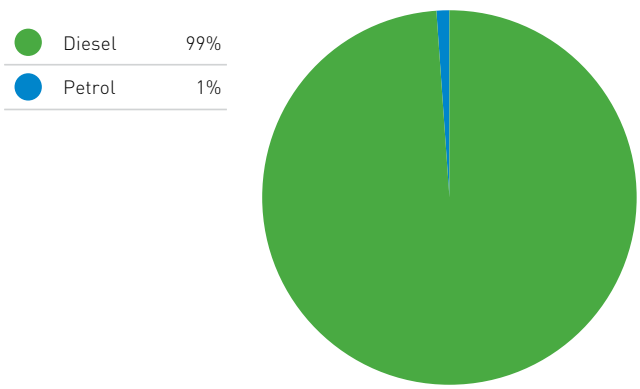


Figure 11: DLRCC Fleet Fuels TPER - 2018

Energy Performance of Fleet

The database shows that the energy performance of Fleet has improved by 57.5% since the baseline year. This is an absolute reduction of 5.6 GWh[2] of primary energy and 596 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 2010 and 2011 due to the outsourcing of waste collection services. From 2011 to 2016, there was a steady improvement in the energy performance of the fleet. This could be attributable to the introduction of newer, more fuel-efficient vehicles to replace older vehicles, but without the use of a robust energy performance indicator to track this diesel consumption, it is hard to identify a definitive reason for this improvement over these years. In 2017 and 2018, 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 691 MWh of primary energy and 165 tonnes of CO_2.

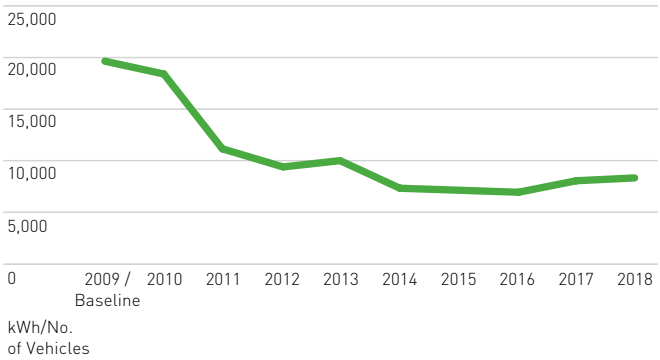


Figure 12: Fleet Annual Energy Performance

FLEET PLAN TO 2020

Dún Laoghaire-Rathdown County Council now has a vehicle telematics system installed across its fleet, which will allow for regular analysis of the energy performance across this SEU and among its subdivisions. Combined with driver training and education initiatives such as the eco-drive programme, significant efficiency gains should be possible. In addition to this, the rollout of electric vehicles among the Council's vehicles will reduce the carbon footprint associated with Fleet. Combining the expected savings from these actions, an achievable target of 0.4 GWh reduction in primary energy consumption has been set between now and 2020. This should also result in CO_2 savings of over 100 tonnes per year.

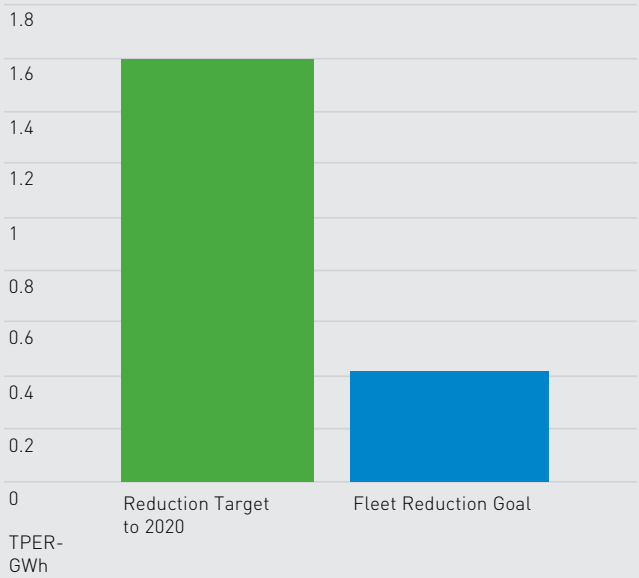


Figure 13: Fleet Plan to 2020

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 2018, these facilities accounted for 7% of DLRCC's primary energy consumption. This represents a consumption of 3.7 GWh of primary energy, 770 tonnes of CO_2 and an estimated €223,000 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 2018

CONSUMED 3.7 GWH OF PRIMARY ENERGY

770 TONNES OF CO_2 EMITTED

€223,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 30.1% SINCE BASELINE

Energy Performance of Corporate Services

The database shows that the Corporate Services facilities have improved their energy performance by 30.1% since the baseline year. This is an absolute reduction of 1.7 GWh of primary energy and 370 tonnes of CO_2 when comparing 2018 against the baseline year. The savings achieved to date are illustrated in Figure 14.

