semple mckillop CONSULTING ENGINEERS

Proposed Part 8 Residential Development

Clonburris, Kishoge Lucan, Dublin 22

Climate Action Energy Statement, Sustainability & Part L Compliance Report

ISO 9001
ISO 14001
OHSAS 18001
Registered

INVESTORS IN PEOPLE

www.semplemckillop.com

Belfast
T +44 (0)28 9033 1700

Monaghan
T +353 (0)42 974 9570

Glasgow
T +44 (0)141 433 0219

London
T +44 (0)20 3328 5088

E admin@semplemckillop.com
info@semplemckillop.com

Document History

Version	Issued	Comments
0	22nd March 2023	
1	4th April 2024	Updated in line with SDCC Development plan.
2	31st May 2024	Updated in line with comments

Contents

1 INTRODUCTION

This Climate Action Statement, Sustainability & Part L Compliance Report was prepared on behalf of the National Development Finance Agency (NDFA) and South Dublin County Council, to accompany a Part 8 proposal for the development at Clonburris, Kishoge Lucan, Dublin 22.

This document provides an overview of the energy strategy for this new development to support the Part 8 circulation. The main aim is to meet or exceed the sustainability and energy targets and overheating risk assessment set by the Irish Building Regulations, Technical Guidance Document Part L 2022 – Conservation of Fuel and Energy - Dwellings. This report looks at how the design team have reviewed the proposed development and identified opportunities to implement nearly Zero Energy Buildings (nZEB) solutions to reduce the energy demand from building services and meet the targets of Part L 2022 for Dwellings. To that end several passive and active strategies described in detail in Section 4 were implemented. Primary energy sources were also evaluated to identify the most suitable solution for the development. As stipulated in the Part L 2022 for Dwellings, a DEAP (Dwelling Energy Assessment Procedure) assessment was conducted to evaluate the primary energy consumption and carbon emissions associated with the operation of the dwellings and verify they are in line with the current regulation. All the building services options presented in this report under Section 4 for each building type of the development have demonstrated compliance with Part L 2022 for Dwellings

The development will consist of:

i. 118 no. residential units including 89 no. apartment units and 29 no. houses in a mix of two storey houses, 3 storey duplex units and apartment blocks of 4 – 6 storeys comprising 26 no. 1 bed apartments; 42 no. 2 bed apartments; 21 no. 3 bed apartments; 23 no. 3 bed houses; and 6 no. 4 bed houses, with renewable energy design measures (which may be provided externally) for each housing unit;

ii. Landscaping works including provision of (a) communal open space areas (b) outdoor sports and play areas; (c) new pedestrian and cycle connections; and (d) civic plaza;

iii. Associated site and infrastructural works including provision for (a) ESB substations and switchrooms; (b) energy centre to the rear of 6 storey block; (c) car and bicycle parking; (d) public lighting; (e) bin storage; (f) temporary construction signage; (g) estate signage; and (h) varied site boundary treatment comprising walls and fencing; and

iv. all associated site development works.

The EU Directive on the Energy Performance of Buildings (EPBD) contains a range of provisions aimed at improving energy performance of residential and non-residential buildings, both new-build and existing. This Directive was adopted into Irish law as Regulation in 2006.

The EPBD obliges specific forms of information and advice on energy performance to be provided to building purchasers, tenants and users. This information and advice provide consumers with information regarding the energy performance of a building and enables them to take this into consideration in any decisions on property transactions.

As part of the Directive, a Building Energy Rating (BER) certificate, which is effectively an energy label, will be required at the point of sale or rental of a building, or on completion of a new building. As such the Dwellings Energy Assessment Procedure (DEAP) was created a base procedure in which the BER can be calculated. The Dwelling Energy Assessment Procedure (DEAP), which is the Irish official procedure for calculating and assessing the energy performance of dwellings. The procedure takes account of the energy required for space heating, ventilation, water heating and lighting, less savings from energy generation technologies. For standardized occupancy, it calculates annual values of delivered energy consumption, primary energy consumption, carbon dioxide emissions and costs, both totals and per square meter of total floor area of the dwelling.

The report sets out to discuss options of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed in part or in combination with each other. The proposed techniques to be employed to achieve compliance with both the building regulations Part L (NZEB) and the local Strategic Environmental Plan (HC 12) are provided. One of the house types DEAP report is provided to demonstrate this, as an example.

Climate change is expected to have a wide-ranging impact on Ireland's environment. This document is intended to outline the energy strategy design approach and building regulation compliance criteria at planning stage for this residential development and takes account of The governments 'Climate Change Adaptation Strategy 2024' as well as the local authority 'Climate Action plan.'

