SOUTH DUBLIN COUNTY COUNCIL ENERGY REVIEW 2019

Codema
Dublin's Energy Agency

Comhairle Contae
Átha Cliath Theas
South Dublin County Council

01. INTRODUCTION

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

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

As part of this process, Codema has analysed SDCC's total energy use and broken this down into four 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 detailed recommendations on the action SDCC must take to reduce energy consumption in each SEU area to meet its 2020 and 2030 targets.

Codema has also included a summary of SDCC's progress in terms of its carbon emissions. In SDCC's Climate Change Action Plan 2019-2024, the Council committed to reducing its greenhouse gas emissions (GHGs) by 40% by 2030. This target goes beyond the national public sector target of a 30% reduction by 2030, which was set by the Government in 2019, but this is likely to increase 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

LEISURE CENTRES

OFFICES

TRANSPORT

Current Status & Obligations

In 2019, SDCC consumed a total of 47 gigawatt hours (GWh) of primary energy; this is the equivalent of 8,678 tonnes of CO_2 and Codema estimates the associated cost of this energy use to be approximately €3.1 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 Climate Action, Communication Networks and Transport (DCACNT). It is important to note that these figures may vary, as changes to data within the M&R system for previous years are accounted for, such as the addition of missing accounts, the removal of accounts that are no longer linked to SDCC and also changes in conversion factors. These changes are made throughout the system, from the baseline year to date, and don't affect the baseline or reduction target.

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

To date, as reported by the M&R system, SDCC has improved its energy performance by 34.4%, compared to the baseline year (which is an average of between 2006-2008). This amounts to an absolute saving of 13 GWh of primary energy or 4,448 tonnes of CO_2, compared to the baseline year. The overall energy performance in 2019 improved by 6.7%, when compared to the previous year.

This means that SDCC 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. A new target of 50% improvement in energy efficiency from the 2006-2008 baseline and a 30% reduction in CO_2 by 2030 have been set. This will require continued and increased focus on the energy performance of SDCC's buildings and operations over the coming decade.

SDCC Energy Overview 2019

CONSUMED 47 GWH OF PRIMARY ENERGY

8,678 TONNES OF CO_2 EMITTED

€3.1 MILLION ASSOCIATED ENERGY COST

Public Sector Obligations

ACHIEVE SAVINGS OF 33% BY 2020

REDUCTION TARGET OF 3% PER YEAR

SDCC Progress Baseline-2019

IMPROVED ENERGY PERFORMANCE BY 34.4%

4,448 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 is back operating to a fuller capacity in 2020, so we may see a reversal of some of the gains from the previous two years. If the primary energy factor were to return to its 2017 value, and taking into account any additional projects coming into effect in 2020, then SDCC would only achieve a 31.9% improvement in energy efficiency, and fail to meet its 2020 target. While it is unlikely that the primary energy factor would worsen to this extent, it shows that SDCC's achievement of the 33% target is by no means locked in at this stage.

Methodology

Through this Energy Review, Codema highlights the areas within the Council that are consuming the most energy (i.e. the SEUs) and sets out possible solutions for each of these areas in order to achieve additional savings.

In order to calculate potential energy savings in SDCC, 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 SDCC's energy performance more accurately. This method determines how efficiently SDCC 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 proportion of each variable's contribution is defined on a weighted scale.

In the case of SDCC, the overall performance indicator is based on population served. Therefore, SDCC's EnPI is the TPER divided by the population served for that year. Therefore, the performance of SDCC is determined not only by its annual energy use, but also by a rise or fall in population in the South Dublin area in the same year. Savings are based on cumulative absolute primary energy and carbon savings from the baseline year to 2019.

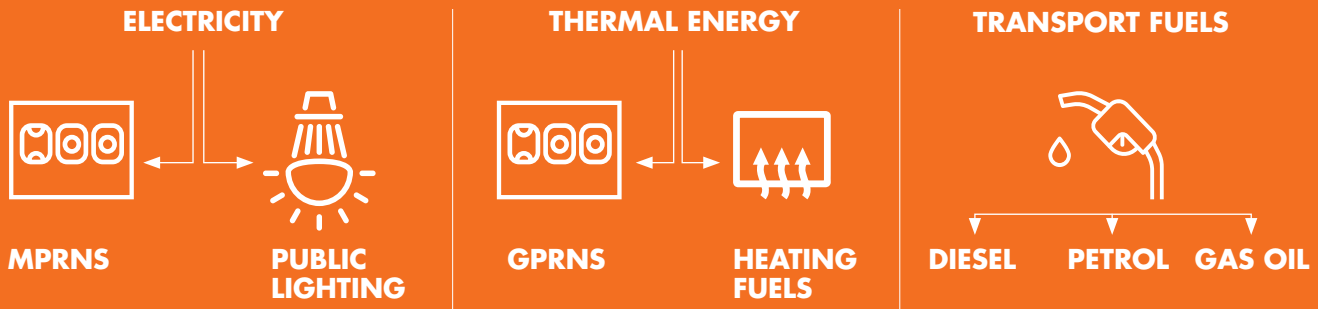
In 2010, the Dublin Local Authorities outsourced waste collection within the region. Also, in 2013, water services within the local authorities were transferred to Irish Water. The M&R system and Codema's database have provisions to account for these changes, and therefore accurately track the actual energy performance of the local authority from the baseline year to 2019, which takes proper account of services that have been outsourced.

Formula for Calculating EnPIs for SEUs

$$ACTIVITY_0 = \sum_{i=1}^{x} \left(\frac{Subactivity_i}{Subactivity_{i,baseline}} \times Weighting_i \times 1{,}000 \right)$$

02. SDCC ENERGY CONSUMPTION 2019

The energy database shows that SDCC consumed 47 GWh of primary energy and produced 8,678 tonnes of CO_2 in 2019. Codema estimates the costs associated with this energy use to be approximately €3.1 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 SDCC's public buildings and unmetered public lights. Thermal energy consumption consists of metered gas accounts (GPRNs) and heating fuels data from buildings, and transport accounts for all the transport fuels within SDCC, i.e. diesel, petrol and gas oil.



02. SDCC ENERGY CONSUMPTION 2019
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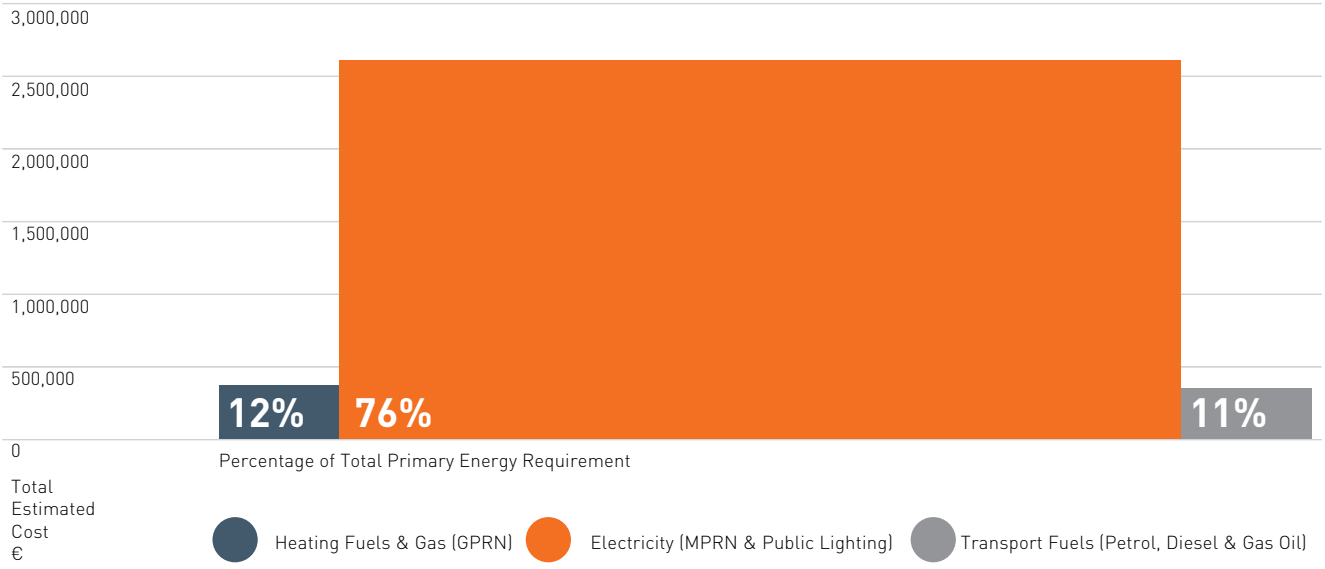