In 2018, gas consumption in County Hall decreased by 15% compared to 2017, but electricity consumption increased by 12%. The increase in electricity consumption may be partly due to the installation of an air handling unit (AHU) to serve the Council Chamber. The addition of roof insulation and replacement of glass panels in the Civic Hub area may have contributed to the reduction in gas consumption. In Block 1 Harbour Square, gas consumption decreased by 24% in 2018, with electricity consumption also decreasing by 6%. This reduction in energy consumption can be attributed to ongoing improvements in energy management in the facility.

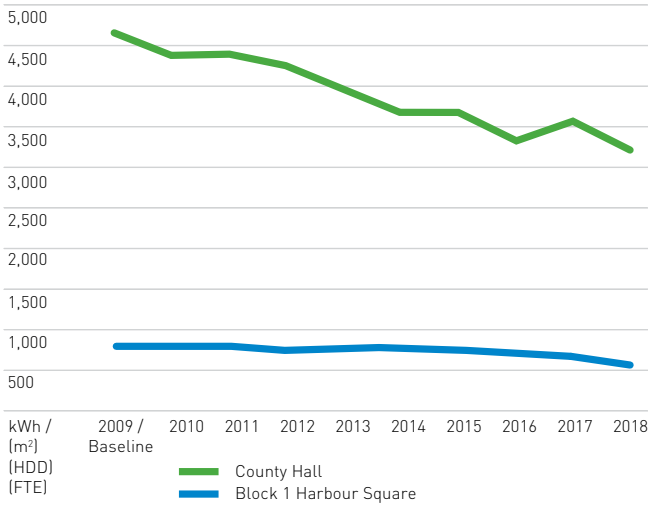


Figure 14: Corporate Services' Annual Energy Performance

CORPORATE SERVICES' PLAN TO 2020

Codema is currently assisting DLRCC in implementing its first Energy Performance Contract (EPC). 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. This contract will include the three leisure centres mentioned in the earlier chapter, as well as County Hall and Block 1 Harbour Square. Looking just at the Corporate Facilities, savings of up to 1.4 GWh in primary energy and 262 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

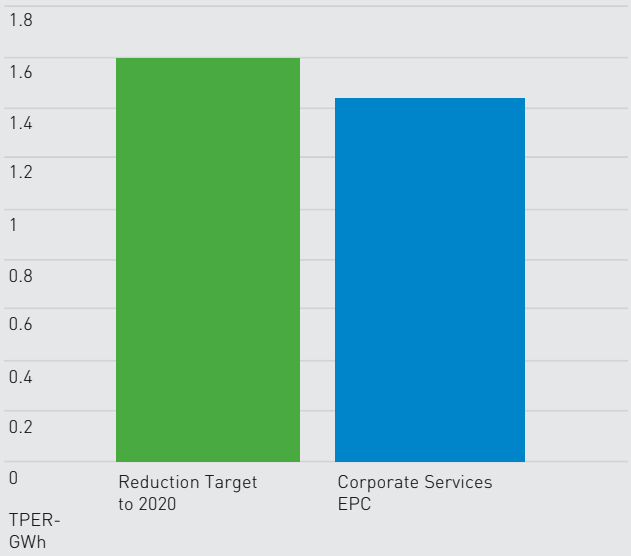


Figure 15: Corporate Services' Plan to 2020

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

LEXICON

The dlr LexIcon, the new 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 2018, the LexIcon accounted for 4% of DLRCC's primary energy consumption. This represents a consumption of 2.2 GWh of primary energy, 436 tonnes of CO_2 and an estimated €148,000 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 2018