This sustainability report outlines the schemes Climate Change Adaptation Design along with detailed energy efficiency approaches. This approach seeks to ensure that the development meets the principles of the Government's 'National Climate Change Policy', Local Area Development Plan with regard to Climate Change and Energy Efficiency and that it exceeds the requirements of the Building Regulations Part L and maximises the reduction in Carbon Dioxide (CO_2) emissions thus demonstrating the Client's commitment to Climate Change.

The sustainable design strategy will be to use robust, passive, cost-effective measures to create a more efficient and healthy environment within the planned spaces. By utilizing an integrated approach to design, planning, construction, and operation, the development provides an opportunity to create environmentally sound and energy efficient housing.

Sustainable development encourages the conservation of our precious natural resources. A whole life cycle approach to development management and planning will be used, as well as energy efficiency with a specific focus on reducing the carbon footprint, improving the environmental quality of the building spaces, material selection and use, waste management, water management and conservation, and enhancing the ecological value of the site.

2 BUILDING REGULATIONS PART L 2022 DWELLINGS

Compliance with Building Regulations Part L 2022 Dwellings is broken down into six distinct categories, known as Regulation 8; parts (a) to (f). A summary of each of these parts as listed in Technical Guidance Document L 2022 is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

2.1 REGULATION 8 PART (A)

The regulation requires that:

Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably practicable.

Part (a) is the overarching compliance target which stipulates the required overall reduction in energy consumption and carbon emissions for new dwellings.

This requires that the energy consumption and carbon emissions of every dwelling is assessed using the DEAP software and that reductions of 70% in energy consumption and 65% in carbon emissions are achieved. The baseline against which this reduction is to be measured is considered to be a dwelling which is constructed to perfectly comply with the 2005 version of Building Regulations Part L.

The ratio of the energy consumed by the proposed dwelling to a similar dwelling constructed to 2005 energy efficiency standards is referred to as the "Energy Performance Co-efficient".

2.2 REGULATION 8 PART (B)

The regulation requires that:

Providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced onsite or nearby;

This requires that all new dwellings are provided with a renewable energy source. The regulations state that 20% of the total energy consumed within the dwelling must be provided from renewable thermal sources (solar thermal, biomass, heat pumps) or renewable electrical sources (Photovoltaic, Micro-wind). In practical terms, for a multiple unit development, this requirement is usually met by incorporating PV panels at roof level, incorporating air source heat pump technology or by adding an element of biomass or micro-Combined Heat & Power (CHP) to a district heating scheme.

CHP run on oil or gas and in this development no fossil fuels sources are being used and therefore CHP is discounted as an option.

2.3 Regulation 8 Part (c)

The regulation requires that:

Limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;

This requires that the fabric of the building is designed to minimise heat loss from the building and that the air permeability of the structure limits the unwanted passage of air into the building.

The aim for this development is to achieve low U-Values beyond Part L compliance. Target U-Values are set out below:

- Walls - 0.17 W/m2.K
- Window - 1.1 W/m2.K (solar fraction (g factor) of 0.65 or greater, Frame factor of 0.7 or better)
- Roof - 0.15 W/m2.K
- Doors - 1.2 W/m2.K (This is to include frame)
- Ground Floor slab - 0.13 W/m2.K
- Thermal Bridging - Factor of 0.08, with junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"

The u-values of individual elements can be relaxed if required provided that compensatory measures are taken on other elements and that the overall area weighted u-value for the entire dwelling is the same as it would have been if all individual elements had complied.

The thermal bridging details of junctions in the envelope of the building (floor-wall; wall-window; wall-roof, etc) must also be designed and constructed in accordance with the guidance set out in Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details

2.4 Air Permeability (Air Tightness Against Infiltration)

Every dwelling must also be subjected to an air pressure test to determine the air tightness. All dwellings must achieve and air tightness of less than 5m3/m2/hour when tested at 50 Pascals. In multiple dwelling developments with repeating apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD Part L 2022 Dwellings.

This development is to be constructed with a high degree of air tightness to a possible value of **3 m3/m2/hr**. with a permeability test conducted post construction to demonstrate this level.

2.5 Regulation 8 Parts (d & e)

The regulation requires that:

Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls; Providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;

No Oil or gas boilers shall be used on this development. The heating controls on this development shall allow independent time control of the heating (2 zones for dwellings larger than 100m2) and hot water. Heating in each zone should also be controlled by room thermostats (in the case of heating) and cylinder stats (in the case of hot water).

2.6 Regulation 8 Parts (f)

The regulation requires that:

Providing to the dwelling owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.

This requires that information is provided to the dwelling owner which relates to the effective and efficient operation of the systems installed in that dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements. Full demonstration shall be provided to each tenant on this social housing development and full maintenance and facilities management shall be provided to the tenants as part of development construction contract.

