Roinn Cumarsáide, Gníomhaithe
ar son na hAeráide & Comhshaoil
Department of Communications,
Climate Action & Environment

Ireland's Long-Term Renovation Strategy

2020

As required by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

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1 Overview

This document sets out Ireland's Long-Term Renovation Strategy as required by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency[1].

This Long-Term Renovation Strategy has been developed based on the guidance issued by the European Commission[2].

This Long-Term Renovation Strategy includes Ireland's existing building renovation policies which are set out in a range of policy documents most notably the Climate Actin Plan[3] and the National Energy and Climate Plan[4]. This document does not change or amend policy and it does not provide a framework for development consent for projects.

Following the formation of a new Government in June 2019, a new Programme for Government was approved and published. This includes the commitment to an average 7% per annum reduction in overall greenhouse gas emissions from 2021 to 2030 (a 51% reduction over the decade) and to achieving net zero emissions by 2050.

As Ireland's building renovation polices are further developed in order to meet the commitments set out in the Programme for Government, it is intended to update this Long-Term Renovation Strategy to encompass new polices and measures. Prior to any updates or developments to the Strategy, a public consultation will be carried out which will be open to all organisations and individuals, and will provide them with the opportunity to input into the process.

[1] Directive (EU) 2018/844 available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0844&from=EN

[2] Commission Recommendations (EU) 2019/786 available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32019H0786

[3] https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

[4] https://www.dccae.gov.ie/en-ie/energy/publications/Documents/26/National_Energy_and_Climate_Plan2021-2030.pdf

2 Targets and Objectives

2.1 Renovation of Ireland's Building Stock

In order to reduce emissions in line with national and international targets, Ireland's building stock will need to be highly energy efficient and largely decarbonised by 2050.

This will require:

1. ensuring that new buildings are to at least a nearly zero-energy building (NZEB) standard, and
2. The retrofitting of the majority of existing buildings.

The introduction of advanced Building Regulations, energy and carbon performance requirements for new dwellings in 2007, 2011 and Nearly Zero Energy Buildings (NZEB) requirements in 2017 for new buildings other than dwellings and in 2019 for dwellings has been a key driver in ensuring all new buildings are energy efficient. The NZEB standard, which has been in place since 1 November 2019, ensures all new buildings are highly energy efficient. It is projected that approximately 355,000 new dwellings will be constructed to a Building Energy Rating (BER) level of A by 2030.

It will also be necessary to retrofit older buildings. The Building Regulations require major renovations to achieve a BER level of B, or cost optimal or carbon equivalent. It is expected that it will be necessary to retrofit more than 1.5 million buildings by 2050.

2.2 National Milestone Targets

Ireland's Climate Action Plan[5] sets out a detailed roadmap for the period 2021 to 2030 with the objective of reducing CO_2 equivalent emissions from the built environment by 40%-45% relative to 2030 projections. This includes the milestone targets for 2030.

In the residential sector, these include:

- retrofitting 500,000 homes to a BER level of B2 or cost optimal equivalent or carbon equivalent;
- Local Authorities upgrading their housing stock under Phase 2 of the social housing retrofit programme to bring dwellings to a BER level of B2 or cost optimal equivalent;
- installing 600,000 heat pumps (400,000 in existing buildings); and

[5] https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

- advanced performance requirements in the current regulations combined with a mandatory renewables requirement, creating a rapid transition to low carbon heating systems in new dwellings.

In the commercial and public sectors, the targets include:

- investments in energy efficiency of existing commercial building stock with a target at least one-third of total commercial premises upgraded to BER level of B; and
- the Public Sector Energy Efficiency Strategy and its associated support programme assisting public bodies in achieving the national energy efficiency targets of 33% 2020, and 50% by 2030, which includes public buildings.

It is targeted that all public sector buildings and one-third of commercial buildings will be retrofitted to a BER level of B by 2030. While no milestones have been formally set for 2040 and 2050, it is expected that an indicative milestone of two-thirds of commercial buildings retrofitted to a BER of B will be reached by 2040 and all commercial buildings by 2050.

Formal milestones have not been set for the residential sector for 2040, however as the 500,000 target for 2030 represents one-third of the stock in the first of three decades, it currently considered likely that a further 500,000 retrofits would be an expected milestone target for 2040 ahead of achieving the 1.5 million houses retrofitted by 2050.

The indicative annual breakdown for residential retrofit as modelled Under the With Additional Measures (WAM) of the National Energy and Climate Plan (NECP) is shown in the table below. While this may change due to a range of factors, we will endeavour to deliver in line with the profile below.

For public buildings, it is estimated that an average of 1,350 buildings per annum will be retrofitted.

Number of Residential Buildings Expected to be Retrofitted to BER B2 per Annum (or carbon equivalent)	
Year	**Heat Pumps in Residential Buildings**
2021	13,000
2022	33,500
2023	55,000
2024 - 2030	56,215 each year

Table 1: Number of Residential Buildings Expected to be Retrofitted to BER B2 per Annum (or carbon equivalent)

Source: SEAI

The level of retrofit will lead to an increase in the number of heat pumps and biomass boilers. The numbers assumed under the With Additional Measures (WAM) of the National Energy and Climate Plan (NECP) are shown in the table below.

Cumulative Number of Heating Systems in Existing Buildings			
Year	**Heat Pumps in Residential Buildings**	**Heat Pumps in Commercial/Public Sector Buildings**	**Biomass Boilers in Commercial/Public Sector Buildings**
2021	53,865	5,872	72
2022	75,365	6,330	186
2023	118,240	6,752	307
2024	161,115	7,185	433
2025	203,990	7,336	558
2026	246,865	7,489	558
2027	289,740	7,644	558
2028	332,615	7,786	558
2029	375,490	7,928	558
2030	418,365	8,071	558

Table 2: Cumulative Number of Heating Systems in Existing Buildings

Source: SEAI

3 Overview of the National Building Stock

3.1 Climatic Zones and Location

Ireland is a small island with temperate weather across the entire country. There is little climatic variation across the country. Given the geographical area of the nation and lack of significant climatic variation across this area there is no need to identify discrete bands of climatic zones that might require differing interventions.

There is a also very low level of seismic activity in Ireland resulting in very minimal fire safety and risk in relation to energy efficiency renovations.

The external environment in Ireland presents unique challenges, particularly for internally insulated solid wall buildings. Many of these structures are already poorly adapted to the Irish climate and require expensive ongoing maintenance. Wind-driven rainfall indices for Ireland are well beyond the values experienced by most of the other Member States. Additionally, atmospheric relative humidity levels are high year-round and the drying experienced in most Member States through seasonal weather patterns is not experienced to any similar extent in Ireland.

More than one-third of Irish dwellings are in rural areas and 93%[6] of these dwellings are either detached or semi-detached. The combination of high numbers of rural dwellings and single family homes makes retrofit project aggregation more challenging in Ireland.

There are high levels of privately-owned single-family dwellings which have been adapted to particular family needs over time on a piecemeal basis. This introduces a level of customisation in the residential building stock which makes aggregation of retrofitting more challenging. For instance, even buildings built on the same street at the same time by the same builder are adapted over time and become very different in their floor area and energy use.

3.2 Residential Sector

3.2.1 Building Numbers, Types, Age and Occupancy

There are approximately 1.7 million occupied residences in Ireland. The vast majority of residential buildings in Ireland are single family houses. Only one in eight dwellings in Ireland is an apartment or part of a multi residential unit.

[6] 2016 Census

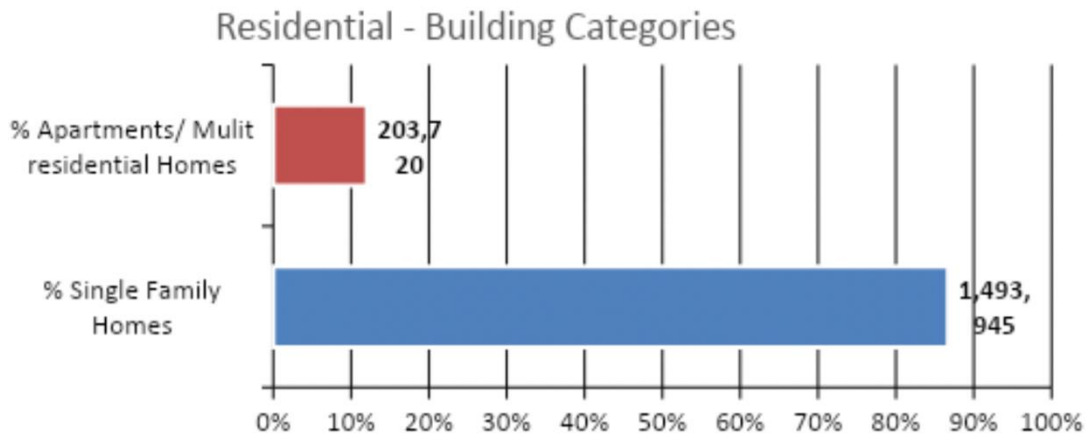

Figure 1: Residential Building Categories

Source: The 2016 Census[7] (residential data)

The European Housing Review of 2007 found that Ireland has the youngest dwelling stock in the EU. Buildings constructed in Ireland pre-1940 (described as 'traditional buildings') are generally of solid masonry wall construction and deal with moisture in a very different way to modern buildings, allowing the absorption, movement and evaporation of moisture within the building fabric rather than attempting to exclude it, as is the case with most modern buildings.

A general lack of understanding of the hygrothermal (the movement of heat and moisture through buildings) performance of the traditional building stock in the construction industry and among specifiers together with the diverse nature of these buildings, can pose some difficulty in retrofitting. Approximately 16% of the residential building stock was constructed prior to 1940. A further 15% of the current housing stock was completed before 1970, and has little or no insulation built in.

The first Building Regulations, that explicitly addressed conservation of fuel and energy in buildings, were issued in 1992. Approximately 58% of residential dwellings date from before this time. As a result of the Building Regulations, dwellings built after 2006 are required to have a higher level of energy efficiency.

[7] The next Census in Ireland is due to take place in 2021.