CONSUMED 2.2 GWH OF PRIMARY ENERGY

436 TONNES OF CO_2 EMITTED

€148,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 9.5% SINCE BASELINE

Energy Performance of the LexIcon

The database shows that the LexIcon energy performance has improved by 9.5% since the baseline year. This is an absolute decrease of 0.2 GWh of primary energy and 4 tonnes of CO_2 when comparing 2018 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 2018, a significant decrease in energy consumption was recorded for the LexIcon. This can be attributed to decreases across all three energy types. The data relating to biomass consumption each year is a rough estimate, however, as it is based on tonnes of biomass delivered to the site each year. As such, the indicated decrease in consumption recorded for 2018 may not actually have been as great if significant stocks of wood chips were left over from the previous year. The installation of a metering system on the biomass hopper would significantly increase the accuracy of these figures and this is currently being investigated.

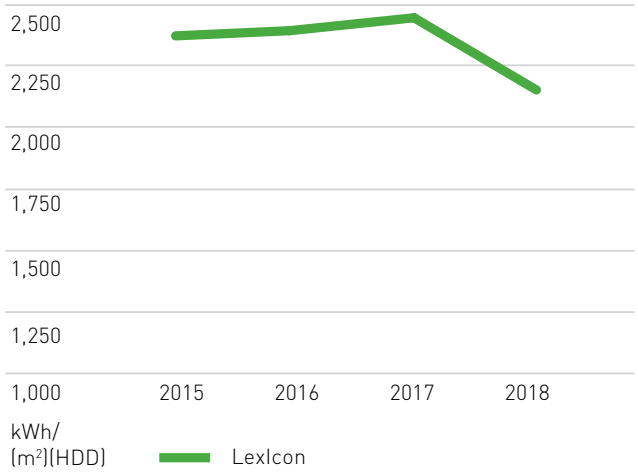


Figure 16: The LexIcon's Annual Energy Performance

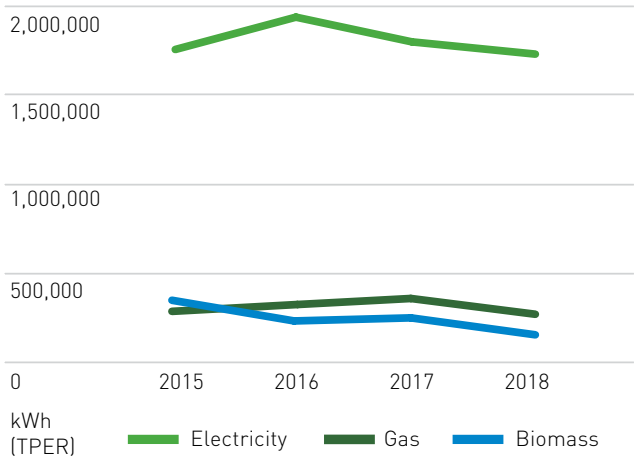


Figure 17: The LexIcon's Primary Energy Consumption by Type

THE LEXICON'S PLAN TO 2020

As the LexIcon is a relatively new building, there are no major opportunities for energy efficiency upgrades to the building fabric or plant.

However, significant savings may still be achieved through improved energy management in the facility. In particular, the installation of dedicated monitoring equipment on the biomass boilers would provide much better data to the facility management in terms of its operation and efficiency. This would allow for accurate tracking and review of the total energy consumption of the facility at regular intervals, as part of an overall energy management system. Codema is currently investigating options for a smart biomass energy metering system on behalf of DLRCC for the LexIcon.

By implementing this biomass metering system and a structured energy management system in the facility, energy savings in excess of 10% may be achieved. This could amount to 0.3 GWh of primary energy and 65 tonnes of CO_2.