2.7 Requirements for Common Areas

Section 0.1.2.3 requires that:

Where a new dwelling forms part of a larger building, the guidance in this document applies to the individual dwelling, and the relevant guidance in Technical Guidance Document L - Conservation of Fuel and Energy – Buildings other than dwellings applies to the non-dwelling parts of the building

2.8 L2A & S.I No 393 of 2021 Regulation 5 Part (f) – Electric Vehicle Charging

The regulation requires that:

(a) A multi-unit building containing one, or more than one, dwelling that is new shall have installed ducting infrastructure (consisting of conduits for electrical cables) for each car parking space, to enable the subsequent installation of recharging points for electric vehicles where the parking space is:

(i) located inside the building concerned, or

(ii) is within the curtilage of the building concerned.

(c) A new building that is a dwelling, other than where the dwelling forms part of a multi-unit building, where a parking space is located within the curtilage of the dwelling, shall have installed appropriate electric vehicle recharging infrastructure to enable the subsequent installation of recharging points for electric vehicles.

This requires that ducting provision for the future installation of car charging point be made in all carparks with more than 10 parking spaces associated with multi-unit residential buildings. It also requires that individual / own-door dwellings which have on curtilage parking are provided with ducting infrastructure to allow the future installation of e-car charging.

In terms of this development this would mean ducting to ALL CARPARK SPACES for future EV charging connections in line with the development plan.

3 SOUTH DUBLIN CLIMATE ACTION PLAN (CAP) 2024-2029 AND DEVELOPMENT PLAN (DP) 2022-2028

Energy and Buildings section of south Dublin Climate action plan 2024-2029 sets out a number of policies in relation to energy in use in existing and proposed developments and the potential use of district heating / waste heat networks. The policies relevant to this proposed development are set out below and are addressed.

3.1 CAP E17 & E18

'Develop proposals for further district heating schemes, including Clonburris and Grange Castle.'

One option included within the proposal is a district heating system for this development.

3.2 CAP T23

'Implement the Dublin Local Authority Electric Vehicle Charging Strategy, (aligning with the National EV Charging Infrastructure Strategy 2022-2025).

This development includes for All spaces ducted for future chargers with 20% of spaces with chargers installed as part of the development.

3.3 DP 12.7.5

'EV charging shall be provided in all residential, mixed use and commercial development and shall comprise a minimum of 20% of the total parking spaces provided, with higher provision within this range required in urban areas. The remainder of the parking spaces should be constructed to be capable of accommodating future charging points'

This development includes for All spaces ducted for future chargers with 20% of spaces with chargers installed as part of the development.

3.4 H7 OBJECTIVE 2:

'To ensure that new residential developments incorporate energy efficiency measures and promote innovation in renewable energy opportunities.'

This development shall have renewable energy opportunities included as part of the development.

4 Building Fabric

Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. Target performance levels have been identified by the design team and are presented below in Table 4.1.

4.1 Elemental U-Values

The U-Value of a building element is a measure of the amount of heat energy that will pass through the constituent element of the building envelope. Increasing the insulation levels in each element will reduce the heat lost during the heating season and this in turn will reduce the consumption of fuel and the associated carbon emissions and operating costs.

It is the intention of the design team to exceed the requirements of the building regulations. Target U-Values are identified below.

- Walls - 0.17 W/m2.K
- Window - 1.1 W/m2.K (solar fraction (g factor) of 0.65 or greater, Frame factor of 0.7 or better)
- Roof - 0.15 W/m2.K
- Doors - 1.2 W/m2.K (This is to include frame)
- Ground Floor slab - 0.13 W/m2.K
- Thermal Bridging - Factor of 0.08, with junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"

4.2 Air Permeability

A major consideration in reducing the heat losses in a building is the air infiltration. This essentially relates to the ingress of cold outdoor air into the building and the corresponding displacement of the heated internal air. This incoming cold air must be heated if comfort conditions are to be maintained. In a traditionally constructed building, infiltration can account for 30 to 40 percent of the total heat loss, however construction standards continue to improve in this area.

With good design and strict on-site control of building techniques, infiltration losses can be significantly reduced, resulting in equivalent savings in energy consumption, emissions and running costs.

In order to ensure that a sufficient level of air tightness is achieved, air permeability testing will be specified in tender documents, with the responsibility being placed on the main contractor to carry out testing and achieve the targets identified in the tender documents.

A design air permeability target of 3 m3/m2/hr has been identified for the dwellings on the site. This performance level is a 40% improvement on the target of 5 m3/m2/hr identified in TGD Part L 2022.

The air permeability testing will be carried out in accordance with IS EN 9972:2015 'Thermal Performance of Buildings" and CIBSE TM23: 2000 'Testing buildings for air leakage.