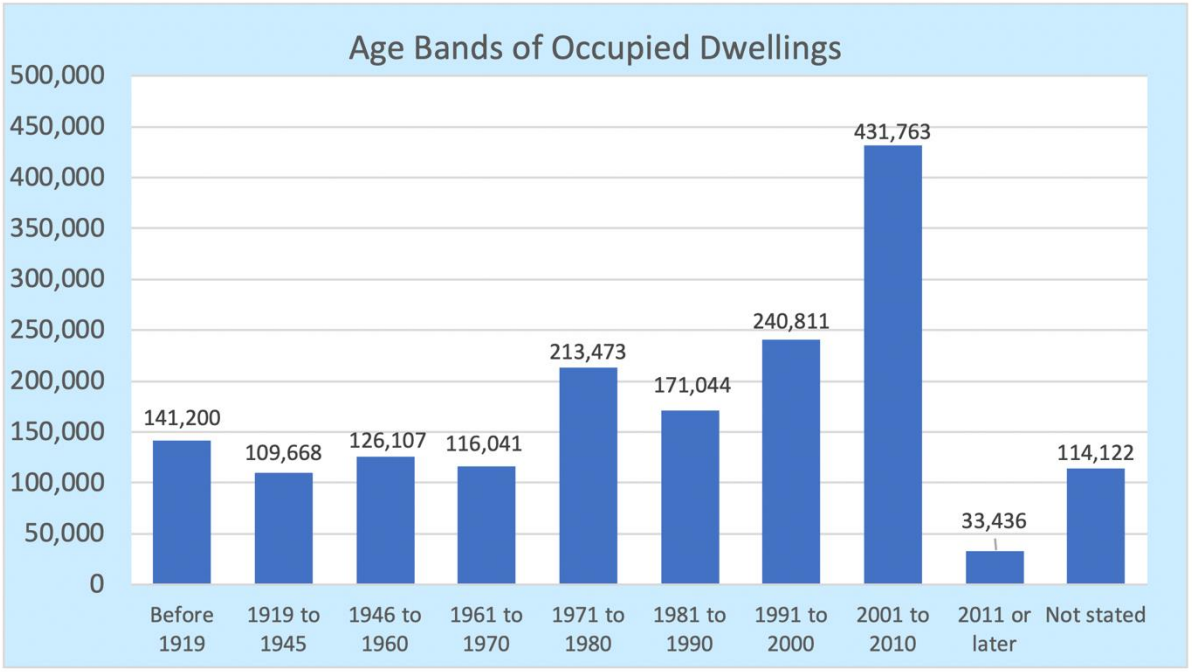

Figure 2: Age Bands of Occupied Dwellings

Source: Census 2016

Approximately two-thirds of residential buildings in Ireland are owner occupied; although, there has been a trend towards renting in recent years. 36% of Irish households own their home outright, without any mortgage or loan. Tenure is an important consideration for retrofit or renovation programmes as consumers with different tenures are likely to have differing circumstances and motivation. The private rental sector represents 18% of the Irish housing stock.

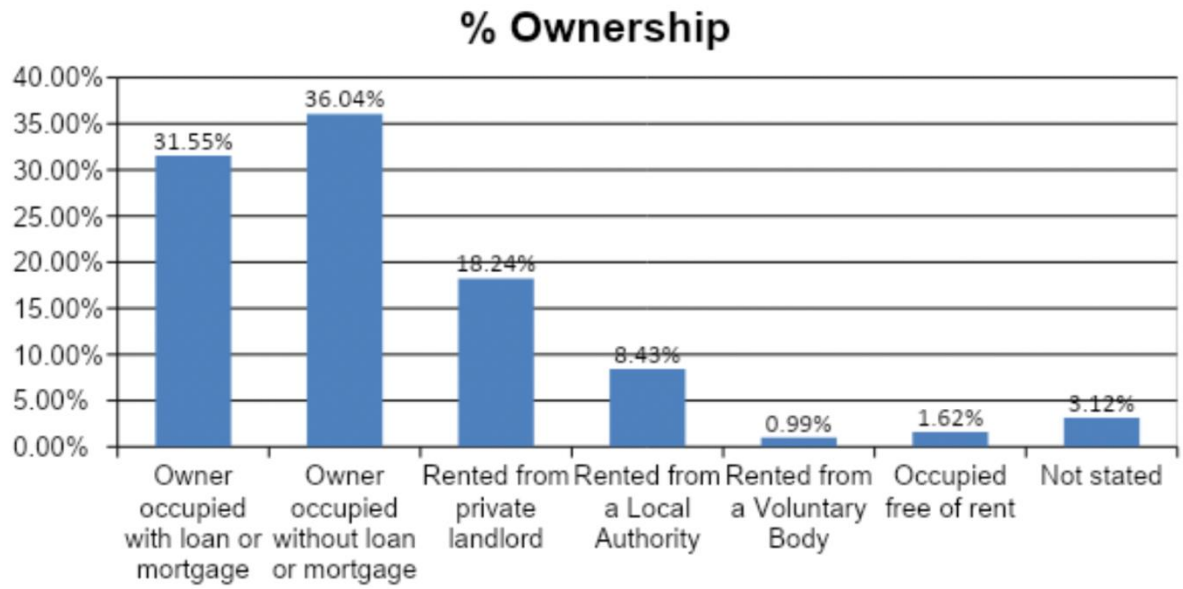

Figure 3: Breakdown of Ownership

Source: Census 2016

3.2.2 Energy Performance

The figure below shows the trend for residential sector final energy consumption between 2005 and 2018. Residential energy demand decreased every year between 2007 and 2012 but increased between 2015 and 2018. Residential final energy use in 2018 was 2,786 ktoe which is 5.1% below the level recorded in 2005. Correcting for weather variations, 2018 residential final energy use was 8.2% below 2005.

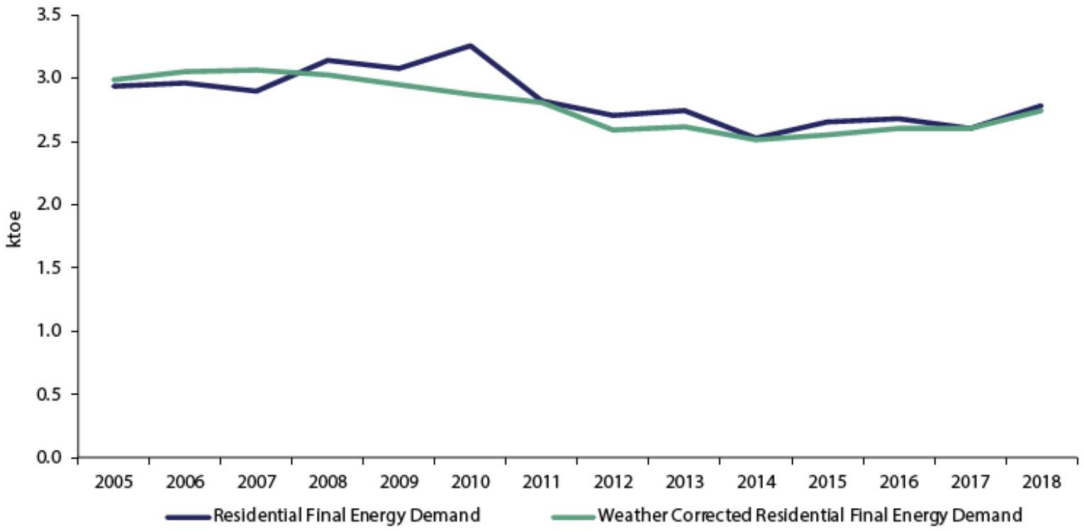

Figure 4: Residential Final Energy.

Source: SEAI December 2019

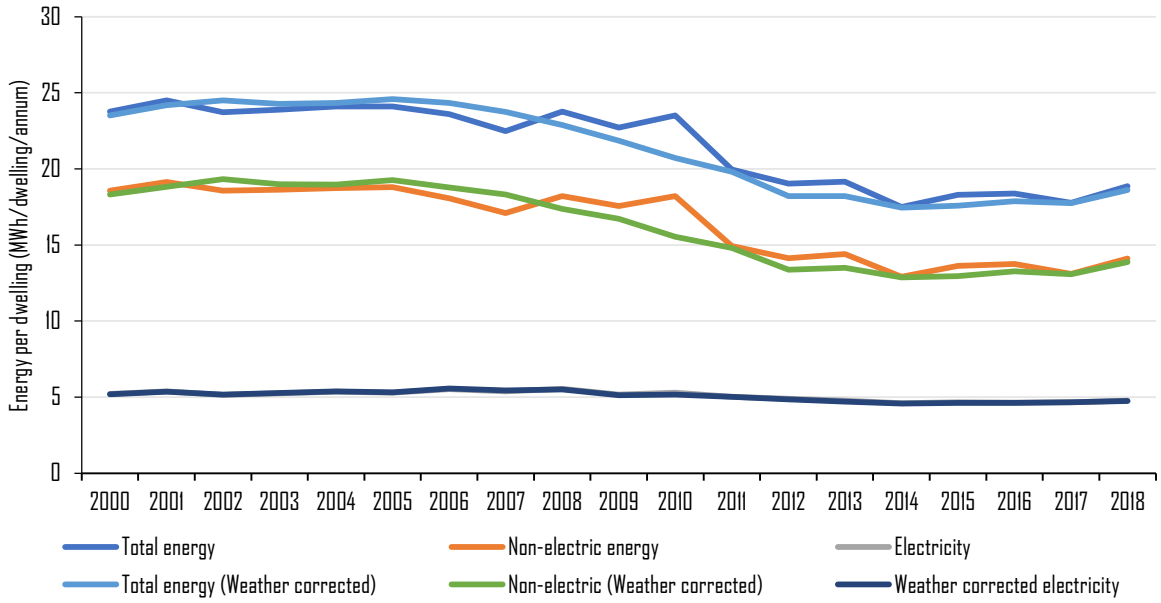

Figure 5: Energy per dwelling

Source: SEAI September 2020

All fuels	unit	2016		2017		2018	
Space heating	ktoe	61%	1,652	59%	1,535	61%	1,686
Space cooling	ktoe	0%	0	0%	0	0%	0
Water heating	ktoe	19%	507	20%	516	19%	532
Cooking	ktoe	2%	61	2%	63	2%	64
Lighting and appliances	ktoe	17%	459	18%	468	17%	477
Other end uses	ktoe	1%	25	1%	25	1%	26
Total Residential / Households	ktoe		2,704		2,608		2,786

Table 3: End use of energy in the residential sector

Source: SEAI September 2020

Between 2005 and 2018, sources of fuel were relatively stable, with a gradual increase in the share of electricity and gas and a gradual, decline in coal, peat and oil use. The mix of fuels consumed in the residential sector over the period as well as the growth rates, quantities and shares are shown in the figures below.

Oil remains the dominant fuel in the residential sector, though its share reduced slightly, from 39% in 2005, to 38% in 2018. Electricity was the second largest source of energy in the sector in 2018, at 25%, with natural gas having the next largest share at 22%. The renewables share of final energy used directly in households in 2018 was 2.5% which does not take into account the renewable share of electricity use.

Over the period 2007 to 2014 weather-corrected residential energy use declined by 18%, or 542 ktoe. The majority of the reduction was due to oil use which fell by 28% (or 324 ktoe) followed by gas, which fell by 16%, (100 ktoe). Electricity consumption in the residential sector peaked in 2010 and has fallen by 2.1% since then.