Figure 1: SDCC Energy Categories - 2019

Figure 1 shows the breakdown of the consumption categories. The height represents the total estimated cost of that energy type, and each coloured area highlights what percentage of the overall energy use this energy type accounts for. Electricity accounts for the largest share of energy consumed at approximately 76%. The reasons for this are the large number of public lights in the South Dublin area and the vast amount of electricity accounts within SDCC'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 SDCC improved its energy performance by 34.4% between the baseline and 2019, with a reduction in annual primary energy consumption of 13 GWh of primary energy or 4,448 tonnes of CO_2. This means that SDCC has now achieved its goal of 33% energy efficiency savings by 2020, a year ahead of target. The new targets of 50% improvement in energy efficiency, coupled with a 30% reduction in CO_2 by 2030 must now be tackled. This presents a new gap-to-target of 15.6%, meaning that SDCC must improve its energy performance by a further 15.6% compared to its original baseline between now and 2030, in order to meet the 50% energy efficiency target. This is estimated to be a reduction of 12.4 GWh[1] in primary energy. Therefore, an annual reduction of 1.5 GWh of primary energy between now and 2030 is necessary; this equates to the average yearly reduction since the baseline.

Figure 2 on the next page illustrates SDCC's absolute energy consumption. The absolute energy consumption is the energy consumption with no activity metric associated. This is directly looking at the overall reduction of total primary energy from the baseline to 2019. Since the baseline, SDCC has seen a reduction of 13 GWh of primary energy or 4,448 tonnes of CO_2, as mentioned previously.

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

In 2019, SDCC's absolute energy consumption decreased once more. The most significant gains were made in the area of Public Lighting, with the retrofit of LEDs to existing street lamps.

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.

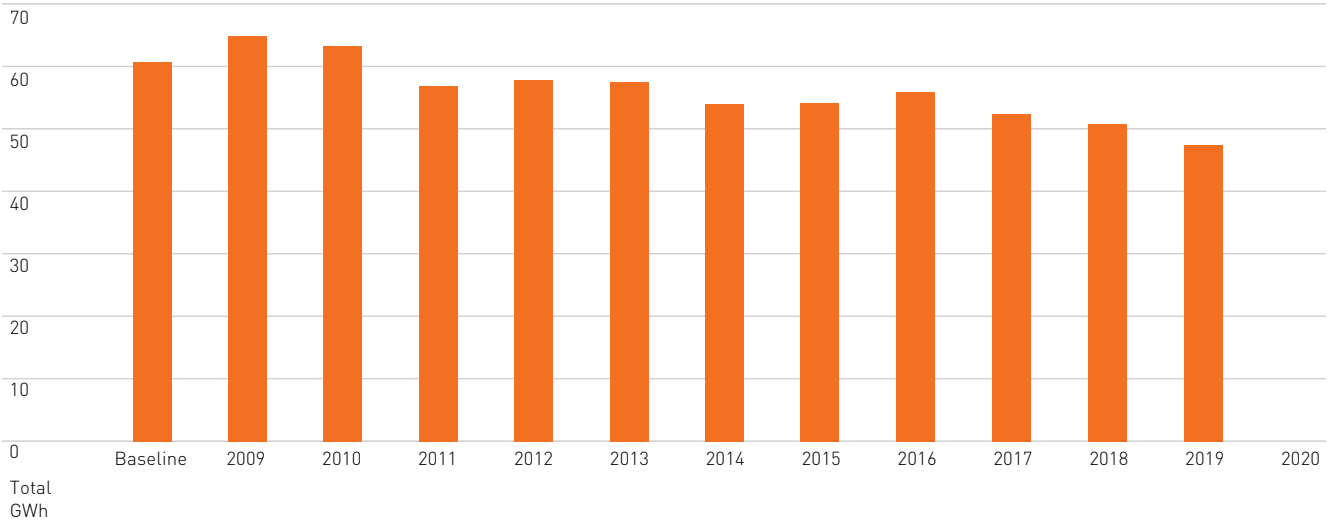


Figure 2: SDCC Absolute Annual Energy Consumption

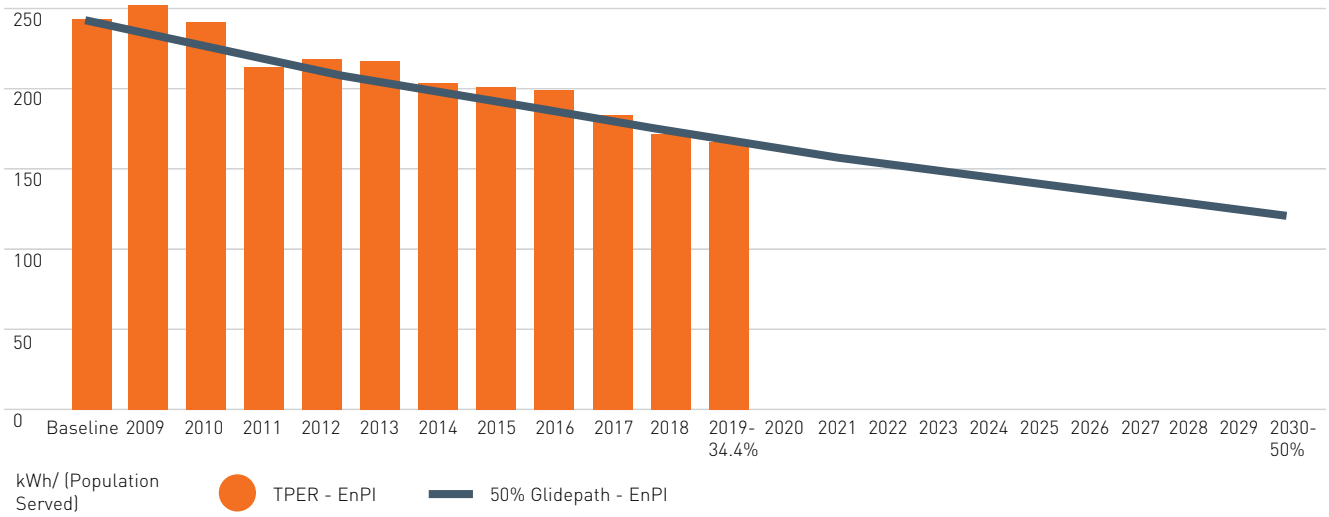


Figure 3: SDCC Annual Energy Performance Compared to 50% Glidepath to 2030

02. SDCC ENERGY CONSUMPTION 2019
(CONTINUED)

CLIMATE CHANGE ACTION PLAN & CARBON EMISSIONS

In 2018 and 2019, Codema helped to prepare SDCC's Climate Change Action Plan 2019-2024, in cooperation with the various departments and the Elected Members of South Dublin 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 South Dublin a more climate-resilient area with engaged and informed citizens. This will be achieved by a range of ongoing and planned actions in five key areas, which will be continuously monitored, evaluated and updated to 2030 and beyond. The key targets included in this plan are the statutory 33% improvement in the Council's energy efficiency by 2020, now superseded by the 50% 2030 target, as well as a 40% reduction in the Council's greenhouse gas emissions by 2030.

In terms of greenhouse gas emissions, SDCC is already making good progress towards its 40% reduction target and is ahead of its glidepath, as presented in Figure 4. Compared to the baseline year, SDCC's CO_2 emissions in 2019 had reduced by 33.6% to 8,678 tonnes. This leaves a gap-to-target of 832 tonnes of CO_2 between now and 2030.

