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Climate Action Report

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1.0 Building Regulations

1.1 NZEB

Building energy has long been understood as contributing a major component of greenhouse gas emissions. This was acknowledged within the 2030 Communication published by the European Commission (2014), which stated that "*the majority of the energy-saving potential (for the EU) is in the building sector*"

The 2010 EU Energy Performance of Buildings Directive (EPBD) sets out the target that all new developments should be Nearly Zero-Energy Buildings (NZEB) by the end of 2020. A Nearly-Zero Energy Building is defined in the Directive as having "very high energy performance", with Article 2 of the EPBD outlining that "*the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby*".

Interpretation and implantation of these statements within the directive are at the discretion of each EU Member State in accordance with their "*National, Regional or Local considerations*" and thus the definition of NZEB itself varies greatly between different countries.

For new dwellings in Ireland, NZEB has been defined as being (primarily) associated with demonstrating the following characteristics are achieved:

- Primary Energy/ Carbon Emissions: 70% reduction against Part L 2005
- Renewable Energy: 20% of this Primary Energy required

These NZEB targets have been now incorporated within the current Technical Guidance Document (TGD) Part L 2021, as discussed in section 2.2.

Figure 2.1.1 illustrates comparative Primary Energy consumption for Dwellings in Ireland from the 1970's through to current NZEB standards. It may seen that continued improvements in Primary Energy consumption over the past 20years have been maintained by the ongoing revisions to the building regulations.

Figure 2.1.2 illustrates the NZEB targets for Primary Energy (and Carbon Emissions) and Renewable Energy. The Part L 2005 benchmark could be expected to achieve a B3 BER, in comparison to A2 for NZEB compliance.

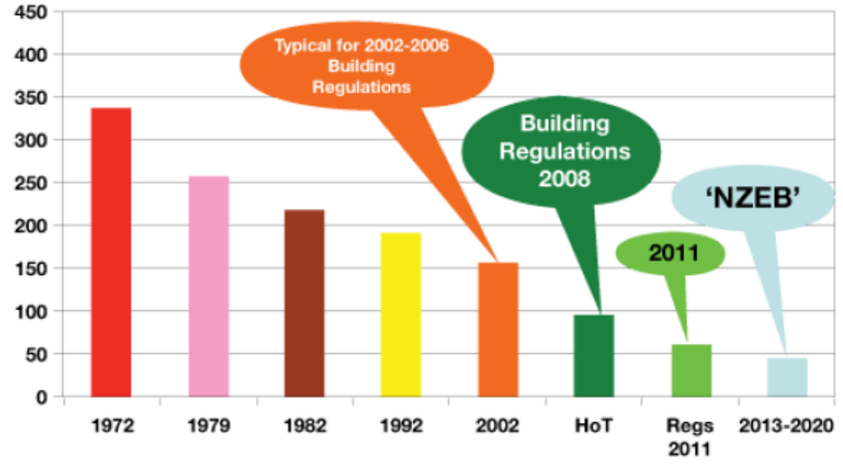

Figure 2.1.1: Primary Energy Consumption in Irish Housing 1972-2020

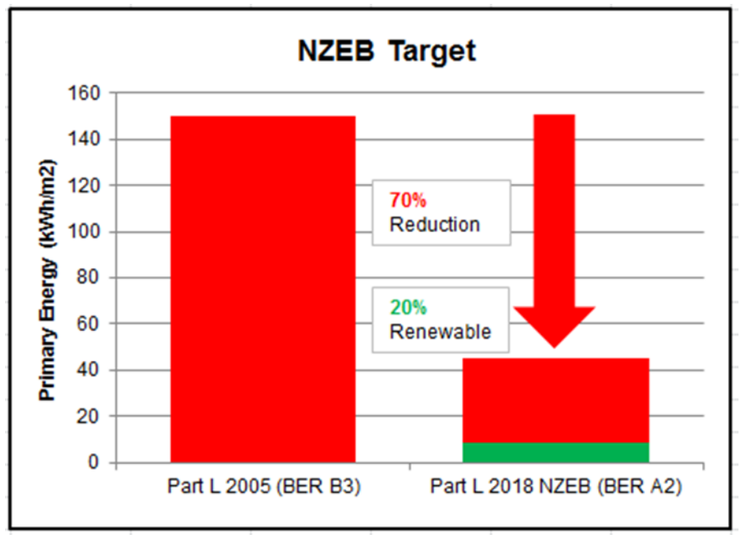

Figure 2.1.2: NZEB Targets

1.2 Part L 2021

Technical Guidance Document (TGD) Part L Conservation of Fuel and Energy – Dwellings outlines how compliance to this element of the Building Regulations may be demonstrated through the utilisation of the Dwelling Energy Assessment Procedure (DEAP) software, which analyses comparative energy usage for a particular residence.