4.3 THERMAL BRIDGING

Thermal bridges occur at junctions between planar elements of the building fabric and are typically defined as areas where heat can escape from the building fabric due to a lack of continuity of the insulation in the adjoining elements.

Careful design and detailing of the manner in which insulation is installed at these junctions can reduce the rate at which the heat escapes. Standard good practice details are available and are known as Acceptable Construction Details (ACDs). Adherence to these details is known to reduce the rate at which heat is lost.

The rate at which heat is lost is quantified by the Thermal Bridging Factor of the dwelling and measured in W/m2K. The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

0.15W/m2K Used where the ACDs are not adhered to

0.08W/m2K Used where the ACDs are fully adhered to

< 0.08 W/m2K Used where the thermal details are thermally modelled and considered to perform better than the ACDs

It is intended that the ACDs will be adhered where suitable benchmarks exist and/or that thermal modelling will be carried out for any non-standard junction details within proposed development

5 HEAT SOURCES & RENEWABLE ENERGY OPTIONS

As set out in Section 2 of this report, Part L of the building regulations requires that all new residential buildings must meet overall energy performance levels (as defined by the Energy Performance Coefficient - EPC) and must have a portion of their annual energy demand provided by renewable energy sources.

The renewable energy source can be thermal energy such as solar thermal collection, biomass boilers or heat pumps or it can be electrical energy as generated by photovoltaic solar panels or wind turbines. The minimum renewable energy contributions defined in Part L 2022 Part (b) is 20% of the total energy consumption for the dwelling.

In order to comply with the requirements of the Development Plan, a detailed feasibility assessment has been carried by Semple McKillop to investigate the options available to meet the heating and hot water demands of the site and to assess the feasibility of (a) implementing a district heating solution or (b) delivering a site which is “district heating enabled”.

A combination of the systems below can be used to deliver, heating, hot water, ventilation and electrical energy to this development.

A description of the systems considered within the study are summarized below:

5.1 OPTION 1 - CONNECTION TO A THIRD-PARTY OFF-SITE DISTRICT HEATING NETWORK

This approach would involve the installation district heating pipework throughout the scheme to distribute the heat generated by a third-party off-site district heating network. Each apartment would be served via a heat interface unit (HIU). The HIU will both control and meter the consumption of heat and hot water within each individual dwelling allowing occupants to set the times they need space heating and ensuring they are charged accordingly.

The source of heat for the third-party district heating network could be waste heat from nearby commercial or industrial systems such as data centres, or from municipal geothermal heat sources.

5.2 OPTION 2 - ON-SITE DISTRICT HEATING

This approach would involve the generation of heat in a central location on the site and the distribution of this heat to each unit via a network district heating pipework. The central plant used to generate the heat could include either Air Source Heat Pumps or Grond Sourced Heat pumps

The large Air Source Heat Pumps (ASHPs) operate in the same manner as the smaller units incorporated in houses or apartments but at a larger scale. They utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the ambient air. While the electricity consumed is not renewable energy, the efficiency at which a heat pump operates allows a significant portion of the heat delivered be considered as renewable. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

Typical District heating Air Source HP arrangement

Heating pipework will be installed throughout the scheme to distribute the heat generated in the plant room throughout the apartment development, serving each apartment via a heat interface unit (HIU). The HIU will both control and meter the consumption of heat and hot water within each individual dwelling allowing occupants to set the times they need space heating and ensuring they are charged accordingly.

5.3 Option 3 –Exhaust Air Heat Pumps

Exhaust Air heat pumps (EAHPs) operate in a very similar manner to the more conventional air source heat pumps and utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the internal air within the apartment. The internal air is extracted from kitchens and wet rooms and is drawn into the heat pump via ductwork in the ceiling void. The heat pump extracts heat from this air before expelling it from the apartment.

As noted in Section 4.2 above, the electricity consumed is not renewable energy but the efficiency at which a heat pump operates allows a significant portion of the heat delivered to the dwelling be considered as renewable.

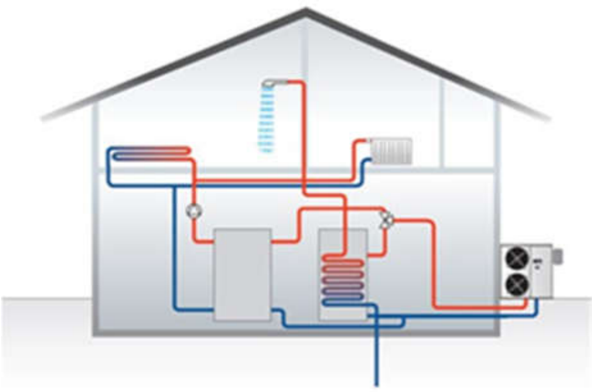
There are a number of manufacturers offering products of this type and the certified seasonal efficiencies of some models can exceed 450% in heating mode and 170% to 190% in hot water mode. These efficiencies can deliver Part L 2022 compliance in most circumstances but in some instances may need supplementary PV panels in order to meet the required energy targets.