Residential TFC	Overall Growth (%)		Average Annual Growth (%)				Quantities (ktoe)		Share (%)	
	1990 - 2018	2005 - 2018	2005 - 2018	2010 - 2015	2015 - 2018	2018	2005	2018	2005	2018
Fossil Fuels (Total)	8.5	-11.3	-0.9	-5.0	1.7	8.3	2,271	2,015	77.3	72.3
Coal	-75.2	-36.9	-3.5	-4.1	-9.0	4.4	246	155	8.4	5.6
Peat	-72.9	-28.0	-2.5	-4.6	-0.7	4.4	273	197	9.3	7.1
Briquettes	-55.6	-23.8	-2.1	-3.7	-1.9	13.5	90	69	3.1	2.5
Oil	172.0	-7.5	-0.6	-5.4	3.5	9.5	1,145	1,059	39.0	38.0
Gas	415.2	-0.4	0.0	-4.8	2.9	8.7	607	604	20.7	21.7
Renewables	52.9	246.1	10.0	6.4	4.2	8.0	20	68	0.7	2.5
Combustible Fuels (Total)	7.4	-10.7	-0.9	-4.9	1.6	8.3	2,287	2,043	77.9	73.3
Electricity	97.3	8.8	0.7	-1.6	1.2	2.6	646	703	22.0	25.2
Total	23.4	-5.1	-0.4	-4.0	1.6	6.8	2,937	2,786	100.0	100.0
Total (weather-corrected)	15.6	-8.2	-0.7	-2.3	2.5	5.5	2,995	2,749	-	-

Table 4: Growth rates, quantities and shares of final consumption in the residential sector

Source: SEAI December 2019

In 2018, the average dwelling consumed a total of 18,208 kWh of energy based on weather-corrected data. This comprised 13,614 kWh (75%) of direct fuels and 4,594 kWh (25%) of electricity.

The average final energy use of permanently occupied dwellings reduced significantly between 2005 and 2014, before returning to growth in 2015 and 2016, falling in 2017, and growing again in 2018. Weather-corrected total final energy consumption per dwelling had been consistent for the last three years, and is still 27% below 2005 levels. Between 2007 and 2018, the final energy use of electricity per dwelling, weather corrected, reduced by 14%.

Residential Unit Energy Consumption	Overall Growth (%)		Average Annual Growth (%)					Quantities (kWh/ Dwelling)	
	1990 - 2018	2005 - 2018	2005 - 2018	2005 - 2010	2010 - 2015	2015 - 2018	2018	2005	2018
Total Energy	-30.2	-24.5	-2.1	-1.0	-5.0	1.0	6.2	24,105	18,208
Fossil Fuel Energy	-38.0	-27.6	-2.5	-1.2	-5.8	1.1	7.7	18,802	13,614
Electrical Energy	11.7	-13.4	-1.1	-0.6	-2.7	0.6	2.0	5,302	4,594
Residential Unit Energy Consumption Weather Corrected	Overall Growth (%)		Average Annual Growth (%)					Quantities (kWh/Dwelling)	
	1990 - 2018	2005 - 2018	2005 - 2018	2005 - 2010	2010 - 2015	2015 - 2018	2018	2005	2018
Total Energy Climate Corrected	-34.5	-26.9	-2.4	-3.4	-3.9	1.9	4.9	24,583	17,967
Fossil Fuel Energy Climate Corrected	-42.5	-30.5	-2.8	-4.2	-4.3	2.3	6.0	19,261	13,385
Electrical Energy Climate Corrected	10.4	-13.9	-1.1	-0.6	-2.8	0.8	1.8	5,322	4,582
Residential Energy-Related CO_2 Unit Emissions	Overall Growth (%)		Average Annual Growth (%)					Quantities (tCO_2/Dwelling)	
	1990 - 2018	2005 - 2018	2005 - 2018	2005 - 2010	1990 - 2018	2005 - 2018	2005 - 2018	2005	1990 - 2018
Total Energy CO_2	-52.1	-38.7	-3.7	-2.6	-5.7	-2.2	-0.6	8.4	5.1
Fossil Fuel Energy CO_2	-51.4	-31.9	-2.9	-1.7	-6.0	0.4	7.4	5.0	3.4
Electrical Energy CO_2	-53.2	-48.8	-5.0	-4.1	-5.1	-6.5	-13.2	3.4	1.7

Table 5: Growth rates and quantities of residential energy consumption and unit of CO2 emissions

Source: SEAI December 2019

The emissions of energy-related carbon per dwelling fell by 39% over the period 2005 to 2018, while the reduction for unit energy use was 24%. In 2018, the average dwelling was responsible for emitting 5.1 tonnes of energy-related CO2. A total of 3.4 tonnes of CO2

(66%) came from direct fuel use in the home and the remainder indirectly from electricity use.

Energy-related CO2 emissions per dwelling for direct non-electric fuel use fell by 32% between 2005 and 2018, primarily as a result of reduced energy consumption per dwelling. CO2 emissions from electricity use reduced by 49% in the same time period due to a combination of reduced electricity use and the reduced carbon intensity of the electricity grid. The carbon intensity of grid electricity has improved since 2002, with combined-cycle gas turbines replacing oil, peat and coal-fired generation and the contribution of renewables in electricity generation began to grow.

Emissions from energy use in households increased by just 0.04% in 2018, the increase kept low as a result of the decreased CO2 intensity of the electricity supplied and countered by increased fossil fuel consumption. Emissions from the direct use of fuel increased by 8% in 2018.

The table below illustrates the BER system as operated in Ireland.

Building Energy Rating	Rating	Primary Energy
BER A1 A2 A3	A rating	< 75 kWh/m2/yr
BER B1 B2 B3	B rating	75 to 150 kWh/m2/yr
BER C1 C2 C3	C rating	150 to 225 kWh/m2/yr
BER D1 D2	D rating	225 to 300 kWh/m2/yr
BER E1 E2	E rating	300 to 380 kWh/m2/yr
BER F	F rating	380 to 450 kWh/m2/yr
BER G	G rating	> 450 kWh/m2/yr

Table 6: Building Energy Rating (BER) Chart

The most recent data on the energy rating of the national housing stock is presented in the table and graph below. It shows the distribution of energy ratings nationally as of 2019. Produced by the CSO it projects the national picture of energy ratings with actual BER ratings weighted to national level.

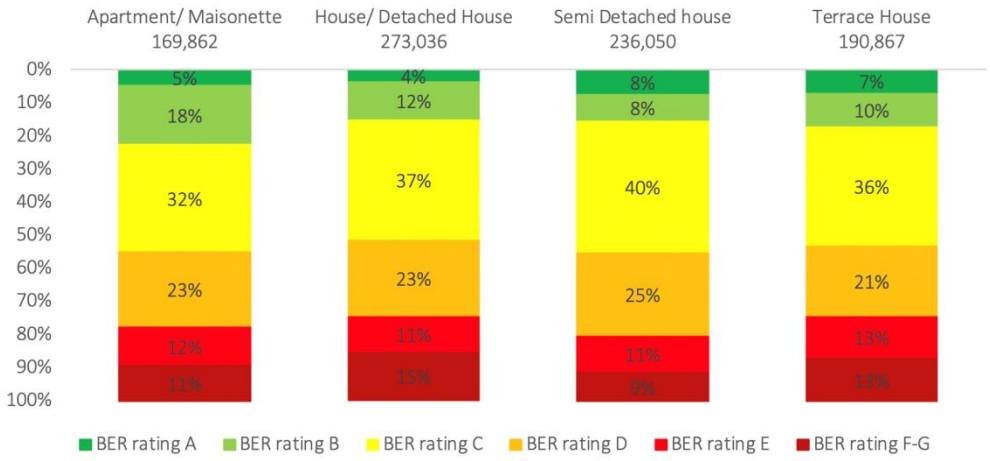

Figure 6: BER Ratings by type of dwelling

Source: CSO BER Database

Dwellings built in 2015-2019 were considerably more energy efficient than in earlier periods with 97% given a BER "A" compared with 36% in 2010-2014 and 1% in 2005-2009.

Domestic Building Energy Ratings

Quarter 1 2020

Table A: BER Ratings by Period of Construction

% of row

Period of construction	*Energy rating*						
	A	B	C	D	E	F-G	Total
1700-1977	0	4	19	24	20	32	266,833
1978-1999	0	6	41	35	12	6	249,947
2000-2004	0	10	61	21	6	2	159,337
2005-2009	1	35	51	10	3	1	148,544
2010-2014	35	56	7	1	0	0	11,201
2015-2020	97	3	0	0	0	0	48,518

Figure 7: Domestic BER Chart

Source: CSO April 2020

3.2.3 Renovation to Date

The graphic below shows dwellings that have had more than one BER audit carried out. This illustrates the progress in the past decade in improving residential energy ratings.

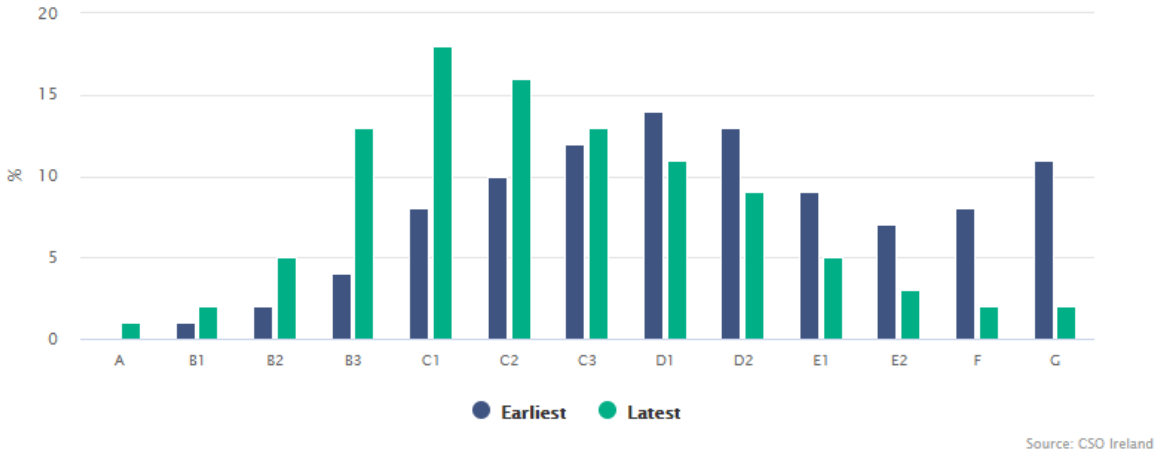

Figure 8: Earliest BER compared with latest for dwellings with multiple BERs (2009-2020)

Source: CSO 2020[8] based on over 835,000 ratings for that period.

In Ireland energy efficiency grant and support schemes are designed to support energy efficiency upgrades to houses built before 2006 and installation of renewables in houses built before 2011. Building regulations introduced from 2006 required an improved level of energy performance and regulations introduced from 2011 required renewables to be installed. Since its introduction over 400,000 households have availed of Government grant support under the Better Energy Programme.

In the period between 2000 and 2019, circa one-third of homes had some renovation work done with Government or energy supplier support. Renovations carried out over the period, where these do not involve State support or are not supported by an energy supplier, are not currently recorded. The focus since 2017 has been more in-depth of renovation. Therefore, while the overall number of home renovations with state supports may have declined in comparison to previous years, the level of renovation in those homes has been significantly higher.

3.3 Commercial & Public Sector

Ireland has a commercial building stock that includes offices, retail and industrial buildings. The public sector building stock includes offices, hospitals and healthcare buildings, schools and educational buildings, cultural and historic buildings and Garda (police) stations.