The energy assessment is determined annually on a floor area basis (kWh/m^2.ann) under the following headings, known as “regulated loads”:

- Heating
- Hot Water
- Auxiliary (Fans, Pumps and Controls)
- Lighting

It should be noted that significant energy loads within dwellings; particularly equipment associated with cooking, washing etc. are excluded from DEAP analysis and associated Part L Compliance/ BER calculations. These energy loads, known as “unregulated loads” are deemed to be associated with operational usage which is not consistent across all dwellings, as opposed to the building’s fabric and services performance.

Figure 2.2.1 indicates an energy breakdown for a typical apartment (100m2, local gas-fired boiler) compliant to NZEB / Part L 2021. It can be seen that Hot Water Energy consumption pre-dominates accounting for over half of the primary energy consumed, with Heating Energy considerably lower. This is reflective of the extensive improvements to insulation / air permeability / thermal bridging / glazing / heating system efficiency etc. through successive Building Regulation revisions over recent years.

As both Hot Water and Lighting Energy consumption are effectively fixed within the calculation methodology (as based on standardised databases of hot water usage etc.), further improvements to Heating related items (insulation etc.) are generally required to ensure overall compliance can be achieved.

The following minimum Fabric Performance targets are defined in Part L 2021:

<u>Thermal Transmittance (U-Values)</u>

- Pitched Roof/Flat Roof: 0.16 W/m^2K / 0.20 W/ m^2K
- External Walls: 0.18 W/m^2K
- Ground/ Exposed Floors: 0.18 W/m^2K
- Windows/ Doors/ Rooflights: 1.40 W/m^2K

<u>Air Permeability</u>

- Maximum Air Leakage: 3 m3/hr.m2 @ 50Pa

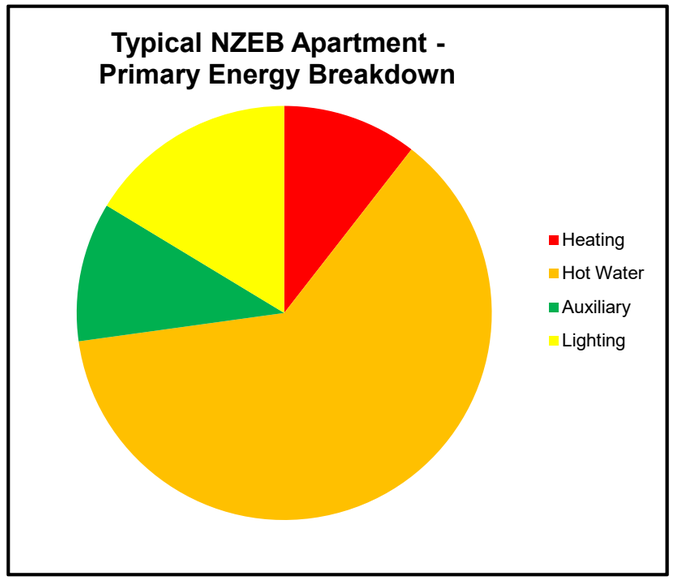

Figure 2.2.1: Typical Residential Primary Energy Breakdown

The Part L regulations specify that for apartments or other terraced residential buildings compliance can be demonstrated based on the average of all dwellings for each of the parameters associated with Part L, namely Primary Energy (EPC), Carbon Emissions (CPC) and Renewable Energy (RER). Therefore, for the purposes of analysis, an apartment representative of the average attributes of the dwellings has been selected.

In summary, DEAP analysis must demonstrate the following to ensure compliance to Part L 2021:

- Energy Performance Coefficient (EPC): 0.30 or lower

  (ie. 70% reduction in Primary Energy against Part L 2005 benchmark)