There is no requirement for a separate Mechanical Extract Ventilation (MEV) systems when an exhaust air heat pump is used as the heat pump draws the air from all wet rooms in the same manner as an MEV system would. The fan will run continuously to ensure that the minimum ventilation rates are maintained and the supply air to the dwelling is provided through trickle vents in each habitable room.

5.4 OPTION 4 – INDIVIDUAL AIR SOURCED HEAT PUMP

Housing units that have a suitable location for an outdoor unit may utilize an air- water heat pump serving radiators and hot water. Heat pumps take advantage of this by transferring the heat/Energy from the outside air. Through compression, heat pumps can 'pump up' heat at low temperature and release it at a higher temperature so that it may be used again. A heat pump looks similar and can perform the same functions as a conventional gas or oil boiler, i.e. Space heating and sanitary hot water production. For every unit of electricity used to operate the heat pump, up to four to five units of heat are generated. Therefore, for every unit of electricity used to pump the heat, 4-5 (400-500%) units of heat are produced. Air/water heat pumps collect heat from the outside air.

This will be served from the primary heating plant (air sourced heat pump) linked via a probe to the cylinder. The Hot Water will be generated via a time clock and as such heats the water on demand.



Typical ASHP system

5.5 OPTION 5 – SMART ELECTRIC SYSTEM

Smart electric radiators would be provided in all spaces to provide the space heating to each apartment which provides an individual apartment heating solution, with heat losses being very small in new apartments this can be an effective solution although slightly higher running costs than heat pumps.

Hot water is provided by an internal domestic hot water heat pump with a 160mm diameter ducted supply air intake to a packaged unit. The end User can have a fully connected system with WIFI control via Control App.

A separate MVHR Heat Recovery Ventilation unit would be required for this solution to provide the mechanical ventilation - stale air is extracted from the wet rooms and kitchen areas of each apartment and supply clean air to occupied rooms.

Typical smart electric system.

5.6 Option 6 – Additional Solar PV

In addition to one of the systems above, Solar PV panels may be employed to contribute to the electrical energy source for each unit.

Typical *Photovoltaic* Arrangement

Use of energy efficient technologies Heat pumps, solar thermal panels, photovoltaics (PV) and Mechanical heat recovery ventilation or Demand control ventilation have been considered. In addition, temperature and zone controls will be used to reduce fuel and electricity demand.

Once the energy consumption has been reduced, a portion of the remaining electrical and thermal (hot water + heating) demand will be met by renewable sources. Not all renewables may be suitable to employ but it is intended to evaluate effectiveness of technologies such as heat pumps, solar panels and onsite generation from or photovoltaic panels.

Solar and Photovoltaic panels are apt due to the unobstructed southerly and south easterly elevations. PV is particularly suitable due to a simultaneous requirement for heating, hot water and electrical demand. The on-site generation of electricity will supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand and from the grid.

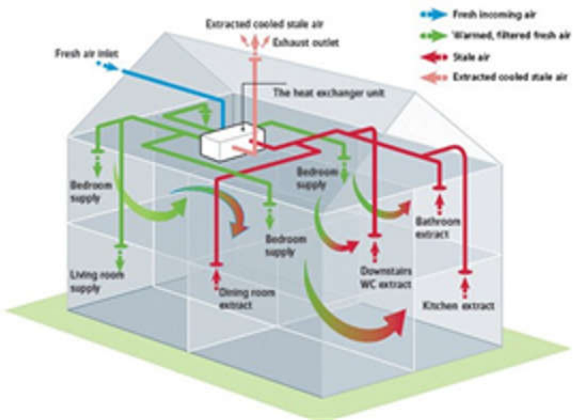
Applying this to each unit would considerably reduce the demand from the grid and consequently reduce losses and emissions from power stations. Such is the benefit of on site or distributed generation, the DEAP model determines that each kWh offset from PV equates to 2.5 times the thermal equivalent.

The Housing units do not require solar PV to comply with Part L when ASHP is employed. Solar PV may also be used for Landlord Part L compliance.

5.7 OPTION 7- MECHANICAL VENTILATION HEAT RECOVERY (MVHR) SYSTEM OR DEMAND CONTROL VENTILATION

In our design strategy we shall consider mechanical ventilation from wet areas e.g. toilets, utility rooms in accordance with Part F, with supply air provided to habitable spaces (bedrooms, circulation and living spaces).

See Figure 6 for a typical type arrangement of Heat recovery ventilation which provides a continuous supply of fresh air to the dwelling through special air valves or grilles located in each habitable room thereby eliminating the number of opening required in the structure.