[8] https://www.cso.ie/en/releasesandpublications/er/dber/domesticbuildingenergyratingsquarter12020/

3.3.1 Building Numbers, Types, Age and Occupancy

There are an estimated 124,000 buildings in the commercial and public sector in Ireland with the largest numbers being offices and retail outlets. A breakdown by category is shown below.

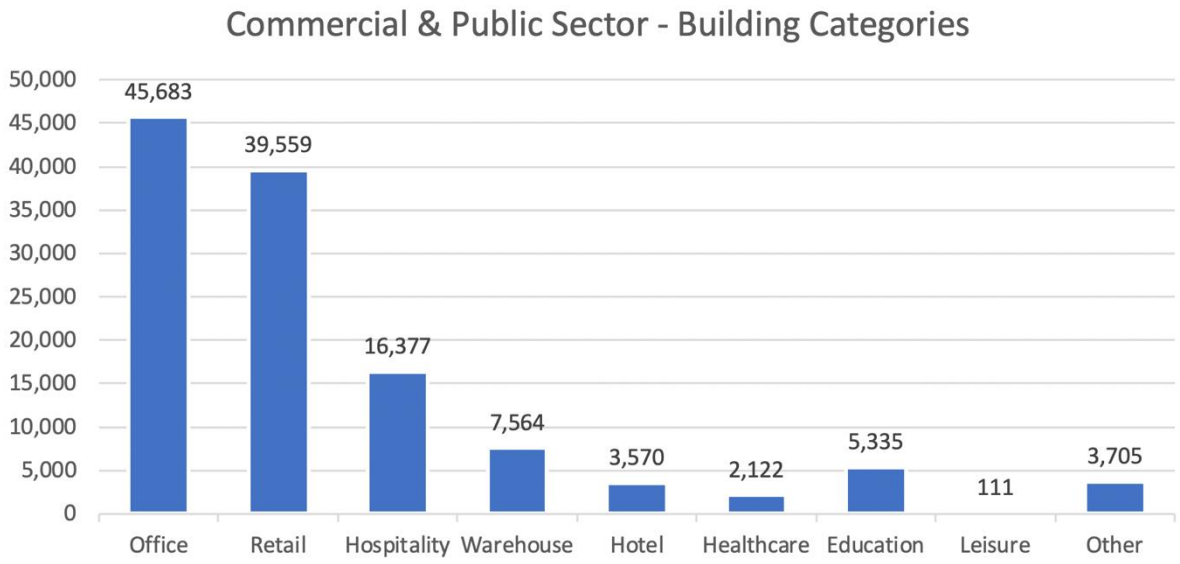

Figure 9: Commercial and Public Sector Building Categories

Source: SEAI: Extensive survey of the commercial buildings stock in Ireland

The building stock in Ireland includes approximately 15,000 public sector buildings and in or around 109,000 commercial buildings. A breakdown of commercial buildings by size is shown below.

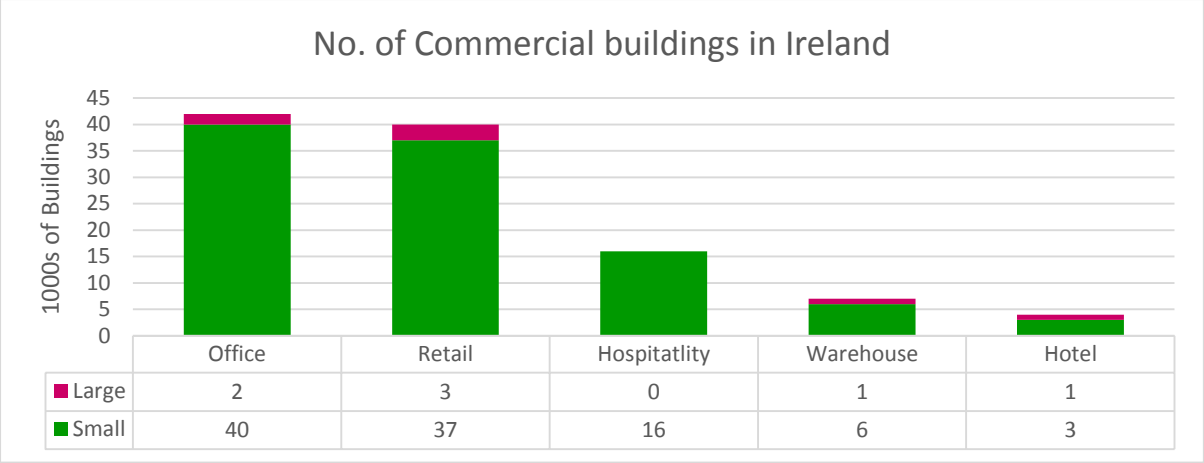

Figure 10: Number of Commercial Buildings

Source: SEAI: Extensive survey of the commercial buildings stock in the Republic of Ireland

Large Building: Gross Floor Area > 1000m2; Small Building Gross Floor Area < 1000m2

It is estimated that 29% of commercial buildings in Ireland also incorporate a level of residential use with the remaining 71% being exclusively commercial.

An estimated 38% of commercial building stock in Ireland consists of standalone buildings with the majority of buildings attached to one or more other buildings. A breakdown is provided below.

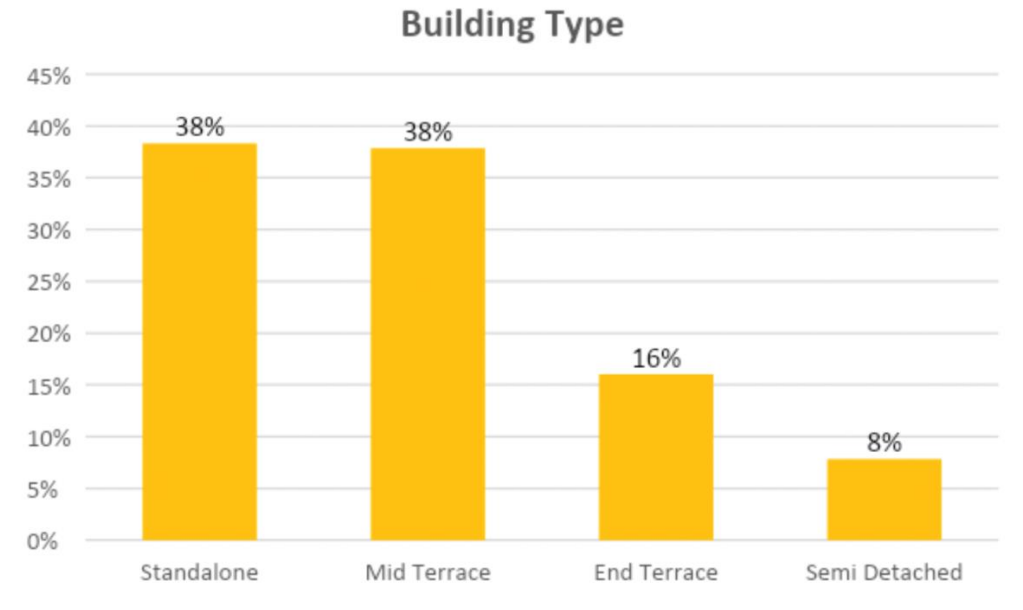

Figure 11: Building Type

Source: SEAI: Extensive survey of the commercial buildings stock in the Republic of Ireland

An estimated 7% of Ireland's commercial building stock has been constructed since 2010. A breakdown is provided below.

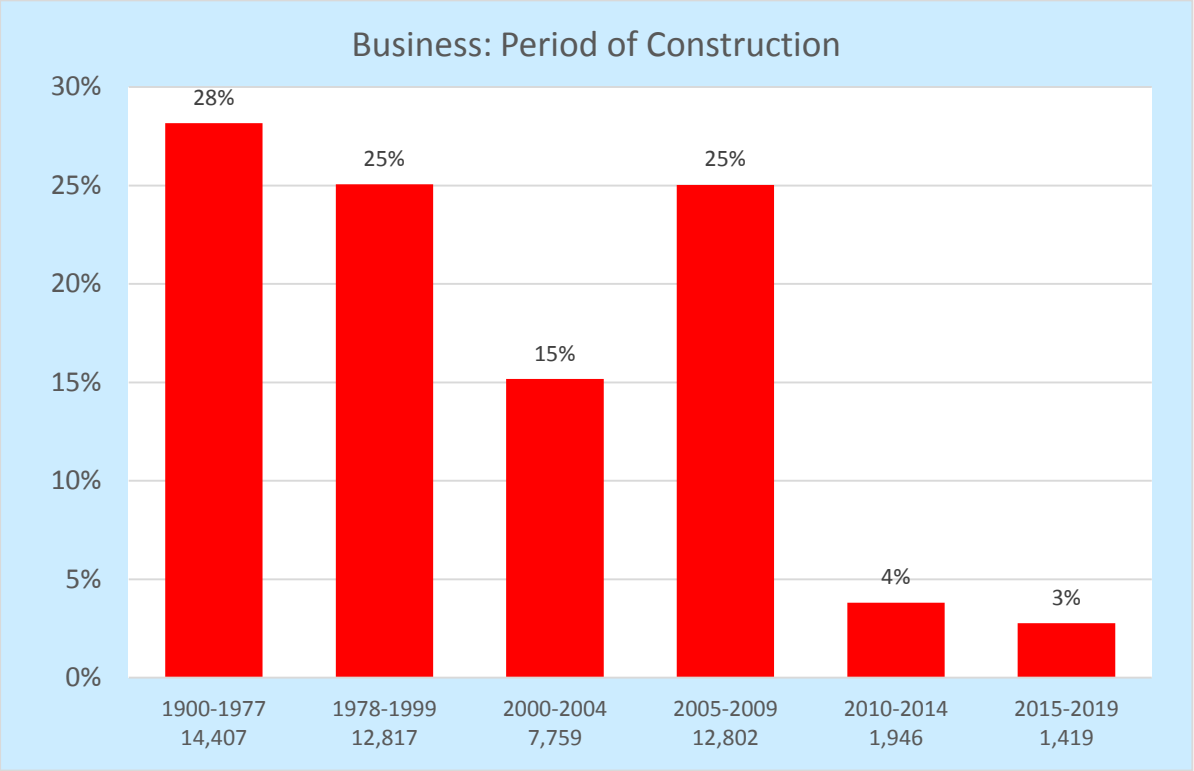

Figure 12: Commercial and Public Sector Period of Construction %

The commercial building stock in Ireland includes a mix of owner-occupier and rented buildings. A breakdown, including who the decision maker is in relation to retrofitting, is provided below.