- Carbon Performance Coefficient (CPC): 0.35 or lower

- Renewable Energy Ratio (RER): 0.20

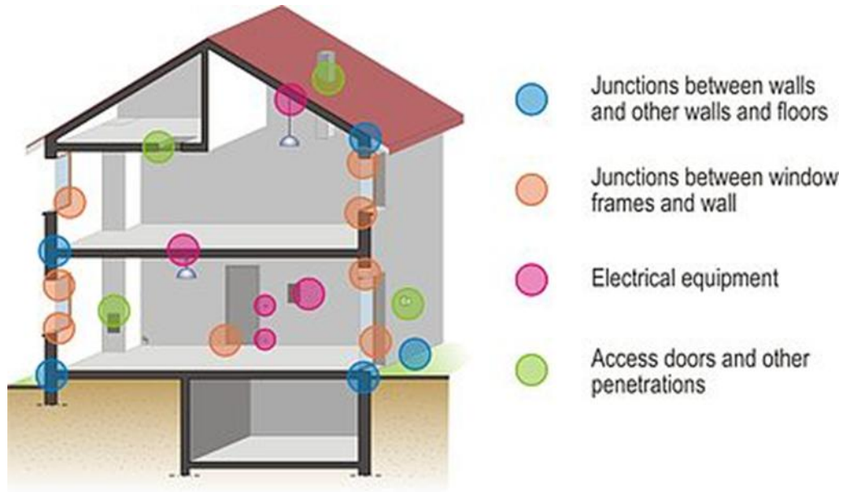

Figure 2.2.2: Common areas of air leakage

1.3 Primary Energy

In assessing energy performance for dwellings, Part L (and BER) utilises Primary Energy as a means of comparative analysis. This relates to the energy at source as required for the dwelling, as opposed to that consumed within the actual building. For example, electrical Primary Energy relates to that required for both generation (based on average of power plant fuels and efficiencies) and transmission for electricity through the ESB grid.

Primary Energy Factor (PEF) conversions as of 2020 for main fuel types are as follows:

- Electricity: 1.83
- Natural Gas: 1.10

It can be seen from the above that the Primary Energy conversion for Electricity is twice that of Natural Gas (as well as other fossil fuels and biomass); therefore a direct electric heater would consume double the Primary Energy of an LPHW radiator. However, as can be seen from Figure 2.3.1, the underlying trend over time has been that the Primary Energy of electricity with respect to Natural Gas (and other fuels) has been reducing (due to the increased “greening” of the ESB grid with Wind and Solar renewables and more efficient plant operation), with the following impacts in terms of technologies and associated Part L compliance, as PEF for electricity reduces.

- Heat Pump, both Air Source and Geothermal, are becoming increasingly viable.
- Natural Gas Combined Heat and Power (CHP) is becoming less viable.
- Larger Photovoltaic (PV) arrays required to offset electricity usage (albeit offset by increases in PV efficiency for equivalent array sizes).

As the efficiency of the Electrical grid continues to improve the current Part L 2021 PEF is based on the average of the projected Electrical grid efficiency over the next 10years.

The associated Carbon Factors for main fuel types in Ireland are as follows:

- Electricity: 346 gCO2/kWh
- Natural Gas: 203 gCO2/kWh

The Carbon Factors associated with electricity have fallen by approximately 45% in Ireland over recent years (from 635 gCO2/kWh in 2005) as renewable technologies are

added to the grid however the reliance on natural gas, peat and coal ensures electricity remains a relatively significant source of carbon emissions.

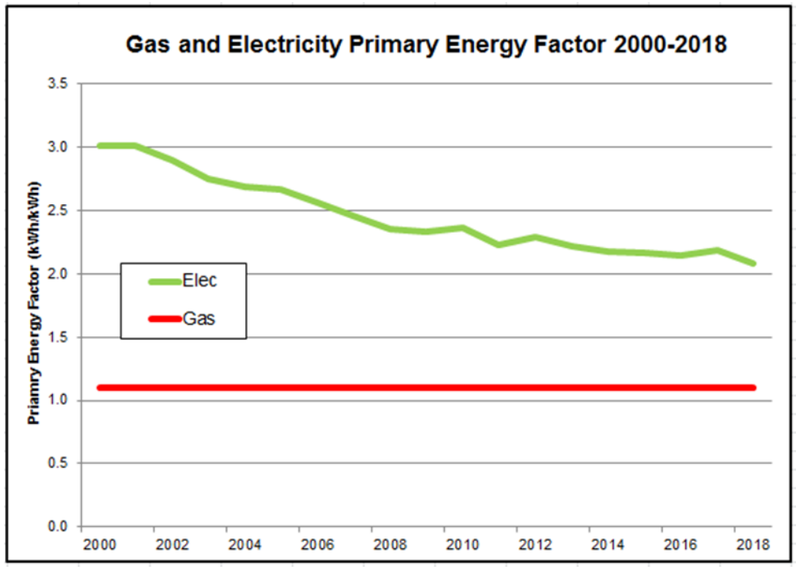

Figure 2.3.1: Primary Energy Factors for Gas and Electricity 2000-2018

Primary energy conversion factors

Energy consumption can be expressed as total final consumption (TFC) or total primary energy requirement (TPER). TPER accounts for the energy that is consumed and/or lost in transformation, transmission and distribution processes. It is calculated by applying conversion factors, which vary by fuel type, to TFC values. The table below shows the conversion factors for 2019. Historic conversion factors can be downloaded here.