Typical Mechanical Ventilation Heat Recovery (MVHR) Arrangement

Continuous extract is also provided with the outgoing stale air and from wet areas with the exhausted air preheating the incoming fresh air via a heat exchanger in the unit 90% of the heat can be recovered through this process that would otherwise be wasted.

While MVHR would have the effect of reducing the energy demand (or increasing the energy efficiency) of each unit, renewable technologies such as heat pumps, solar thermal and solar PV offset would offset this demand.

The alternative of demand control ventilation provides a lower cost solution with much less maintenance cost associated on a yearly basis. The MHRV system requires the filters in the system to be cleaned or changed on an annual basis not only to keep the system operating but also to maintain efficiency in the system. If the air tightness of the development is less than 4 m3/m2/hr then heat recovery ventilation or demand control system will be required to be employed. We would propose to review both options through Stage i design looking at the overall energy performance of the units in terms of fabric U-Values, air tightness, heat recovery/Demand control ventilation and renewable options to provide the most economical solution with the best life cycle costs.

Demand controlled MEV system consumes only slightly more energy – 1070 kWh – per heating period than an 80% heat recovery system. The corresponding extra cost, €47, is much smaller than the cost of the annual filter changes necessary to maintain the level of performance of HR units (see graph 1 below).

Heat recovery or Demand Control ventilation maybe used for this development.

5.8 Option 8 - Lighting

All lighting to be energy efficient with provision made for low energy lamps such as LED which use 80% less electricity and last up to 10 times longer than ordinary light-bulbs in the dwellings.

	Traditional Incandescent	Eco-Halogen	CFL	LED
				
Power Consumption	60W	42W	13W	6W
Brightness	700 lumens= 60W	625 lumens= 54W	741 lumens= 60W	500 lumens= 60W
Energy Efficiency*	E	D	A	A+
Lifespan	1,000hrs = 1 year	2,000hrs = 2 year	10,000hrs = 10 year	30,000hrs = 30 year
Cost per Bulb	1	3	3.5	9.45
Yearly Running Cost	10.8	7.56	2.34	1.08
15 year Lifetime Cost	Yearly Running Cost + 15 Bulbs = €177	Yearly Running Cost + 7.5 Bulbs = €135.90	Yearly Running Cost + 1.5 Bulbs = €40.35	Yearly Running Cost + 1 Bulb = €25.65

* All calculations are based on 1,000 hours per year at €0.18 per kWh

* A+ = Most Efficient, G = Least Efficient

Table 1: Home Bulb Options

As detailed in Table 1 LED lighting consumes the least amount of power to achieve the required lighting levels. Combined with a long lifespan this minimises whole life costs and reduces the carbon footprint of each home.

6 EV (Electric Vehicle) Charging compliance

6.1 Regulations

In accordance with Building Regulations Technical Guidance Document L 2021 Conservation of Fuel and Energy – Dwellings, the current policy on EV charging states in regulation 5 Part (f)

"(f) A new building (containing one, or more than one, dwelling), which has more than 10 car parking spaces, shall have installed ducting infrastructure (consisting of conduits for electric cables) for each car parking space to enable the subsequent installation of recharging points for electric vehicles."

In terms of this development this would mean ducting to ALL CARPARK SPACES for future EV charging connections in line with the development plan. In additional 20% of spaces shall have EV chargers installed as part of the development in line with South Dublin Development plan.

6.2 Public Street Parking Proposal

In this development curtilage parking is not available, the approach is a public network that is installed and managed through a specialist EV charging company such as "Easygo" www.easygo.ie Or ecar www.esb.ie/what-we-do/ecars

The management company can manage the infrastructure and operate it as a public network rather than a resident network.

The resident will sign up with the EV charging company and have an account with them and pay for charging their car.

The proposal for this development is that 20% all public spaces will have EV chargers installed and with and the rest will ducted for future EV charging points. 10% of bicycle parking provision to provide for charging.

7 EMBODIED CARBON ASSESSMENT

The Climate Action Energy Plan should also include an assessment of the embodied carbon impacts of a proposed low energy heating solutions proposed.

The calculation and assessment of the embodied carbon of various aspects of the a building's fabric and structure have become more common in recent years, there are less well established methods for assessing the embodied carbon of mechanical and electrical systems within buildings. This is primarily due to the difficulty in determining the embodied carbon in items of plant or equipment, which themselves are often constructed from numerous other sub-components.

CIBSE TM65 has been published by the Chartered Institute of Building Services Engineers in an attempt to address this, however even within this document it is noted that the assessment of embodied carbon for mechanical and electrical building services is very difficult.