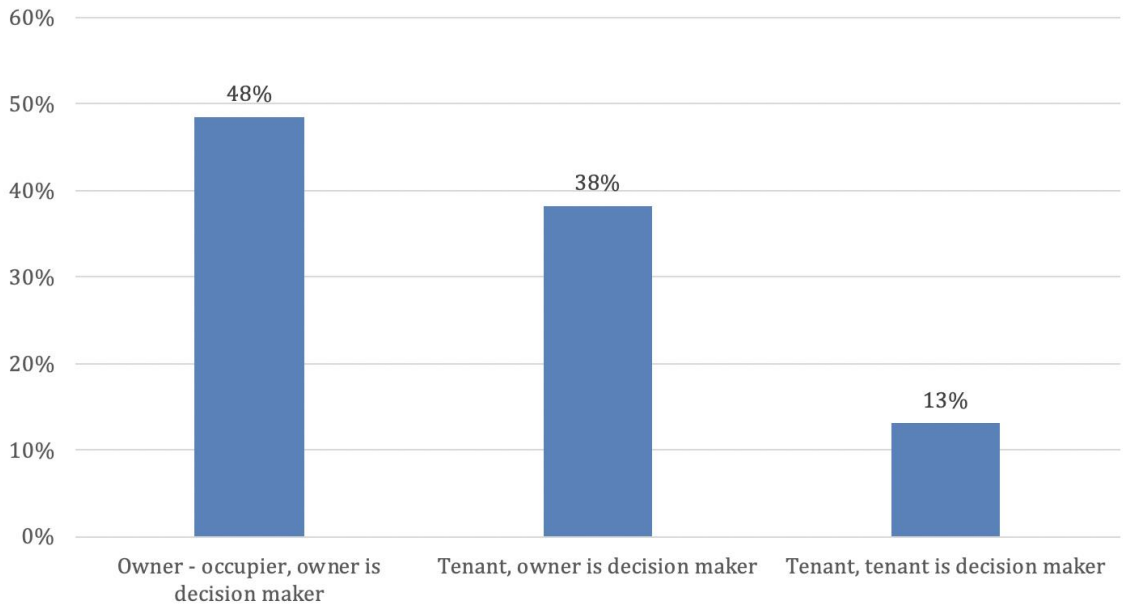

Figure 13: Decision Makers

3.3.2 Energy Performance

An indication of the energy performance of buildings by period of construction is provided below based on available data. It should be noted that this data is not available for all buildings and is more likely to be available for those that have undergone retrofit and so should be treated as indicative only.

The figure below shows the trend for final energy consumption in the commercial and public sector between 2005 and 2018.[9] Commercial and public sector energy demand decreased every year between 2008 and 2014 but increased between 2015 and 2018.

Commercial and public sector final energy use in 2018 was 1,484 ktoe, 5.4% below the level recorded in 2005. Correcting for weather variations, 2018 final energy use was also 8.2% below 2005. When reviewed based on the number of employees, the energy use/employee in 2018 was 10,040 kWh/employee a 22.9% improvement on the level recorded in 2005.

[9] The data regarding energy use are sourced from: *Energy in Ireland. 2019 Report,* Sustainable Energy Authority of Ireland, 2019.

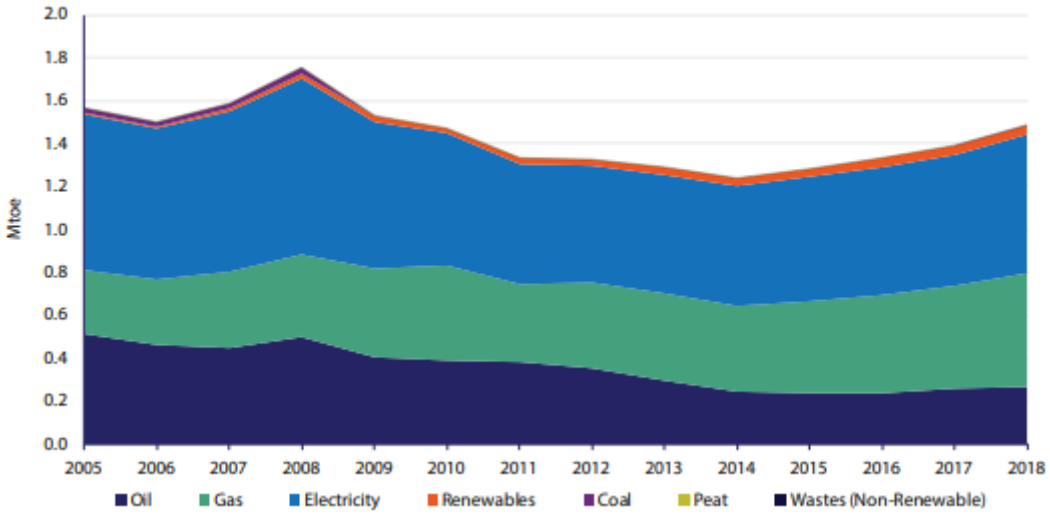

Figure 14: Commercial and Public Sector Final Energy

Source: SEAI December 2019

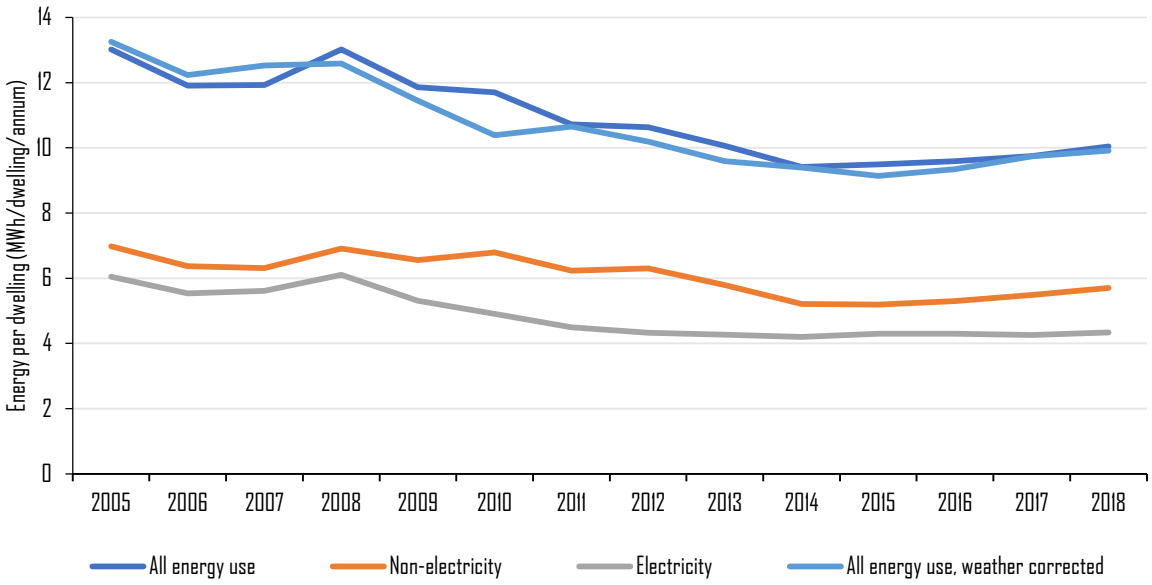

Figure 15: Energy per dwelling

Source: SEAI September 2020

Electricity is the dominant fuel in the commercial and public sector, though its share reduced slightly, from 46% in 2005, to 43% in 2018. Fossil fuels remained consistent at 53%, however oil reduced from 33% to 18% and gas increased from 19% to 36%. The renewables share of final energy used directly in commercial and public Sector in 2018 was 2.9%. The

emissions of energy-related CO_2 emissions fell by 37% over the period 2005–2018. This is shown in more detail in the tables below.

Commercial/ Public TFC	Overall Growth (%)		Average Annual Growth (%)				Quantity (ktoe)		Shares (%)	
	1990 - 2018	2005 - 2018	2005 - 2018	2010 - 2015	2015 - 2018	2018	2005	2018	2005	2018
Fossil Fuels (Total)	9.3	-4.5	-0.4	-4.2	6.1	7.8	837	800	53.4	53.9
Coal	-100.0	-100.0	-100.0	-	-	-	27	-	1.7	0.0
Oil	-55.8	-47.7	-4.9	-9.6	4.2	4.0	511	268	32.6	18.0
Gas	466.2	78.2	4.5	-0.4	7.2	9.9	299	532	19.0	35.8
Renewables	89719.3	964.6	20.0	8.7	9.7	-2.0	4	43	0.3	2.9
Combustible Fuels (Total)	12.8	-1.8	-0.1	-4.0	6.1	7.2	840	825	53.6	55.6
Electricity	167.0	-11.8	-1.0	-1.2	3.4	5.3	728	642	46.4	43.2
Total	52.7	-5.4	-0.4	-2.7	5.0	6.4	1,569	1,484	100.0	100.0
Total Climate Corrected	43.0	-8.2	-0.7	-1.1	5.9	5.2	1,597	1,466	-	-

Table 7: Growth rates, quantities and shares of final consumption in the commercial and public sector

Source: SEAI December 2019

Commercial/Public Energy per Employee	Overall Growth %	Average Annual Growth (%)				Quantity (kWh)	
	2005 - 2018	2005 - 2018	2010 - 2015	2015 - 2018	2018	2005	2018
Total kWh/employee	-22.9	-2.0	-4.1	1.9	3.0	13,020	10,040
Fuel kWh/employee	-18.3	-1.5	-5.2	3.1	3.9	6,980	5,699
Electricity kWh/employee	-28.1	-2.5	-2.6	0.3	1.9	6,040	4,341
Commercial/Public Energy per Employee (Climate Corrected)	**2005 - 2018**	**2005 - 2018**	**2010 - 2015**	**2015 - 2018**	**2018**	**2005**	**2018**
Total kWh/employee (cc)	-25.2	-2.2	-2.5	2.7	1.8	13,248	9,914
Fuel kWh/employee(cc)	-21.9	-1.9	-3.0	4.4	2.1	7,163	5,596
Electricity kWh/employee(cc)	-29.0	-2.6	-1.9	0.7	1.4	6,085	4,318

Table 8: Growth rates and quantities of unit energy consumption per employee for Commercial and Public Sector

Source: SEAI December 2019

Commercial/ Public CO_2	Overall Growth %	Average Annual Growth (%)				Quantity (kt CO_2)		Share (%)	
	2005 - 2018	2005 - 2018	2010 - 2015	2015 - 2018	2018	2005	2018	2005	2018
Combustible Fuels	-13.6	-1.1	-4.9	5.5	7.5	2,385	2,060	30.7	42.4
Electricity	-48.0	-4.9	-3.6	-3.9	-10.4	5,379	2,800	69.3	57.6
Total	**-37.4**	**-3.5**	**-4.1**	**-0.3**	**-3.6**	**7,764**	**4,860**	**100.0**	**100.0**

Table 9: Growth rates, quantities and shares of CO2 emissions in Commercial and Public Sector