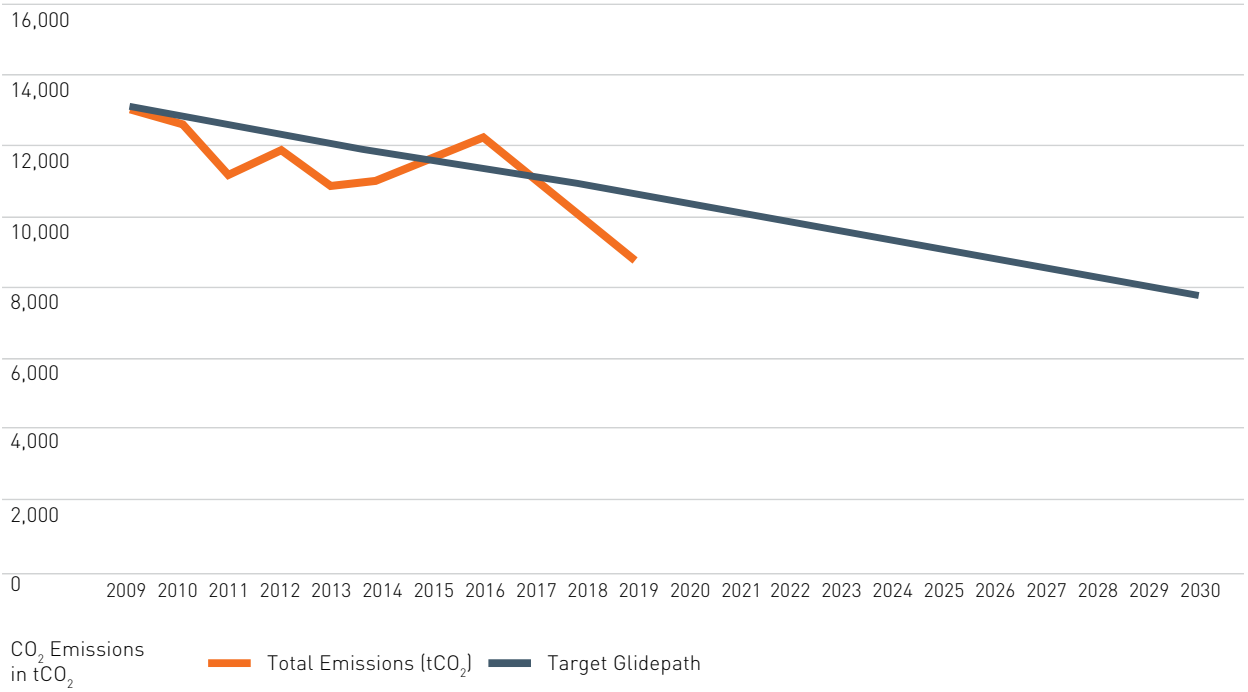


Figure 4: SDCC Annual CO_2 Emissions Performance Compared to 40% Glidepath

03. SIGNIFICANT ENERGY USERS

To help better understand SDCC'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 SDCC. Codema developed these SEUs by creating an energy database, which includes all the data reported in the M&R system back to the baseline, data compiled by Codema through energy audits, and direct contact with SDCC staff.

Codema compiled all of the Council's electricity and gas accounts, and developed a full list of buildings by marrying electrical and gas accounts for each of these buildings. SDCC'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 SDCC's SEUs into Total Primary Energy Requirement (TPER), CO_2 and cost year-on-year, and compares this back to the baseline. Codema also compares this data to an energy performance indicator to track the energy performance of each SEU.

Through analysis of this data, Codema has identified four key areas, or SEUs, which account for 80% of SDCC's total primary energy requirement and can be broken down as follows:

PUBLIC LIGHTING 44%

LEISURE CENTRES 15%

OFFICES 12%

TRANSPORT 9%

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

Figure 5 on the next page shows the breakdown of SDCC's SEUs. Public Lighting is the largest SEU, accounting for 44% of the total energy consumed. This is followed by Leisure Centres at 15%, while Offices, which comprise of County Hall in Tallaght and the Civic Offices in Clondalkin, account for 12%. The last SEU, Transport, accounts for 9% of the total energy consumed.

The remainder of the consumption is made up of smaller accounts within SDCC, such as community centres, libraries, arts and civic centres, housing, depots, and heating fuels.

The management of energy in these four SEUs is critical for SDCC to achieve its 50% energy reduction target and 40% absolute carbon reduction target by 2030. Small percentage energy reductions in these areas have a much greater effect on overall consumption than large percentage reductions in the less significant areas.

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.

Codema therefore recommends that SDCC uses a structured approach at senior management level in order to carefully plan and execute energy reduction projects. Initially, an Energy Management Team should be set up to help drive energy performance throughout the local authority. A representative from all identified SEUs should be included in this Energy Management Team, which is driven by senior management.

Figure 6 shows how the SEUs performed in 2019, compared to 2018. Most of the SEU areas recorded an improvement in energy performance in 2019, compared to the previous year.

The greatest improvement was seen in Public Lighting, with a year-on-year improvement in performance of 9.6%, or a 2.6 GWh saving in primary energy. This was due to the continued roll-out of the LED retrofit programme, as well as efficiency gains from improvements to the national electrical grid. Transport saw an improvement of 0.4%, with a reduction in diesel consumption. Offices' energy performance improved by 3.8% due to a decrease in electrical consumption in both County Hall and Clondalkin Civic Offices. Energy performance in the Leisure Centres remained static in 2019 with very little change in performance.

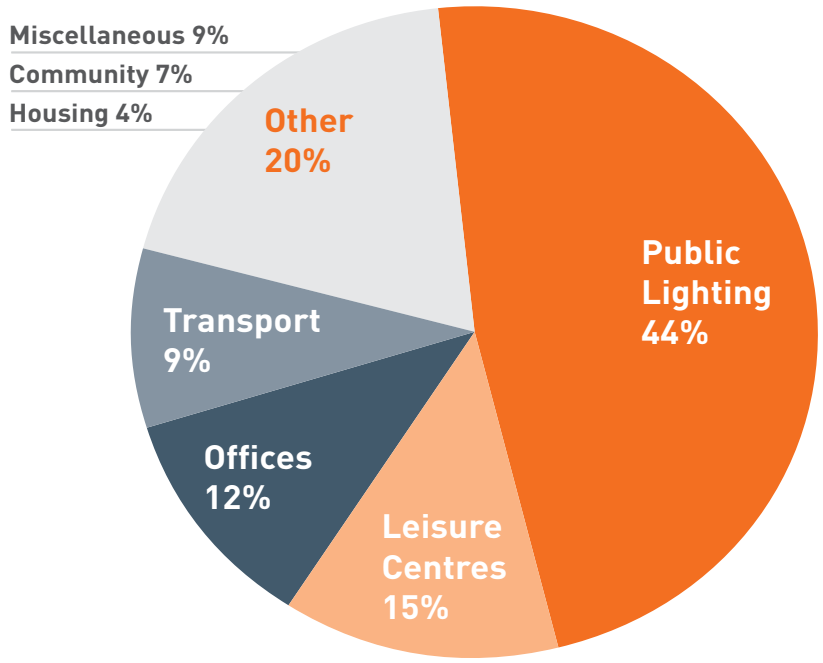


Figure 5: SEU Analysis

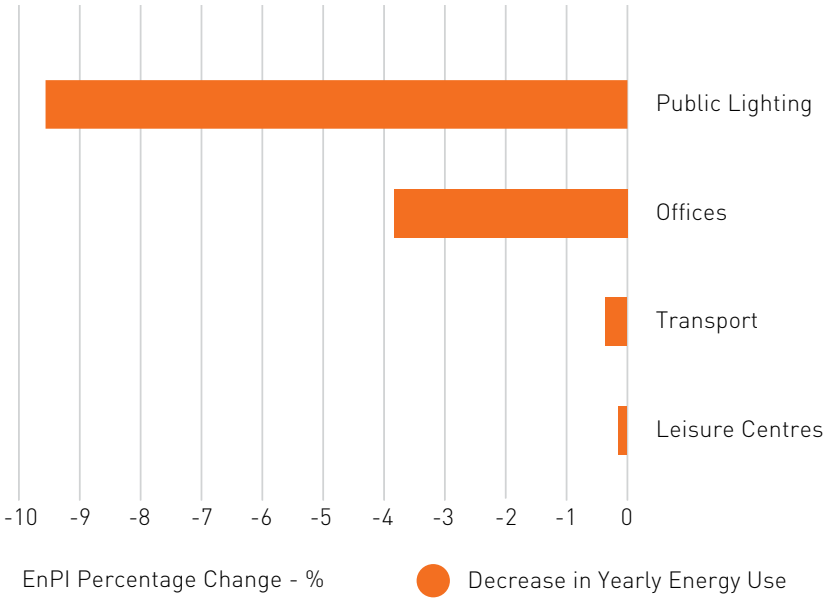


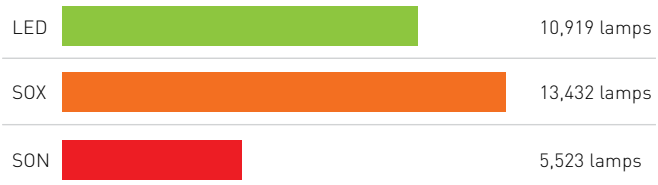
Figure 6: SEU Performance Change Between 2018 & 2019