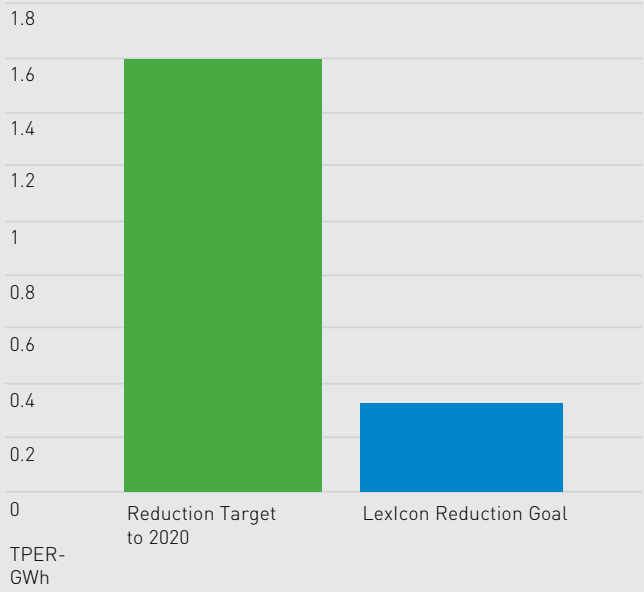


Figure 18: The LexIcon's Plan to 2020

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 2018, the Ballyogan Operations Depot accounted for 3% of DLRCC's primary energy consumption. This represents a consumption of 1.4 GWh of primary energy, 273 tonnes of CO_2 and an estimated €99,000 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 is 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 2018

CONSUMED 1.4 GWH OF PRIMARY ENERGY

273 TONNES OF CO_2 EMITTED

€99,000 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 10% SINCE BASELINE

Energy Performance of the Ballyogan Operations Depot

The database shows that Ballyogan Operations Depot's energy performance has decreased by 10% since the baseline year of 2013. This is an absolute energy increase of 75 MWh of primary energy and 70 tonnes of CO_2 when comparing 2018 against the baseline year. The energy performance decrease to date is illustrated in Figure 19.

In 2016 and 2017, the depot served as a temporary dwelling and support centre for the families affected by the Carrickmines fire disaster. This had a significant impact in driving consumption and altering the consumption profile of the depot.

In 2018, it can be seen that there was a significant saving in energy consumption. This was attributable to both gas and electrical savings. In relation to the gas, the reduction can primarily be attributed to the reinstatement of the biomass boiler in October, following the appointment of a suitable maintenance contractor. 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, planned preventative maintenance and reporting, and energy management services provided by FM contractor Apleona. As with the LexIcon, biomass consumption is currently estimated based on deliveries received throughout the year. A biomass metering system is being investigated for this site also.

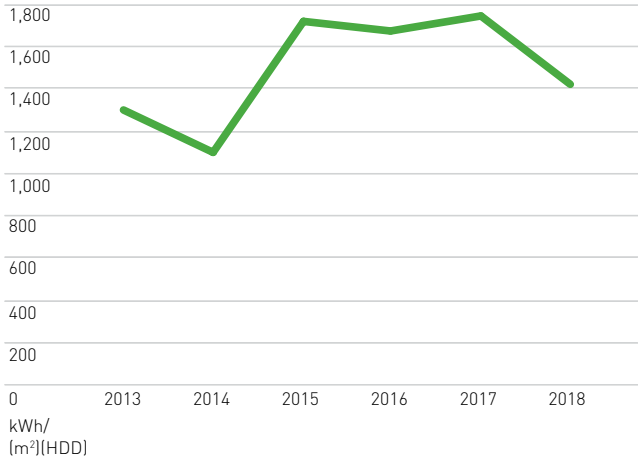


Figure 19: Ballyogan Operations Depot Annual Energy Performance

BALLYOGAN OPERATIONS DEPOT PLAN TO 2020

A number of LED lighting upgrade projects have already been identified in the yard, garage and stores, with approval being sought in 2019. Legacy issues, which are resulting in increased electrical consumption in the lighting management system, are also to be investigated in 2019/2020. The use of biomass is to be increased as a result of the improved maintenance programme. The installation of energy metering on the biomass boiler should also lead to efficiency gains. A number of EV charging points are already installed at the depot and metered under the same account as the main facility. It is expected that the EV fleet will be expanded by 2020, 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 DLR 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 41 tonnes of CO_2 annually.