Fuel	2020 conversion factor
Aviation fuels	1.1
Biogas / landfill gas	1.0
Coal	1.1
District heat	1.1
Electricity	1.830257
Gasoil	1.1
Kerosene	1.1
Light, medium & heavy fuel oils	1.1
LPG	1.1
Manufactured Ovoids	1.2
Marked diesel, road diesel & petrol	1.1
Natural gas	1.1
Peat	1.1
Pure biodiesel / bioethanol	1.1
Solar thermal	1.0
Wood briquettes / chips / logs / pellets	1.1

Figure 2.3.2: Primary Energy Conversion Factors as of 2020

1.4 Route to Net Zero Carbon

The building regulations in Ireland assess both primary energy consumption and carbon intensity. The carbon intensity that is applied for electricity within the DEAP methodology is the grid average. There is therefore no benefit to the NZEB calculation for changing to a renewable electricity supplier. This approach was taken by the SEAI in developing the regulations to ensure that buildings would be designed to prioritise reducing primary energy consumption regardless of the energy source.

Although sourcing renewable energy providers will not affect the results of the NZEB calculations this approach should still be considered as best practice.

Renewable Gas

An EU commissioned report has found Ireland has the highest potential for Renewable Gas production per capita in Europe. This is based on Anerobic Digestion technology which generates biogas from grass or manure.

Renewable gas is currently projected to make up 12% of the gas grid by 2030 however renewable gas is not currently widely available to customers.

Renewable Electricity

Ireland in 2020 delivered 40% of electricity from renewable sources. This is due to continue to rise in the coming years with Eirgrid reporting a target of 60%-70% renewable electricity by 2030 dependant on consumption patterns.

Renewable electricity is widely commercially available and should be considered when choosing an energy supplier for the development.

2.0 Climate Action and Energy Statement

The fifth assessment report by the Intergovernmental Panel on Climate Change (IPCC) in 2014 confirmed that warming of the atmosphere and ocean system is happening and that there is clear human influence on the climate.

Whilst climate change is a global scale problem requiring a multi-faceted international response, the overall challenge for Ireland is to develop and improve its inter-disciplinary approach. The EU has committed to cut greenhouse gas emissions by at least 55% by 2030.

Based on the EU approach, the framework requests local authorities to prepare and publish local adaptation plans which will complement mitigation actions and reduce our vulnerability to the negative impacts of climate change.

The Climate Action and Low Carbon Development Bill 2015 was passed in December 2015 and requires the preparation of a new national mitigation plan and an adaptation framework. The 2015 Act was subsequently amended by the Climate Action and Low Carbon Development (Amendment) Act 2021.

The Dublin City Council Climate Action Plan 2019 – 2024 was adopted in response to this and sets out policies and objectives to achieve a 20% reduction of energy use for the whole city and for a 33% reduction for the Council's own energy by 2020, along with 20% of energy to come from renewable sources, with the EU Mayors Adapt Initiative agreeing to reduce carbon dioxide emissions by at least 40% by 2030. The plan includes adaptation measures to reduce our vulnerability to the negative impacts of climate change and mitigating actions to reduce emissions of the greenhouse gases that are driving climate change.

As key strategies it sets out to increase the share of renewable energy generation to reduce energy consumption and find alternative, non-polluting, and renewable sources for energy provision, and improve energy efficiency in the built environment, reducing energy demand and energy wastage/loss in order to reduce CO_2 contributions.

Design and layout of schemes optimised by maximising benefits from energy efficient passive measures such as natural ventilation and lighting and reduction of cooling requirement through control of excessive solar gain is encouraged.

In the previous section we illustrate how NZEB/Part L 2021 performance can be achieved. The above also complies with the requirements of Dublin City Council Climate Action Plan 2019 – 2024 for energy reduction, carbon reduction and renewable energy usage would be met.

2.1 Climate Mitigation Actions

The development has been designed to promote low carbon technologies, by utilising decentralised Exhaust Air Heat Pump technology to meet the thermal load for each apartment in the development. This will also allow for the complete elimination of Fossil Fuels from the site, while maximising operational efficiencies.

The development has been designed to maximise natural daylight, natural ventilation, please refer to Sunlight / Daylighting study report for full details.

The development is situated in close proximity to multiple public transport routes.

As mentioned, the use of a decentralised Exhaust Air Heat pump for means of thermal generation will result in an extremely high efficient renewable means of satisfying each apartments heating & hot water needs throughout the development.

Exhaust Air Heat Pump technology is considered a renewable technology and as such provides the full NZEB Renewable Energy Contribution requirement for each apartment.

2.2 Resilience to Climate Change

The proposed development has been designed to be resilient to climate change. The proposed measures include the use of Green Roofs to reduce internal overheating and the urban heat island effect and help to mitigate peak surface water run offs during heavy rain fall for full details please refer to SuDS proposals in civisl engineering reports.

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