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

PUBLIC LIGHTING

Public Lighting is the largest SEU within SDCC. In 2019, Public Lighting accounted for 44% of SDCC's primary energy consumption, which amounted to 20.7 GWh of primary energy consumption, 3,622 tonnes of CO_2 and an estimated €1.3 million in energy costs. Public Lighting consists of over 29,000 lamps, which are broken up into three main different light sources, which are listed below in order of their efficiency:

- Light Emitting Diode (LED) – 10,919 lamps
- Low Pressure Sodium (SOX) – 13,432 lamps
- High Pressure Sodium (SON) – 5,523 lamps



SDCC Public Lighting 2019

CONSUMED 20.7 GWH OF PRIMARY ENERGY

3,622 TONNES OF CO_2 EMITTED

€1.3M ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 34.5% 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 seasonally, and don't change from year to year.

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

Public Lighting EnPI = kilowatt hours (kWh) TPER / Number of public lights

Energy Performance of Public Lighting

In 2019, SDCC's Public Lighting Department retrofitted 1,736 SOX fittings to LEDs. The result of this saw energy performance in Public Lighting improve by 9.6% compared to the previous year. This resulted in an absolute reduction of 2.6 GWh of primary energy and 838 tonnes of CO_2. To date, SDCC's Public Lighting Department has already retrofitted 10,919 lights with LEDs. The energy database shows that Public Lighting has improved its energy performance by 34.5% since the baseline, based on its EnPI. This is an absolute reduction of 9.8 GWh of primary energy and 3,450 tonnes of CO_2.

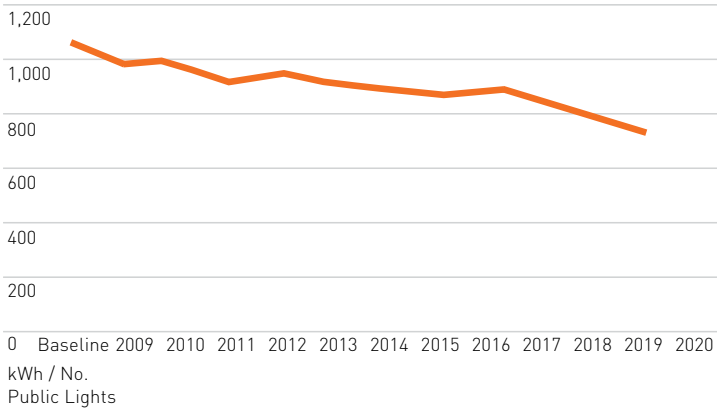
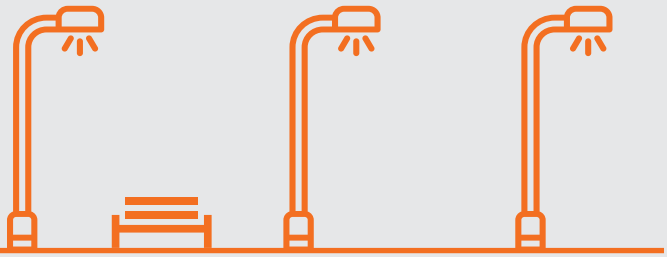


Figure 7: Public Lighting Annual Energy Performance

PUBLIC LIGHTING PLAN TOWARDS 2030



As Public Lighting is key to SDCC achieving its energy efficiency improvement target, the Council must commit to further annual 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 high primary energy conversion factor.

Within SDCC's stock of public lighting, there are currently over 13,000 SOX lamps. The manufacture of these SOX lamps is in the process of being phased out, so these will have to be replaced as a priority. LED lights, with their very high energy efficiency, are the obvious replacement. If SDCC commits to replacing 950 of these SOX lamps by the end of 2020, it could produce savings of 700 megawatt hours (MWh) of TPER and 514 tonnes of CO_2. This would have a significant impact on the Council's targets towards 2030.

An ongoing programme to replace the remaining SOX street lighting with LEDs beyond 2020 has been formulated and is due to commence towards the end of the year.

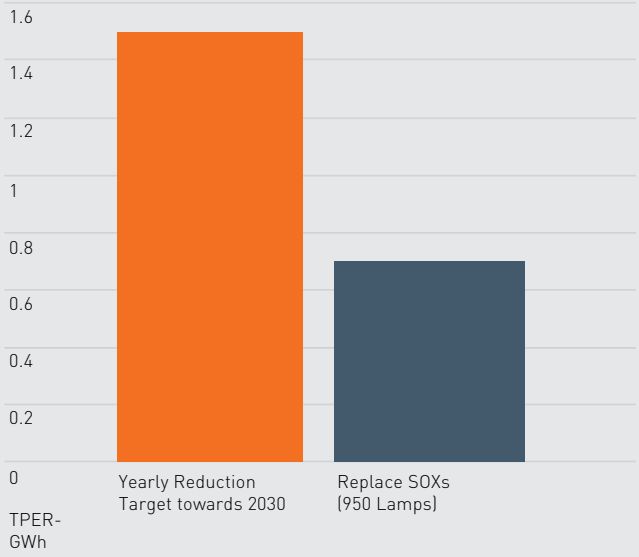


Figure 8: Public Lighting Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

LEISURE CENTRES

Leisure Centres are the second largest energy consumer within SDCC. SDCC currently operates two large leisure centres, namely Tallaght and Clondalkin Leisure Centres. In 2019, these leisure centres accounted for 15% of the local authority's primary energy requirement. This is a consumption of 6.9 GWh of primary energy, 1,256 tonnes of CO_2, and an estimated €352,380 in energy spend.

Identification of relevant variables for the Leisure Centres

In relation to the Leisure Centres, electricity and gas are the two main energy types. With multiple variables driving energy consumption, a composite performance indicator is used to determine the overall energy performance.

Factors such as footfall, opening hours and floor area are the significant variables influencing the overall energy consumption. Consequently, a composite metric is appropriate, dividing energy consumed (kWh TPER) by a weighted scale of total floor area (m^2) and Heating Degree Days (HDD). This is shown in the formula below:

Leisure Centre EnPI = kWh TPER/ (m^2)(HDD)

SDCC Leisure Centres 2019

CONSUMED 6.9 GWH OF PRIMARY ENERGY

1,256 TONNES OF CO_2 EMITTED

€352,380 ASSOCIATED ENERGY COST

INCREASED ENERGY PERFORMANCE BY 22.3% SINCE BASELINE

Energy Performance of Leisure Centres

The Energy Database shows that the Leisure Centres have improved their energy performance by 22.3% since the baseline, compared to the EnPI.

As highlighted in previous Energy Reviews, there was a decrease in the Leisure Centres' energy consumption around 2011. In analysing the electrical and gas consumption from both facilities to help identify this reduction, there was a similar reduction across both facilities. This reduction could be the result of the effect of the recession on the activity levels of the facilities.

In 2019, the total primary energy consumption in the Leisure Centres' SEU was almost the same as 2018. However, Figure 9 shows that significant energy savings achieved in Tallaght were counteracted by an equally large increase in energy consumption in Clondalkin. A significant spike was recorded in Clondalkin's gas consumption, which increased by over 67% compared to the previous year. In contrast to this, Tallaght reduced its electricity consumption by 43% in 2019.