Source: SEAI December 2019

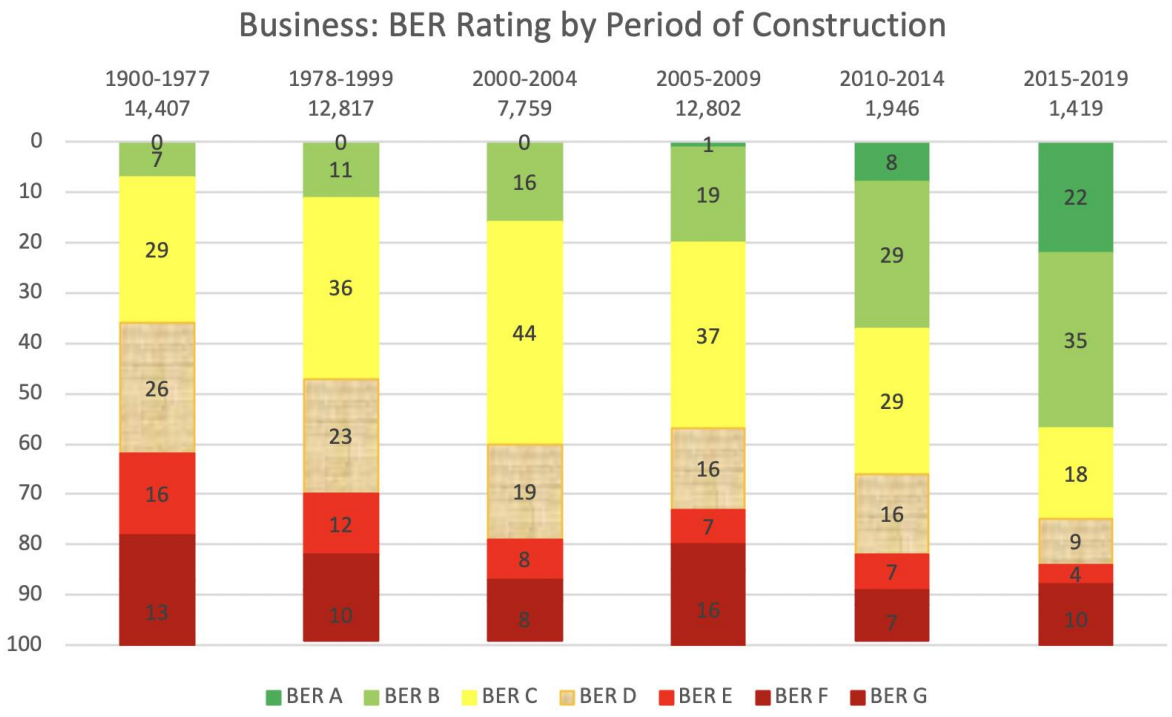

Figure 16: Non-domestic BER rating by period of construction

Source: CSO compiled from SEAI BER Database

There is a range of exchequer supports available to incentivise the upgrading of buildings in the commercial and public sector. In addition, the Energy Efficiency Obligation Scheme provides a market-funded incentive for retrofit. A limited number (estimated to be circa 3% of commercial and public sector buildings) have been upgraded to date using these support schemes. The level of retrofit is thought to be significantly higher. However, gathering accurate data on the level of retrofit is not straightforward.

3.4 Traditional Buildings

Traditional buildings are generally defined as those constructed with solid masonry walls, single-glazed windows and timber-framed roofs. This type of construction was typically used in buildings constructed in Ireland before 1940. Many of these buildings have statutory protection. There are currently over 45,000 protected structures (the majority of which are buildings in use) while many other historic buildings are located within architectural conservation areas. However, most traditional buildings do not have statutory protection.

Traditional buildings occur in the residential, commercial and public sectors. Based on the 2016 Census it is estimated that some 18% of dwellings fall into the traditionally built category. These buildings are generally constructed with vapour-permeable materials and do not incorporate barriers such as damp-proof courses, vapour barriers and membranes and the like which are considered standard in modern construction. For this reason, traditional building fabric is often referred to as 'breathable' construction which both absorbs and readily allows the evaporation of moisture. Therefore, some approaches to energy insulation retrofit are not suitable as they would cause damage to the structures and adversely impact on the internal living environment and the health of its occupants.

The Department of Culture, Heritage and the Gaeltacht are leading the development of a retrofitting guidance document for traditionally built buildings. Other key stakeholders include the Department of Housing, Planning and Local Government, Department of Communications, Climate Action and Environment and the Sustainable Energy Authority of Ireland.

4 Barriers

This scale of retrofit ambition is a significant challenge for Ireland. This is demonstrated by the level of retrofit carried out to date in the residential sector. There were an estimated 23,000[10] homes renovated in Ireland in 2019 (with State support through SEAI schemes) of which approximately 1,500 were renovated to a BER level of B2 or better. Meeting the 500,000 target will require an average of 50,000 homes to be renovated to this standard each year to 2030.

To enable this scale up the Irish Government has:

1. approved a National Development Plan that has allocated funding of €4.5 billion to support energy efficiency improvements across the residential and public sector;
2. committed to increasing the price of carbon to €100 per tonne by 2030 in the Programme for Government;
3. established a Retrofit Taskforce to focus on residential renovation; and
4. set a high level of ambition and leadership expected of the Public Sector.

Ireland faces a number of challenges in reducing emissions from our buildings. Our homes use 7% more energy than the EU average[11]. Our buildings are 70% reliant on fossil fuels, including oil-fired boilers; over 80% of our homes and other buildings assessed have a BER level of C or worse. The current annual retrofit activity for existing stock is relatively low.

Achieving the new retrofit targets it will require analysis of the issues and barriers, and developing appropriate responses to address those barriers. It will also entail very significant scaling up of effort, capacity and investment.

The key barriers can be grouped around three themes. These are:

- Appetite,
- Affordability, and
- Accessibility.

The assessment of barriers, set out below, is structured around these themes.

[10] Source SEAI

[11] SEAI, Energy in the Residential Sector 2018.

4.1 Appetite

It is necessary to grow the appeal of and appetite for retrofit. Unless and until homeowners and decision makers in the commercial and public sectors decide to take the retrofit steps – it will be difficult, if not impossible, to achieve the massive uptake in renovation that we need. The barrier here goes beyond awareness, it's about motivation. The responses will need to entail a focus on making retrofit a more attractive and desirable choice. This will mean demonstrating the advantages and multiple benefits resulting from retrofit, development of effective messaging and marketing as well as push factors.

The following barriers are common across the residential, commercial and public sectors:

- In many cases, the decision maker (e.g. a landlord) will not significantly benefit from the retrofit (e.g. the tenant will have greater comfort and lower utility bills). This is the split incentive problem and is considered a key barrier.
- Opportunities to influence renovation decisions are often time constrained. People's personal circumstances influence receptiveness to the renovation message and appeal varies depending on the stage decision makers are at.
- Even when people consider renovation, it is usually not a priority for them and will not happen unless its appeal and benefits can be more effectively "sold".
- There can be a lack of trust and confidence that the promised outcomes will be delivered as promised.
- Energy costs are sometimes not as visible or significant for some – so reducing energy use is often not prioritised.
- The status quo tends to be the default approach in the absence of an imperative such as regulation to act differently.

The following barriers are most prevalent in the residential sector:

- Lack of awareness of retrofitting and what it means for their homes.
- Long pay back periods and significant upfront costs.
- The level of disruption and "hassle" associated with the experience including from:
    - Co-ordinating contractors
    - Disruption in the home
    - Paperwork associated with applying for grants

The following barriers are prevalent in the commercial and public sectors:

- Lack of expertise, resources, time and information are key barriers to achieving improved energy efficiency and renovation in the commercial sector.
- In the absence of a requirement to act the focus will be on their core business objectives which, in many cases, do not include renovation.
- Without senior management commitment, improved energy efficiency and retrofit is much less likely to happen.

4.2 Affordability

Renovation on the scale needed can only happen if affordability is addressed. Affordability does not appear as a barrier until appetite exists. For those who have developed an appetite affordable options will be required. Mechanisms will need to be developed to allow the decision makers – be they homeowners, landlords or businesses to acquire the renovation in an affordable way. This is likely to entail partial financial assistance in the form of grants or supports – especially for homeowners – and will require the right financing solutions to be developed which meet the affordability circumstances of the people or organisations concerned.

The following barrier is common across the residential, commercial and public sectors:

- Renovations can be expensive – sometimes too expensive to be an option for many.

The following barriers are more prevalent in the residential sector:

- Affordability is a significant barrier given the high up-front costs
- A lack of finance and loans at attractive interest rates or with sufficiently low monthly repayment costs.
- Paperwork associated with grants can be a barrier.

The following barriers are more prevalent in the commercial and public sectors:

- Many businesses lack the resources as well as the expertise to invest in energy efficiency or retrofit.
- To date there has been only modest interest and uptake of Energy Performance Contracting (EPC)

4.3 Accessibility

Accessibility is about making it not just possible, but easy, for decision makers to renovate. This covers availability of the right solutions – effective project approaches delivering the desired results at the right quality. It entails ensuring enough people with the right skills to

carry out the work to the right standards. It also means making the project or journey as easy for the decision makers as possible – and one-stop-shops will have a role in this regard.

The following barriers are common across the residential, commercial and public sectors:

- Projects are perceived as complex and or disruptive.
- Not enough of the skilled and trusted people or companies to do the work to the required quality.
- Without the right guidance and standards, the necessary quality outcomes will not be delivered and further uptake will be impeded.

The following barriers are more prevalent in the residential sector:

- Complexity of the retrofit process;
- Lack of independent advice;
- Lack of trust in contractors;
- Lack of confidence post-works around validity of guarantees provided by contractors.

The following barriers are more prevalent in the commercial and public sectors:

- Without being pushed to do so most businesses would not prioritise or act on retrofit.
- A reluctance to embark on renovation (entailing expenditure of effort and resources) without visibility of effective approaches.

5 Cost-Effective Approaches to Renovation

It is important that approaches used ensure renovation is carried out in a cost-effective manner.

For instance, having energy renovation work done at the same time as other work (e.g. when carrying out major upgrade works) delivers cost effectiveness due to economies of scale while also minimising disruption. Cost effectiveness can also be enhanced by carrying out more works at once than by retrofitting in an incremental or piecemeal fashion. While retrofitting incrementally can be supported and facilitated new approaches are needed to encourage packages of measures or more substantial retrofit wherever possible as this maximises the energy saving gain, minimises disruption and optimises cost effectiveness.

Cost effectiveness is considered in the BER advisory report as it outlines the different approaches appropriate to the property and their relative costs. It communicates to the decision maker how cost effectiveness can be enhanced by availing of grant support for some of the measures.

Cost effectiveness may also be improved through aggregation and this is a key component of the approach to renovation at scale which will be led by the Retrofit Taskforce. The Retrofit Taskforce has cross Departmental and agency membership and has been established to oversee the design and development of a new retrofit delivery model with a specific focus on the residential sector.

The following sub-sections set out a range of approaches that are being employed or considered in order to enhance cost-effectiveness.

5.1 Identifying Trigger Points

Research undertaken for the Retrofit Taskforce indicates that certain “trigger points” can make consumer cohorts more likely to carry out retrofits. Trigger points include:

- House renovations and work:
    - Major renovations which trigger the Building Regulations
    - Other home renovations that don’t require planning permission, but contractors are in the house anyway to advise and carry out work
    - Heating system failure
- Home purchases with BER certificate informing homeowner of energy performance:
    - Mover purchasers (both upgrades and downgrades)

    - Buy to let
    - First time buyers
- Key life events:
    - Households with new babies
    - Health issues
    - Finalisation of mortgage repayments
    - Eligibility for energy poverty retrofits schemes.