The approach proposed within CIBSE TM65 is based on 3 possible metrics, in order of preference (and accuracy) these are:

1. Environmental Product Declarations (EPDs)

2. Manufacturer Form Section A & B (allowing "mid-level" calculation)

3. Manufacturer Form Section A only (allowing "basic" calculation)

However, as this approach is relatively new (TM65 was first published in 2021) few manufacturers of equipment have yet implemented the use of EPDs and use of Manufacturer Forms is also in it's infancy, meaning that there is little information available.

At planning stage of a project, no decisions have yet been made on the specific equipment suppliers or manufacturers so there is no means of having "Manufacturer Forms" completed. Therefore, as illustrated in Figure 4.2 in TM65 (reproduced below) it is not possible to carry out any calculations on embodied carbon for the systems being considered.

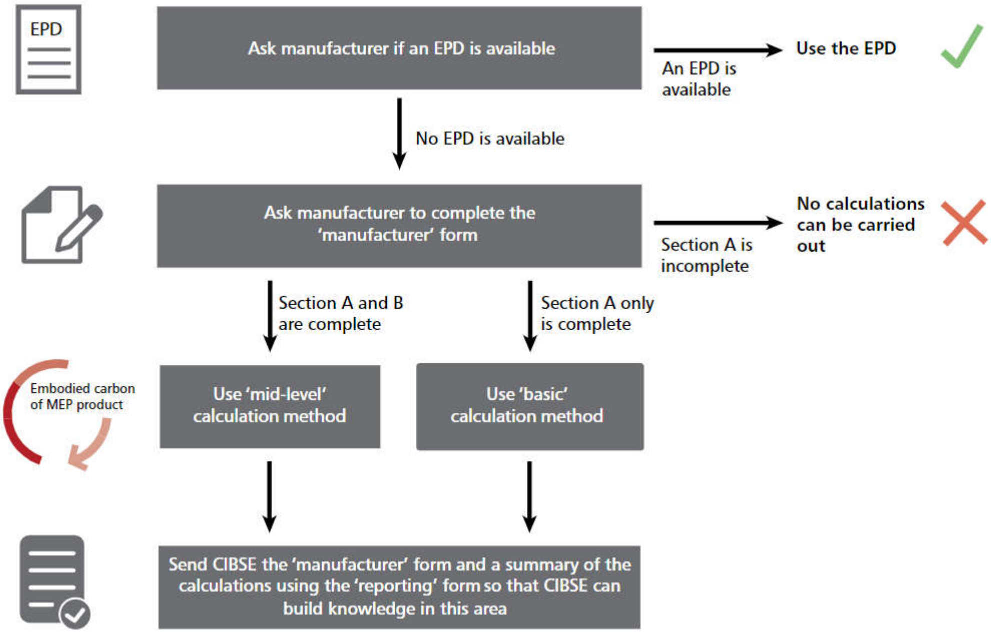


Figure 4.2 Steps taken to understand the embodied carbon impact of a MEP product

8 STUDY FINDINGS

The preceding sections of this report set out the regulatory requirements with which the scheme will have to comply while identifying a number of technologies and design approaches that may be utilised to achieve compliance.

Option 1 offer the best performance in terms of carbon emissions and running costs and is expected to have capital costs that are in line with the most cost effective alternative solutions. However as there are no known third-party off-site district heating networks available for connection to the site at this stage this option must be discounted.

Option 2 is the only proposed solution that enables future connection to a third party off-site district heating network involves the use of an on-site district heating system utilising only air source heat pumps. The analysis shows that Option 2 will have a higher running costs than the individual system and will have higher carbon emissions than the individual system unless the third-party network is available within 21 years of occupancy. The capital costs for Option 2 are also 17% higher than those for alternative systems. This is a viable option for sites that anticipate a future third party district heating system in the medium term.

Option 3 involves the use of individual heat pumps within each residential unit. This option is seen to have the lower carbon emissions than Option 2 if the third-party off-site network does not become available within 21 years respectively. It is also shown to have lower running costs from the outset. It is for this reason that Option 3 has been identified as a good option for the site, both in terms of carbon performance and economic feasibility.

Option 4 involves the use of individual heat pumps within each residential unit and has space for an outdoor unit. This option is seen to have the similar results to option 3. It is for this reason that Option 4 has been identified as a good option for the site for units that have a suitable outdoor space for the outdoor unit. It has good results both in terms of carbon performance and economic feasibility.

Option 5 involves the use of individual smart electric radiators for heating and a hot water heat pump for hot water within each residential unit. This option is suited to units that have a small heat loss, those with limited external fabric losses and a small floor area. Option 4 has been identified as a good option for the units on site that meet this criteria. It has good results both in terms of carbon performance and is seen as the most economic solution.

Option 6 – Solar PV is not a solution on its own for any unit but may be used as a supplement to provide on site electrical energy generation. Considering the base energy for heating and hot water is imported electrical energy, this is a good option to be added to any of the options above to reduce imported energy and provide a low carbon energy source.