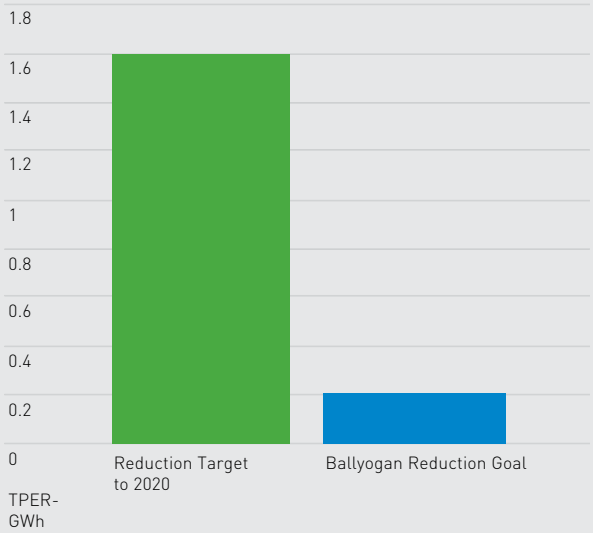


Figure 20: Ballyogan Operations Depot Plan to 2020

04. CONCLUSION

DLRCC has achieved energy savings of 32.4% between the baseline year and 2018. While these savings are substantial, the Council still needs to save a further 0.6% to achieve the 33% energy saving target by 2020. It is clear that while significant gains have been made in certain areas, others have seen very little improvement since the baseline year. A new set of 2030 targets are due to be announced shortly, which will require continued efforts to be made to increase energy efficiency throughout the organisation.

The Government's recently published Climate Action Plan 2019 To Tackle Climate Breakdown has signalled that this may amount to a 50% increase in energy efficiency by 2030, coupled also with a greenhouse gas emissions reduction target of 30%. It is worth noting that DLRCC has already committed to a 40% reduction in GHGs by 2030, through its Climate Change Action Plan 2019-2024 and the Covenant of Mayors initiative. 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 deliver the required energy savings by 2020. Small energy reductions in these areas will have a much greater effect on overall consumption than seemingly large reductions in the less significant areas. Codema therefore recommends that DLRCC uses a structured approach at senior management level in order to carefully plan and execute energy reduction projects. This targeted, holistic approach to these SEUs will help maximise their impact and will go beyond the typical energy-saving projects that are usually reactionary or part of routine maintenance.

DLRCC is currently working towards re-accreditation of its ISO 50001 Energy Management System. Significant effort has been made in 2019 to ensure that the organisation is fully compliant with the standard in time for re-accreditation in November. Senior management has recently signalled its commitment to the ISO 50001 system, while Codema has also provided significant resources towards the re-accreditation process. However, in order for this system to be self-sustaining into the future, increased support and resources will still need to be allocated across all SEU areas.

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 on the next page illustrate DLRCC's gap-to-target model for the next two years. If all the projects set out in this Energy Review are completed by 2020, DLRCC can reach and exceed the target reduction of 1.6 GWh of TPER, or 33% of the baseline, by 2020. The CO_2 reductions resulting from these measures will also cover over 55% of DLRCC's 2,284 tonnes of CO_2 gap-to-target for 2030, with a further decade to achieve the remaining reductions. If this momentum is maintained, it should be possible for DLRCC to go well beyond the 40% target within the given timeframe. Given the urgency of the climate emergency, it would be a good idea to review this target upwards in an effort to provide leadership on climate action.