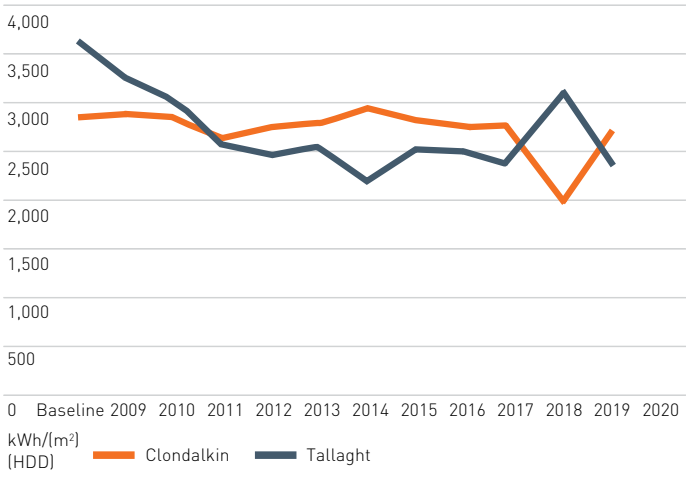


Figure 9: Leisure Centres' Annual Energy Performance

LEISURE CENTRES' PLAN TOWARDS 2020

Codema is currently helping SDCC to implement an Energy Performance Contract (EPC) project within Tallaght and Clondalkin 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. The EPC method is already working very successfully in Dublin City Council (DCC), where it awarded an EPC in 2016 for the upgrade of three of its sports facilities - Ballymun, Finglas and Markievicz Sports and Fitness Centres. The Energy Performance Contract has operated as expected to date, achieving actual cost savings of €318,281 and energy savings of 38%. Based on the actual results for the first two years, the project is forecast to save €1,682,503 that would otherwise have been spent on gas and electricity. When the extra costs for EPC service payments are taken into account, DCC will save €1,532,604 over the contract term, while still having an asset that is fully maintained and has had continued investment throughout the eight-year term.

The initial energy audits of Tallaght and Clondalkin Leisure Centres have been completed to identify the energy savings, and show that a potential 1.6 GWh of primary energy and 373 tonnes of CO_2 could be saved by implementing an EPC in these facilities.

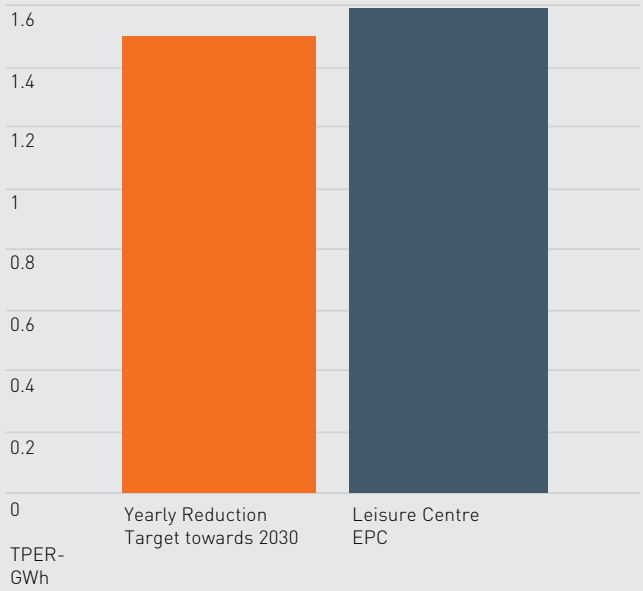


Figure 10: Leisure Centres' Plan towards 2030

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

OFFICES

SDCC has two large public office buildings, namely County Hall in Tallaght and its Civic Offices in Clondalkin. In 2019, these offices accounted for 12% of SDCC's primary energy consumption. This is a consumption of 5.7 GWh of primary energy, 1,019 tonnes of CO_2 and an estimated €359,113 in energy spend.

Identification of relevant variables for the Offices

In relation to the office 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 mentioned in the methodology section. It is difficult to find a single significant driving factor for the overall electrical 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 Offices' energy performance is the energy consumed (kWh TPER), divided by a weighting scale of total floor area (m^2), heating degree days (HDD) and full time employees (FTE). This is derived from the formula given in the methodology, as shown below:

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

SDCC Offices 2019

CONSUMED 5.7 GWH OF PRIMARY ENERGY

1,019 TONNES OF CO_2 EMITTED

€359,113 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 14.9% SINCE BASELINE

Energy Performance of the Offices

The database shows that the Offices have improved their energy performance by 14.9% since the baseline. This is an absolute reduction of 1.7 GWh of primary energy and 610 tonnes of CO_2. In the Clondalkin Civic Offices, however, the energy consumption has continued to increase. In 2019, the office's energy consumption increased by 32% since the baseline. More notably, the gas consumption has increased by 58% since the baseline, after correction for weather factors. In 2019 alone, the gas consumption in Clondalkin increased by 4% compared to the previous year, despite the fact that new, high-efficiency gas boilers had been installed only a couple of years ago. This clearly shows that the existing energy management and control systems in place need to be reviewed and updated. It is therefore recommended that a performance-based maintenance contract be considered. This will help drive energy performance throughout the lifetime of the maintenance contract.

The energy performance in County Hall has improved by 17% since the baseline, due to a steady reduction in electricity consumption over this period. However, the gas consumption trend is going in the opposite direction, with significant increases in gas consumption noted over the past three years in particular. Gas consumption has increased by over 26% since 2016, after taking account of the weather. While efforts to reduce electricity consumption in the facility are clearly working, this demonstrates that further attention needs to be given to the management and control of the heating systems in County Hall. This facility will soon be connected to the Tallaght District Heating System (TDHS). While this will address some of the issues in relation to consumption, general control issues will still have to be addressed.

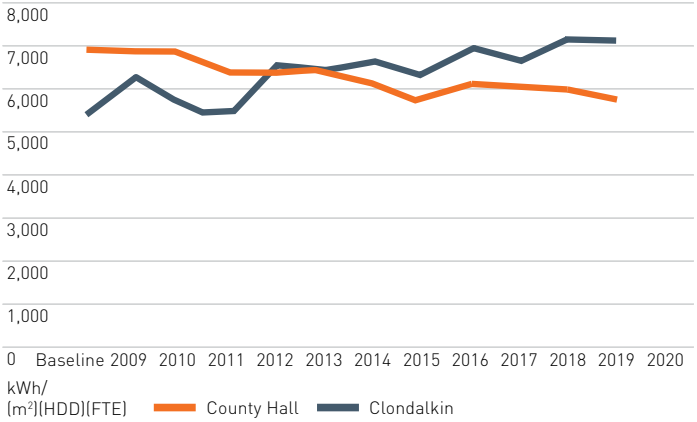


Figure 11: Offices' Annual Energy Performance

OFFICES' PLAN TOWARDS 2020

Following a meeting with SDCC's facilities manager, Codema carried out a detailed energy audit of County Hall in Tallaght in 2018. This energy audit has identified lighting retrofits in particular as having significant potential for continuous energy savings in the facility. The lighting retrofit works in County Hall could achieve savings of 517 MWh in primary energy and 115 tonnes of CO_2. In 2019,facilities management started the retrofit of the light fittings in County Hall. To date, close to 50% of the facility has been retrofitted with LEDs. Facilities management aims to retrofit the entire facility by the end of 2020. The remaining works will see savings of 256 MWh in primary energy and 58 tonnes of CO_2. The reductions could be greater still if some unessential fittings are removed, and a full roll-out of occupancy sensors and light dimming controls is carried out throughout the building.