Building regulations relating to major works on existing buildings are used to ensure that when a substantial renovation is taking place on an existing building that energy renovation requirements come into play. Building regulations, already in force, require that where major renovations[12] are taking place that the energy performance of the whole property is improved. The improvement required[13] has been identified in the Cost Optimal Report[14].

5.2 Energy Performance Assessment

The Department of Housing, Planning and Local Government carried out an assessment of cost-optimal calculations and a gap analysis for residential[15] and non-residential[16] buildings.

The report describes cost-optimal calculations and gap analysis for buildings in accordance with Article 5 of *Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).* The report has been developed in accordance with *Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings* (hereinafter referred to as the Cost-Optimal Regulation) and the associated *Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012.*

For the 2019 non-residential report the cost optimal level has been compared to 2017 Part L of the Building Regulations performance requirements. This regulation introduces Nearly

[12] "Major renovations" means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation.

[13] 125kWh/m2/year, where technically, functionally and economically feasible

[14] Cost optimal report

[15] https://www.housing.gov.ie/sites/default/files/publications/files/200407_irish_2019_non-domestic_cost_optimal_report_revised_.pdf

[16] https://www.housing.gov.ie/sites/default/files/publications/files/200407_irish_2018_residential_cost_optimal_report_revised_0.pdf

Zero Energy Building performance requirements and Major Renovation provisions into Ireland's Building Regulations for buildings other than dwellings.

The 2018 residential cost optimal report compares the cost optimal level to the NZEB performance requirements which were implemented in 2019. These regulations introduce Nearly Zero Energy Building performance requirements and Major Renovation provisions to a cost optimal level into Ireland's Building Regulations for Dwellings.

The cost optimal level of performance is the energy performance level which leads to the lowest cost during the estimated economic lifecycle where the lowest cost is determined taking into account energy-related investment costs, maintenance and operating costs. The cost optimal calculations will be revised every 5 years and regulations will be reviewed if performance levels deviate off cost optimal. This regular assessment allows for a review of the minimum energy performance requirements for buildings in light of technical progress.

The performance requirements in building regulations are set at the cost optimal levels which ensure that the best energy performance is obtained for the lowest lifecycle cost taking account of capital cost and operating costs. These calculations have been carried out to assess performance requirements in 2013 and again in Sept. 2018.

A range of solutions can be used to achieve these performance requirements. The advanced performance requirements in the current regulations combined with a mandatory renewables requirement is creating a rapid transition to low carbon heating systems in new dwellings.

Builders and homeowners have a choice in deciding which energy system best suits their needs.

The NZEB requirements make it more attractive for builders and homeowners to further incorporate renewable technologies and move away from traditional fossil fuels. The Central Statistics Office analysis of Building Energy Rating data demonstrates this shift away from fossil fuels; the installation of oil boilers has dropped from 36% to 4% in new dwellings, and electrical systems (primarily heat pumps) make up 44% of heating systems in new dwellings with this percentage growing steadily each year.

It is estimated that the cumulative improvements to regulations mean that a dwelling built to the 2011 Part L regulations requires 90% less energy than the equivalent dwelling built in 1978 to deliver the same standards of heat, hot water and light. This shows the very significant progress that has already been made in the standards for new buildings.

5.3 Influencing Decision Making

The SEAI Behavioural Economics Unit was established in 2017 to focus on encouraging measurable changes to homeowners' and business' energy behaviour, using the latest evidence from Behavioural Science and Economics. The unit's process of rapid iteration helps to design and test impactful behaviour change strategies. Successful strategies can then be scaled and incorporated into national schemes.

5.4 Building Energy Rating System

One way to help focus people on renovation opportunities is to present them with renovation suggestions – practical measures they can take and associated costs in an accessible way. With this in mind SEAI, working with key stakeholders, have developed a new enhanced BER Advisory report to be introduced in 2020. These reports are provided when a new Building Energy Certificate is obtained – when a property is offered for sale. It therefore has the potential to be a catalyst for action at some key trigger points. Additional supports include the development by SEAI of a technical advisor role for home grant schemes to assist homeowners for technologies such as heat pumps.

5.5 Stakeholder Engagement

To help better understand the issues facing businesses, particularly smaller businesses, DCCAE conducted a stakeholder engagement exercise the results of which were published in 2018[17]. The responses confirmed that businesses were time poor – needing to focus primarily on delivering their service or producing their products and there was little interest in renovation. Since then the additional uncertainties and pressures arising from preparing for Brexit, and more recently the impacts of Covid-19, mean it will be a challenge to engage most businesses to meaningfully consider and respond to renovation objectives.

A key learning from the stakeholder engagement exercise was that businesses were primarily interested in technological solutions and investments with short payback periods. Businesses and investment decisions tend to favour investments for projects with relatively short timeframes of three years or less. Furthermore, businesses with restricted access to capital will also evaluate the opportunity cost of capital invested in energy efficiency against investment in their core business which may offer more attractive returns than a competing energy efficiency project.

[17] https://www.dccae.gov.ie/en-ie/energy/publications/Pages/Report-on-the-Findings-from-the-DCCAE-Commercial-Sector-Survey-Consultation0328-5224.aspx

Recognising these realities, efforts have focused on initiatives with most potential to gain traction with business and deliver improved energy efficiency and emissions reduction outcomes and the potential to drive renovation in the sector.

Stakeholder engagement is also informing the approaches being designed by the Retrofit Taskforce.

5.6 Energy Saving Advice

The SEAI have developed a suite of free online training modules for general use and for SMEs to help them identify and pursue energy efficiency opportunities including renovation. Known as *The SEAI Energy Academy*[18], short course modules are currently being made available on various aspects of energy, efficiency, and renewables, including:

- Energy and Climate Change
- Business Energy Efficiency
- Office Energy Efficiency
- The Home Energy Challenge
- Behavioural Change
- Lighting Efficiency – Basic and Advanced Design

Further modules will be developed and added and all can be accessed at: www.seaienergyacademy.ie.

As renovation is not a high priority for many businesses, linking renovation to priorities they do have, such as renewable energy, or green credentials, can help drive energy renovation activity.

5.7 New Delivery Model

Delivering on our national retrofit targets is a complex programme of work with a wide range of interlinkages and interdependencies. A truly all of Government approach with effective collaboration will be required to deliver the programme. A Retrofit Taskforce with cross Departmental and agency membership has been established to oversee the design and development of a new retrofit delivery model for the residential sector.

[18] https://www.seaienergyacademy.ie/users/sign_in?next=%2Fdashboard

The Taskforce is assessing a range of potential approaches across the 4 dimensions/pillars that will form the core of the retrofit solution:

(i) Customer/homeowner propositions to improve awareness and drive demand

- A network of one-stop-shops that deliver simple customer journeys and coordination with contractors and finance providers as well as minimising hassle;
- Proactive and targeted marketing campaigns targeted at identified segments;
- Appropriate regulation.

(ii) Financial/funding models for each consumer segment/cohort to address high payback periods and ability to pay upfront costs

- Exchequer funding including new and expanded grant schemes;
- Opportunities for private finance;
- Possible tax incentives.

(iii) Supplier scale-up and contracting

- Drive confidence in long-term attractiveness of retrofit market;
- Consistency and confidence in one-stop-shop offerings through clear standards and establishment of contractual obligations;
- Changes to the existing apprenticeship and education programmes and other initiatives to up-skill the existing workforce and bring in new entrants;
- Foster aggregation and standardisation;
- Stimulate innovation.

(iv) Programme governance and roadmap

- Appropriate entity with responsibility for driving achievement of our national retrofit targets;
- Performance monitoring and evaluation mechanisms established.

5.8 Funding and Financing

There is a range of Government supports and grant schemes in place. These undergo a continued process of review and redesign to ensure alignment with Government objectives and value for money.

There is also a range of approaches to financing that are being considered including:

- Identifying options for targeted financing for energy efficiency retrofits in the domestic and commercial sector.
- Exploring (through piloting) the use of salary incentive schemes to encourage, facilitate and support people in retrofitting their homes.
- Exploring the potential use of tax incentives to stimulate the demand for residential energy efficiency improvements.
- Providing easier to access tailored finance for residential energy efficiency investment utilising if/as appropriate the European Commission's Smart Finance for Smart Buildings loan scheme.
- Examining opportunities associated with green mortgages.

5.9 Promoting Retrofit Projects

The effective marketing of retrofit is considered important. The Economic and Social Research Institute's (ESRI) savings index, recorded that 54% of consumers surveyed would use any surplus cash to pay down debt, including their mortgage. This may in part be due to the advantages of retrofit not being properly understood. It underlines the importance of effectively marketing the multiple benefits of retrofit solutions.

Building trust and confidence are also key. Retrofit projects entailing disruption and significant costs are unlikely to be embarked upon unless the decision maker is confident that the promised outcomes will be delivered on time and to the necessary quality.

Community and locally-based organisations are important in building trust and confidence among consumers. The value of working with these locally-based organisations is recognised and a core constituent of Ireland's retrofit approach. SEAI is working closely in delivering the Better Energy Communities Scheme and community engagement will be a key element of future initiatives. The establishment of over 250 Sustainable Energy Communities has been a significant success in encouraging local actors to work together. It is underpinned by SEAI mentors and grants for a Local Energy Plan. They have been able to undertake quite ambitious changes across multiple locations in cooperation with the energy suppliers who are obligated under the Energy Efficiency Obligation Scheme.

There is a huge opportunity to build on this model and to work with the new Climate Officers in Local Authorities to mobilise more such networks with a target to reach 1,500. The aim is to develop a concerted effort to make local communities more conscious of poor carbon technologies and how they can be rectified. A wider use of BER ratings by auctioneers,

Local Authorities and other influencers and the wider promotion of audits can help underpin community mobilisation.

Area based, scaled approaches can make it easier to inform and engage the decision makers being targeted by building on existing community structures and programmes. They can also build the confidence of supply chains, which will need to invest in both competency and capacity.

A key factor in building trust and confidence and in achieving the necessary level of retrofit uptake is ensuring that works done are delivered to the necessary high-quality standards. Quality assurance is therefore crucial. One of the key roles envisaged for the new One-Stop-Shop component of the new Retrofit Delivery Model is that it will be responsible for end-to-end delivery of retrofit, including Quality Assurance of work done by service providers.

Recognising that businesses main focus is on their core activities and that it is often extremely difficult to get their attention in order to encourage them to consider the benefits or retrofit SEAI have focused efforts on initiatives with most potential to gain traction with business and deliver improved energy efficiency and emissions reduction outcomes and the potential to drive renovation in the sector.