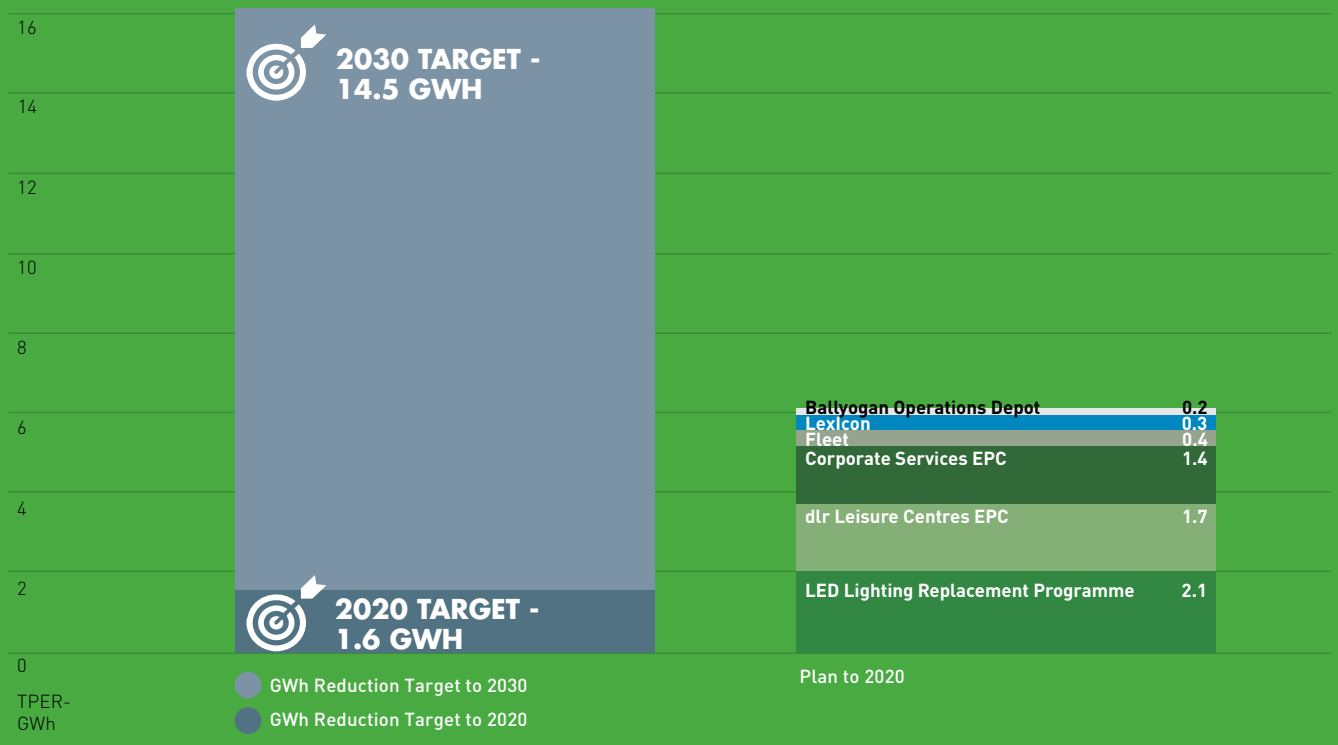


Figure 21: DLRCC Energy Efficiency Plan to 2020 and 2030

Figure 22: DLRCC Carbon Reduction Plan towards 2030 Target

04. CONCLUSION
(CONTINUED)

SEU AREA	ACTION	ESTIMATED SAVINGS
PUBLIC LIGHTING	LED LIGHTING REPLACEMENT PROGRAMME	2.1 GWH
DLR LEISURE & CIVIC CAMPUS EPC	DLR LEISURE CENTRES EPC	1.7 GWH
FLEET	DRIVER TRAINING & EDUCATION INITIATIVES, ROLL-OUT OF COUNCIL EVS	0.4 GWH
CORPORATE SERVICES	CORPORATE SERVICES EPC	1.4 GWH
LEXICON	BIOMASS METERING & ENERGY MANAGEMENT	0.3 GWH
BALLYOGAN OPERATIONS DEPOT	LED UPGRADES, BIOMASS METERING	0.2 GWH

05. APPENDICES

SEU Summary

Table 1 SEU Summary

SEU	TPER - GWh	Tonnes CO_2	Cost	% +/- since baseline
Public Lighting	24.9	5,545	€1,570,198	-27%
dlr Leisure & Civic Campus	7.4	1,473	€394,902	+12.3%
Fleet	4.2	1,000	€408,567	-57.5%
Corporate Services	3.7	770	€223,095	-30.1%
LexIcon	2.2	436	€148,396	-9.5%
Ballyogan Operations Depot	1.4	273	€99,099	-10%
Total	43.8	9,497	€2,844,257	

Project Plan to 2020 Summary

Table 2 Project Plan Summary

SEU	TPER - GWh	Tonnes CO_2
Public Lighting	2.1	464
dlr Leisure & Civic Campus	1.7	329
Fleet	0.4	100
Corporate Services	1.4	262
LexIcon	0.3	65
Ballyogan Operations Depot	0.2	41
Total	6.1	1,261

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Abbreviations

AHU	Air Handling Unit
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
DCCAE	Department of Communications, Climate Action and Environment
DLRCC	Dún Laoghaire-Rathdown County Council
EnPIs	Energy Performance Indicators
EPC	Energy Performance Contract
FTE	Full Time Employees
GHG	Greenhouse Gas
GPRNs	Metered Gas Accounts
GWh	Gigawatt hour
HDD	Heating Degree Days
HVAC	Heating, Ventilation and Air Conditioning
kWh	Kilowatt hour
LED	Light Emitting Diode
m^2	Metres Squared
M&V	Measurement and Verification
M&R	Monitoring and Reporting
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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