Codema is also currently working with SDCC to develop Ireland's first large-scale district heating network involving its County Hall and surrounding facilities. The contract for the Tallaght District Heating Scheme is due to be signed in the summer of 2020, with works commencing later in the year. This project is estimated to save the Council 1 GWh in primary energy and 1,736 tonnes of CO_2. The proposed system seeks to utilise a low temperature waste heat source from a data centre through a large-scale heat pump, in order to supply space heating and hot water to a cluster of nearby local authority buildings. The system will also have the capacity to supply

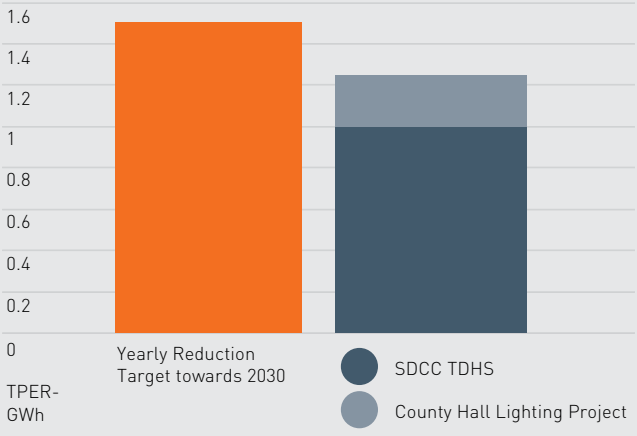


Figure 12: Offices' Plan towards 2030

other nearby interested customers in the public and private sector in the following phases. This innovative district heating scheme will provide low-carbon heat to the Tallaght area, and will be the first of its kind in Ireland and the UK, and the only not-for-profit energy utility in Ireland. If all of the above confirmed projects are completed within the Offices, they could collectively save SDCC 1.25 GWh of TPER in total and 1,794 tonnes of CO_2 by the end of 2020.

03. SIGNIFICANT ENERGY USERS
(CONTINUED)

TRANSPORT

Transport is the fourth largest SEU within SDCC and comprises of fuels used by Council vehicles (including light and heavy vehicles), and fuels used by the park services. In 2019, transport accounted for 9% of SDCC's primary energy consumption. This amounts to 4.4 GWh of primary energy, 1,044 tonnes of CO_2, or an estimated €358,557 in energy costs.

Within Transport, diesel accounts for 70% of the total primary energy consumption, while gas oil accounts for 28%. Petrol accounts for just 2%, as it is only used to fuel small equipment. A breakdown of this is shown in Figure 13.

Identification of relevant variables for Transport

Due to a lack of robust data relating to kilometres driven or efficiency of the fleet, Codema has used the number of vehicles to develop a performance indicator for Transport. Therefore, the EnPI for Transport is the kWh consumption of primary energy divided by the total number of vehicles. This formula is:

Fleet EnPI =
kWh TPER / Number of vehicles

SDCC Transport 2019

CONSUMED 4.4 GWH OF PRIMARY ENERGY

1,044 TONNES OF CO_2 EMITTED

€358,557 ASSOCIATED ENERGY COST

IMPROVED ENERGY PERFORMANCE BY 15.6% SINCE BASELINE

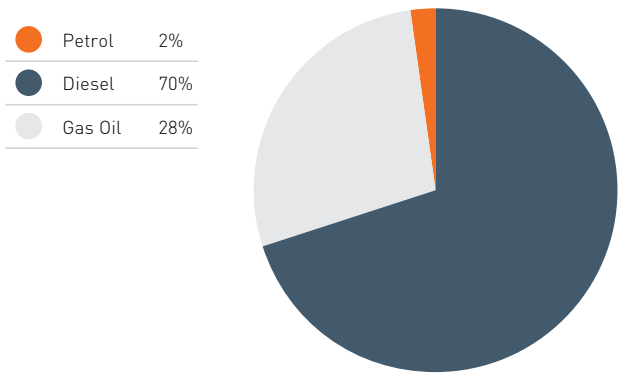


Figure 13: SDCC Transport Fuels TPER - 2019

Energy Performance of Transport

The database shows that the energy performance of Transport has improved by 15.6% since the baseline. There was a sizable reduction in diesel use in 2019, which amounted to a saving of 6% on the previous year. The is due to the impact of the new vehicles that were purchased as part of the latest three-year vehicle replacement programme.

Gas oil consumption increased by 9%.This could be due to an increase in adverse weather conditions requiring additional road services. Without the use of a more robust energy performance indicator, such as kilometres travelled, to track this fuel use, it is difficult to determine a definitive reason for this.

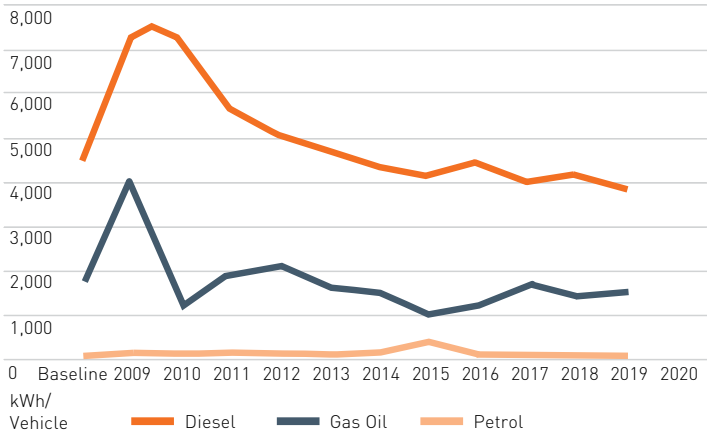


Figure 14: Transport Annual Energy Performance

TRANSPORT PLAN TOWARDS 2030

In 2019, SDCC's Transport Department commenced a three-year replacement programme of 69 vehicles. This programme is following on from previous vehicle replacement programmes. Over time, continued programmes such as these will replace all of the Council's fleet with more up-to-date, energy-efficient alternatives. The replacements in 2020 have not commenced due to an analysis being carried out to ensure the best fit-for-purpose vehicle replacements as opposed to like-for-like replacements. This will be the end of the current three-year replacement programme, with a new replacement programme to be devised for the period between 2021 - 2024.

In addition to this, the Transport Department, in conjunction with the Association of Irish Energy Agencies (AIEA), is rolling out a pilot eco-driving scheme among a number of its depots.

From this three-year programme and planned eco-driving scheme, savings of 230 MWh of TPER and 67 tonnes of CO_2 are expected to be achieved.

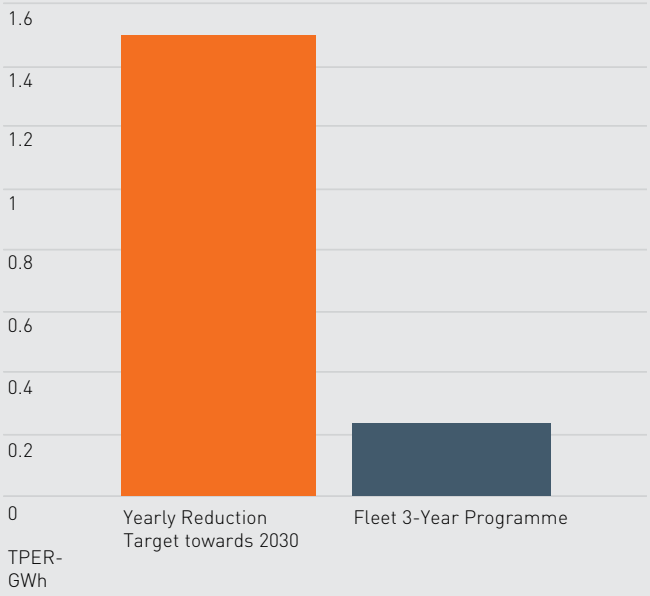


Figure 15: Transport Plan towards 2030

04. NON-SEU PROJECTS

NON-SEU PROJECTS

In 2018, Codema carried out a feasibility study on behalf of SDCC to evaluate the possibility of developing a renewable energy generation project at the now closed Arthurstown Landfill site, which has been capped and sealed since 2013. Ongoing leachate treatment at the facility still results in a significant electrical demand on the site, and this may be set to increase if a proposal to import leachate from other waste sites progresses. This report detailed the various options available to SDCC in order to make best use of this large site, with wind and solar photovoltaic (PV) generation emerging as the two most likely options.

A follow-up report was presented to SDCC in 2019, examining a scaled-down project, which would just supply enough electricity to cover the annual consumption of the site and allow it to operate in a carbon-neutral manner. In early 2020, technical guidance relating to the new Renewable Electricity Support Scheme (RESS) auction process was published, with the first auction taking place in summer 2020. This system will guarantee a minimum price for any renewable electricity sold to the grid. The options proposed for Arthurstown are currently being reviewed with a view towards potential participation in future RESS auctions, possibly under the Community-led projects category.