Option 7 – MHRV and demand control ventilation both provide a fresh environment in the units. The continuous running fan of the MVHR considered against the heat recovery of energy saved and the additional maintenance costs associated with MVHR balances out the two systems so that either system provides a good option for meeting Part F of the building regulations.

Option 8 – LED lighting is now accepted as the only solution for lighting within a domestic situation and shall be part of this delivered scheme.

9 RECOMMENDATIONS

We are proposing for this development the following means of heating, hot water, lighting and renewable energy.

1. U-Values as stated in section 4.1 and Air tightness as per section 4.2
2. Housing Units to have individual air sourced heat pump for heating and hot water.
3. Apartment units to have District heating system from commercial Air sourced heat pump or exhaust air heat pump or Smart Electric heating.
4. Apartments to have Hot water from Heat interface units from the district heating system or through exhaust air heat pump or hot water heat pumps.
5. Duplexes to have Smart electric heating and hot water heat pump or exhaust air heat pump for heating and hot water.
6. Demand control ventilation system or MHRV to be utilised.
7. LED lighting throughout.
8. All public spaces to have ducting for future EV charging point in accordance with Part L and 50% EV chargers installed.
9. Potential Solar PV panels for on site generation for some units.

Whilst the Energy Strategy for the site has yet to be finalised, as ultimately the PPP Company will develop their own proposals for the site, the report does provide output specification to set parameters to be achieved and details some systems that will not be allowed. In line with reducing fossil fuels there will be no fossil fuels (Gas or Oil) on the site in line with the Governments 'Climate Action Plan 2024'.

10 CLIMATE CHANGE SUSTAINABLE STRATEGY

The sustainable strategy will try to include economic and environmental measures that are appropriate. In this regard, the following factors will be taken into account:

- Using the principles of Energy Efficient Design (EED) to reduce the amount of energy used by buildings during their operational phase.
- Making the most of passive design features like the building facade to take advantage of the constraints and orientation of the site. Using fabric u-values that are higher than Part L 2019 and provide a high air permeability rate.
- Energy efficiency will be incorporated into each part of the design including;
  - Construction: Applying considerate construction principles to control energy, water, and other resource use during the on-site phase.
  - Utilizing the extensive metering and controls equipment designed to meet the principles of CIBSE TM 39 – Building Energy Metering, the commissioning phase establishes the appropriate targets for the operational phase based on the energy and water consumption. Utilization of a Commissioning Manager to coordinate and guarantee the installation and operation of all energy-related systems are in accordance with the design.
  - Operation – Confirmation that EED's guiding principles have been adhered to.
- Façade studies with the architect using computer modelling techniques to get the most out of daylight, natural ventilation, and solar benefits that are unique to the site. This will make sure that the buildings have the best air quality and daylight.
- Implementing reuse and recycling throughout the design, construction, and operation phases of the project to ensure the reduction of waste sent to a landfill.
- An integrated Water Management and Conservation Plan that includes efficient sanitary appliances (such as low-water WC cisterns & taps) and equipment with low water consumption to ensure minimal use of potable water.
- Utilizing Dynamic Thermal and Energy Simulation methods to validate a low-energy and low-carbon building design. Natural ventilation principles, and compliance with Part L of the Building Regulations regarding the effects of overheating will be implemented and checked. Using the 2020 CIBSE-accredited weather file, the spaces will also be examined for the effects of climate change, and compliance with the requirements will be confirmed.
- Plants and M&E systems that use less energy, like energy-efficient LED lighting fixtures, heating plants, Triple E-registered products that reduces energy use to a minimum.
- Focusing on natural daylighting factors that meet BRE and CIBSE recommendations. The presence of sufficient natural light contributes to the well-being of the occupants and creates a positive living environment. The use of natural light will be maximized by acceptable levels of glazing on the elevations, which will improve the comfort of the building occupants. High-performance glazing will allow building occupants to take advantage of the benefits of the glazed views while preserving the buildings' thermal performance.
- Using renewable technologies in accordance with Sustainable Design and Climate Action based on optimal technical and financial considerations that will offset primary energy consumption and reduce carbon footprint. Incorporating the aforementioned design measures to achieve a target of an "A" rating for the buildings and maximize

the building energy ratings (BER). This will demonstrate that the buildings were built to be energy efficient and give users a sense of certainty about how much energy they use and how much carbon they produce.

- A sustainable approach will be extended from the building to the site throughout the construction and handover process.
- Reviewing the building's materials throughout their entire life cycle, paying particular attention to how they affect carbon emissions.
- Utilizing the principles of environmental assessment methodologies during the design and construction phases to guarantee that the buildings are developed holistically.