In early 2020, Codema conducted an analysis to determine the potential for the installation of solar PV on Council buildings. From a shortlist of 38 SDCC buildings, 13 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 €400,000. If all the available roof space on these facilities was utilised, the total combined electricity generation from these 13 sites could amount to 130,000 kWh per year. LED retrofits could save a further 160,000 kWh. This could potentially reduce SDCC's carbon emissions by 110 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 SDCC, and the effect it may have on the Council's energy efficiency and emissions targets. The study was limited to just the 19 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 1,410 tonnes is predicted, at a total cost of €5.5 million. In reality, the actual savings would probably be closer to 900 tonnes of CO_2 per year, due to overestimations inherent in the BER calculation methodology.

05. CONCLUSION

SDCC has achieved energy savings of 34.4% between the baseline year and 2019. While these savings are substantial and SDCC has now achieved its 2020 energy efficiency target, the Council still needs to look towards 2030 and the new 50% energy efficiency and 40% carbon reduction targets. These targets will require the Council to save a further 15.6% to achieve the 50% energy saving target by 2030.

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

The energy efficiency projects detailed within each of the four key SEUs in this report will contribute towards SDCC energy efficiency savings by 2030, but SDCC will still fall short of meeting this 50% target. Small percentage 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 SDCC uses a structured approach at senior management level in order to carefully plan and execute these 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.

Under S.I. 426 of 2014, it is a statutory requirement for SDCC to undertake an organisational energy audit every four years, and to report completion to the SEAI. The first audit was required to take place prior to 5th December 2015, and then every four years thereafter. No such energy audit has yet been carried out by SDCC. If an organisation has a valid, certified energy or environmental management system (ISO 50001, ISO 14001 or equivalent) and it can demonstrate to SEAI that the management system meets the Minimum Criteria for Energy Audits, then this may be accepted as an alternative to stand-alone energy audits.

It is strongly recommended that SDCC works towards the development of a structured energy management system, with the goal of achieving certification under the ISO 50001 standard. Codema has been actively engaged with the three other Dublin local authorities in this regard over the past number of years. This approach has seen huge success in Fingal County Council and Dún Laoghaire-Rathdown County Council, who both recently achieved certification to the latest 2018 standard, while Dublin City Council is also currently working towards certification. In order for this to be a success, support and resources need to be allocated across all SEU areas, with commitment from the top management level being crucial. Codema will support SDCC in the setting up and ongoing development of this energy management system. As the implementation of the Energy Management System may take some time, Codema can carry out an energy audit in the meantime to satisfy the Council's statutory requirements.

In terms of the smaller accounts, it is recommended that SDCC develops a framework that will incorporate the maintenance and upgrade of systems within these facilities. This framework will also incorporate an energy efficiency aspect to the works. Codema will help SDCC develop this framework that will focus on the smaller energy consumers within the local authority. This is important as it strengthens the "exemplary role" to the public, as set out in S.I. 426 of 2014.

Figures 16 and 17 on the next page illustrate SDCC's gap-to-target model to 2030 for both energy efficiency and CO_2 emissions. As stated earlier in this report, SDCC has achieved its 33% energy efficiency target one year ahead of the target deadline of 2020 and is also on track to achieve the 40% absolute carbon reduction by 2030. This is a huge achievement for the Council but to ensure that this continues, the Council will have to continue to actively identify energy efficiency and carbon reduction measures.

The greatest concern is that even with all the planned energy efficiency projects, there is still a further gap of 12.4 GWh in energy reductions, which will need to be realised over the next 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.

It is clear now also that the 40% GHG reduction target set by the Council will easily be met, so it would be advisable to review this target upwards in an effort to show leadership on climate action.

SEU AREA	ACTION	ESTIMATED SAVINGS
PUBLIC LIGHTING	REPLACE 950 SOXS WITH LEDS	0.7 GWH
LEISURE CENTRES	EPC IN TALLAGHT AND CLONDALKIN LEISURE CENTRES	1.6 GWH
OFFICES	CONNECTION OF TALLAGHT DISTRICT HEATING SCHEME & LED UPGRADES IN COUNTY HALL	1.3 GWH
TRANSPORT	PROCUREMENT OF ELECTRIC VEHICLES & INTRODUCTION OF ENERGY MANAGEMENT SYSTEM	0.2 GWH

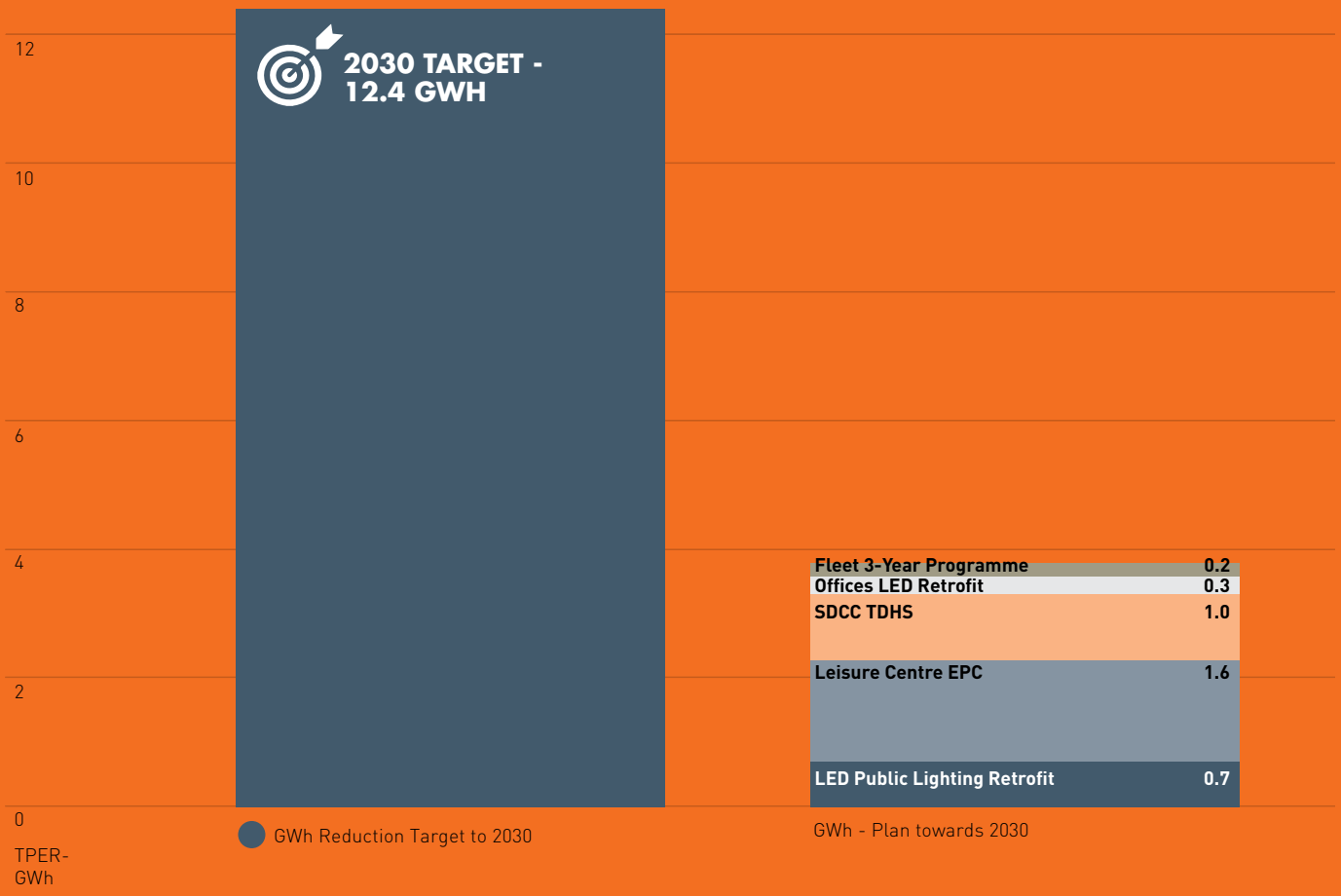


Figure 16: SDCC Energy Efficiency Plan towards 2030

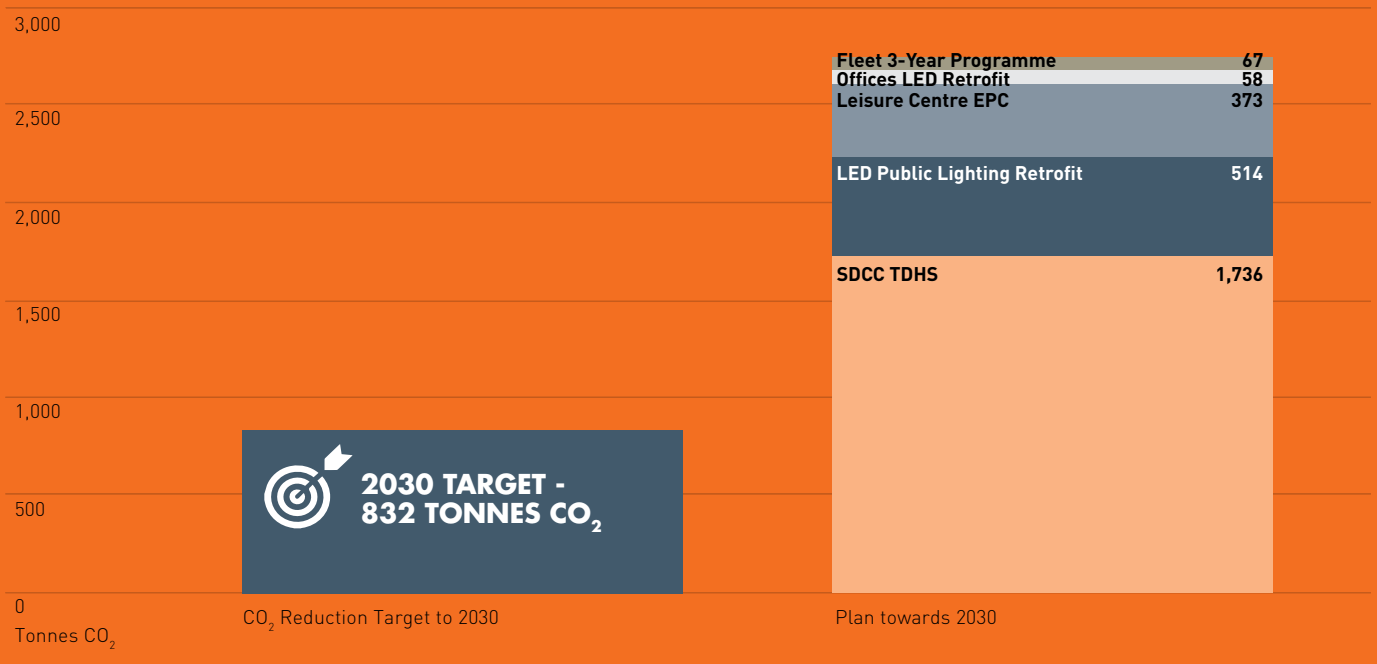


Figure 17: SDCC Carbon Reduction Plan towards 2030 Target

06. APPENDICES

SEU Summary

Table 1: SEU Summary

SEU	TPER - GWh	Tonnes CO_2	Cost	% +/- since baseline
Public Lighting	20.7	3,622	€1,282,941	-34.5
Leisure Centres	6.9	1,256	€352,381	-22.3
Offices	5.7	1,019	€359,113	-14.9
Transport	4.4	1,044	€358,557	-15.6
Total	37.7	6,941	€2,352,992	

Project Plan towards 2030 Summary

Table 2: Project Plan Summary

SEU	TPER - GWh	Tonnes CO_2
Public Lighting	0.7	514
Leisure Centres	1.6	373
Offices	1.25	1,794
Transport	0.23	67
Total	3.78	2,748

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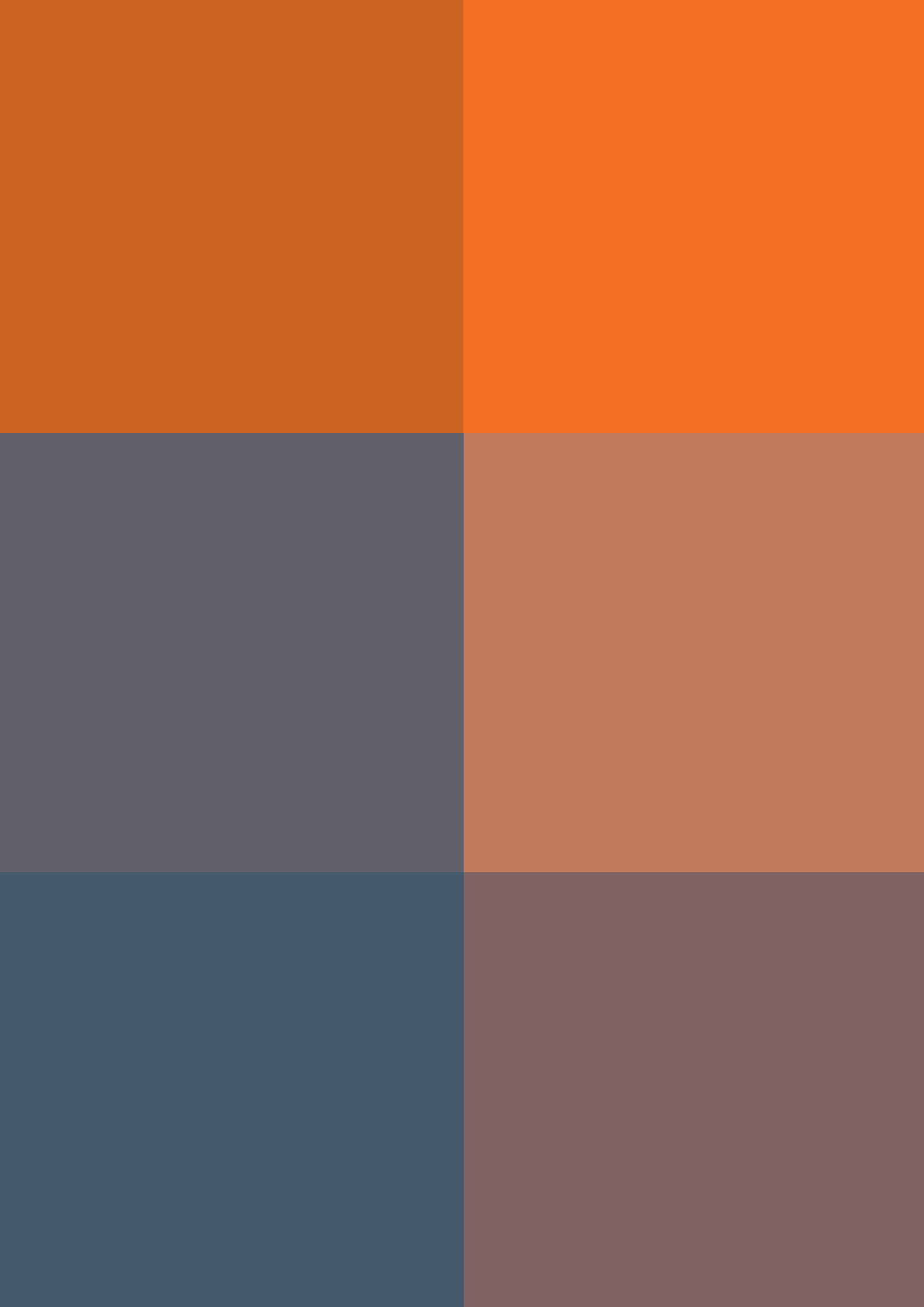
Abbreviations

AIEA	Association of Irish Energy Agencies
BER	Building Energy Rating
CO_2	Carbon Dioxide
CHP	Combined Heat and Power
DCACNT	Department of Climate Action, Communication Networks and Transport
DCC	Dublin City Council
DLAs	Dublin Local Authorities
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
RESS	Renewable Energy Support Scheme
SDCC	South Dublin County Council
SEAI	Sustainable Energy Authority of Ireland
SEUs	Significant Energy Users
SON	High Pressure Sodium
SOX	Low Pressure Sodium
TDHS	Tallaght District Heating Scheme
TPER	Total Primary Energy Requirement
UMR	Unmetered Registrar



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