5.10 Large-Scale Retrofit

The Department of Housing, Planning & Local Government is currently funding Local Authorities in their undertaking of an ambitious programme of insulation retrofitting of the least energy efficient social homes. The programme, launched in 2013, aims to improve the energy efficiency of local authority apartments and houses by reducing heat loss through the fabric of the building, in order to improve comfort levels and address issues around fuel poverty.

The programme continues to sustain and create jobs while making a significant contribution to Ireland's carbon emissions reduction targets and energy reduction targets for 2020, and results in warmer homes and lower energy bills for local authority tenants. The Programme commenced in 2013 and is being rolled out on a phased basis. To date, works have been carried out under Phases 1 and 2.

- Phase 1 of the scheme aims to ensure that the entire social housing stock will have, as a minimum, wall and attic insulation (300mm). To this end, funding has been initially targeted at the less intrusive cavity wall insulation as well as attic insulation.
- Phase 2 focuses on the fabric upgrade works to those remaining dwellings with solid/hollow block wall construction and includes the provision of heating upgrades and replacement windows and doors. Phase 2 rolled out to all local authorities in

March 2019. Local Authorities will upgrade their housing stock under Phase 2 of the social housing retrofit programme to bring dwellings to cost optimal level or alternatively a BER level of B2.

The Department of Housing Planning and Local Government is working closely with the Department of Communications Climate Action and Environment, Midlands Local Authorities and SEAI to develop a pilot retrofitting for social housing upgrades. An allocation of 20 million euro (from the increased carbon price) is being provided to the Midlands Local Authorities for this purpose. The funding will be used to retrofit social housing, improve the comfort and health benefits of occupants for housing and create an economic stimulus for the region. The scheme will also aim to encourage private homeowners in the areas targeted to upgrade their homes.

Schools represent a significant opportunity for building retrofit – with the additional benefit of their high visibility in communities which has potential additional demonstrator and awareness value.

Financial provision has been made in the National Development Plan (NDP) for funding support for the refurbishment of schools including retrofit. To prepare the way for this large-scale retrofit work a number of Pathfinder Partnership Programmes have been put in place between SEAI and DES, OPW and HSE. These Programmes are focused on energy efficiency retrofit improvements in schools, central government and HSE buildings. The main objective of the Programme is to test approaches, build best practice and capacity to develop a replicable scalable retrofit model for the public sector building stock to help deliver on the sectors energy targets once NDP funding becomes available.

To support capital investment in the higher education sector including the upgrade and retrofit of existing buildings to improve energy efficiency and support decarbonisation, a new Partnership programme was launched in 2020 between the SEAI and the Higher Education Authority (HEA) focusing on energy efficiency retrofits in the higher education sector.

5.11 Guidance & Standards

The development of energy efficiency retrofit standards and guidance is critical to ensuring quality retrofit and provides a reference for training bodies, professionals and tradespersons. Examples include:

- The Code of practice for the energy efficient retrofit of dwellings[19] was published in 2014 by the National Standards Authority of Ireland to meet this need. Other energy

[19] https://www.nsai.ie/about/news/publication-of-sr-542014-code-of-practice/

efficient system certification schemes for systems and installers also exist. These include those offered by the Irish Agreement Board which provides alternative means of quality assurance for energy efficiency retrofit works.

- The development of National Standards for Design, Installation and Commissioning of Heat Pumps and Photovoltaic.
- Retrofit Guidance for traditionally built buildings (in development)

Building regulations ensure that new build will be of a high energy efficiency standard. Recognising the dearth of appetite for deep renovation the regulations are also being used to drive renovation for existing buildings in certain circumstances. The 2018 Energy Performance of Buildings Directive requires that all new buildings (public and private) are Near Zero Energy Buildings (NZEB) by 2020. It also requires that new buildings owned and occupied by public authorities in Ireland are NZEB after 2018. NZEB is classified as a building that has a very high energy performance and 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.

For new **dwellings** under the previous regulations a typical new dwelling was built to an A3 Building Energy Rating (BER). The NZEB requirements will equate to an A2 BER. This represents a 70% improvement in energy efficiency and a 70% reduction in CO2 emissions compared to the 2005 Regulations. It also introduces 20% renewables as a percentage of the total building energy use. The NZEB building regulations apply to all new dwellings commencing construction from the 1st November 2019 subject to transition arrangements.

The majority of existing housing stock is energy inefficient, with only 0.4 to 1.2% of the stock being renovated each year. The major renovation performance requirements are set in Building Regulations. These regulations apply from 1st November 2019 for works to existing dwellings.

The performance levels for major renovations have been set to be proportionate to the original cost of works and ambitious but realistic so as not to create an unintended barrier to renovation. For existing dwellings, the cost optimal energy performance level for Major Renovations is equivalent to a BER level of B2 or cost optimal equivalent where technically functionally and economically feasible. The cost optimal performance requirement is typically triggered by external wall insulation or internal wall insulation applied to more than 25% of the surface area of the building.

While building regulations will not increase renovation rates in themselves, they will help to promote renovation by ensuring that when major renovations are carried out they are carried out to this level – typically equivalent to a BER level of B2.

Further regulation from 2022 will effectively phase out further installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings. This will be achieved through the introduction of new regulatory standards for home heating systems, and ensure the supply chain for the installation of renewable heating systems is in place.

Part L of Ireland's Building Regulations (for Buildings other than Dwellings) was amended in 2017 in order to establish the NZEB performance requirement and this sets a performance level representing an improvement in the order of 60% over previous standards. It also includes mandatory renewables on all new buildings and major renovations to a cost optimal level. These regulations apply to works to new and existing buildings which commenced after 1st of January 2019 subject to a one-year transition.

Building Regulations set similar performance requirements with regards to Major Renovations to existing non-residential buildings. These performance requirements also apply to works affecting more than 25% of the surface area of non-residential buildings and apply to all works taking place to non-residential buildings since the 1st Jan 2019.

There has been extensive consultation with the Public Sector and Industry to introduce this step change and extensive Regulatory Impact Assessments have been completed.

The split incentive problem in the rental market needs to be addressed in the context of the current accommodation shortage in Ireland. An Expert Advisory Group was established which looked at examples of best international practice and produced a consultation paper which included examples of approaches used elsewhere together with some other suggested approaches. This paper informed a public consultation launched in Q4 2019. The submissions made to this public consultation have been analysed and will inform the recommendation of the Advisory Group and the work of the Retrofit Taskforce.

5.12 Energy Performance Contracting

There is a role for Energy Service Companies (ESCOs) and Energy Performance Contracting (EPC) in addressing the financing and other barriers to improve energy efficiency in the commercial and public sectors.

An ESRI study on the ESCO market in Ireland, suggested that in-house resources could theoretically deliver on greater energy savings than ESCOs, but in practice this does not happen due to a lack of focus (energy use is but one or two per cent of turnover) and lack of in-house expertise. The study found that the ESCO market was in its infancy and

recommended a number of information (e.g. guidelines, template contracts) and fiscal (grants, fuel tax) recommendations to promote ESCOs. SEAI seeks to promote EPCs through the National Energy Services Framework.

SEAI provides support to facilitate the wider deployment and use of EPCs by building capacity and expertise. This support, available to public and private sector organisations to help them implement EPC projects, includes project assistance grants and training.

In the Public Sector the take up of EPC opportunities has been low to date. To help raise awareness of its potential, EPC has been highlighted to energy managers e.g. through tailored sessions at the annual Public Sector Energy Conference which is attended by energy managers from across the whole public sector. This also covers resources already in place to help PSBs identify opportunities for its appropriate use (e.g. guidance, standardised forms of contract and project assistance grants); and provides examples of where EPC is being used effectively.

Analysis is underway, as part of a study funded by the EU's Structural Reform Support Service (SRSS). As part of this work, the consultants will assess the further potential for EPC to deliver energy efficiency projects in the Irish public sector and how further take up of EPC opportunities, where these are considered beneficial, might be facilitated.

5.13 Skills

Training programmes that cover energy efficiency and installation of energy efficiency products are available from the national training body SOLAS, the Education & Training Boards and from various Universities and Institutes of Technology, along with private sector training providers, accredited by a variety of national and international bodies.

The skills need applies to new build and to retrofit and to existing workers and to new entrants. In some cases, it will be specialised – focusing on a particular type of building or to specific technologies. Training and upskilling is needed for professionals such as architects, engineers, specifiers and for a wide range of trades and craftspeople.

For retrofit there are a number of actions and measures that would help to address skills needs, they include:

- The Regional Skills Fora (who provide an opportunity for employers and the education and training system to work together to meet the emerging skills needs of their regions) could support the identified skills need for deep retrofit, NZEB and heat pump installation across the education system and through apprenticeship programmes.

- The SEAI support relevant professional bodies in the development of training specifications/courses for the design of NZEB and Deep Retrofit of buildings.
- The National Standards Authority of Ireland, with input from key stakeholders, is developing National Standards for the design and installation of heat pumps in new dwellings and also for installation of Photovoltaic (Solar PV).
- The Department of Education & Skills continues to engage with Higher Education Institutions to promote adaptation of courses, in consultation with stakeholders as appropriate, so that graduates have the necessary training and skills on the impacts of climate change.
- The establishment of the High Performance Building Alliance to advance training, research and quality to facilitate delivery of more high performance buildings.

6 Policies & Measures

6.1 Market Failure

The reason for implementing policies and measures is generally due to some form of market failure. In this context, market failure refers to a range of issues which inhibit the energy efficiency upgrading of the building stock and the utilisation of cost-effective energy savings potential.

Market failure issues are considered when developing policies to improve energy efficiency. The following are examples of market failures and how they are overcome:

- The lack of understanding of potential savings will be examined in the forthcoming updated Building Energy Rating Advisory Reports
- The limited renovation & construction activity is being considered in the new Programme for National Recovery strategy which will include a focus on renovation.
- The lack of attractive financing products to persuade people to renovate is being considered by the Retrofit Taskforce.
- The limited information on building stock is being addressed in the context of Public Sector energy efficiency and retrofit goals by an EU-funded consultancy exercise that is currently underway.
- The limited uptake of efficient or smart technologies is being addressed in the context of the public sector through the National Public Lighting Upgrade programme and more broadly through a range of schemes operated by SEAI including supports for businesses and the EXEED programme.
- The options to help address the split incentive problem are being considered by the Expert Advisory Group informed by inputs from the recent public consultation.

6.2 Energy Poverty

Alleviating energy poverty is an important policy goal and a key benefit of retrofitting in the residential sector. The Better Energy Warmer Homes scheme has been in place since 2000. The scheme provides free energy efficiency upgrades to homes where the householder is in receipt of a social welfare payment[20]. These households are unlikely to be in a position to invest in upgrading the energy efficiency of their property themselves.

[20] https://www.seai.ie/grants/home-energy-grants/free-upgrades-for-eligible-homes/

The scheme has upgraded over 142,000 homes since 2000. The scheme initially provided shallow upgrades, installing measures such as more efficient lightbulbs and lagging jackets and attic and cavity wall insulation. Since 2018 the scheme has provided much deeper upgrades, including external insulation, heating system installations and upgrades, and window replacements in certain circumstances. The average energy and carbon savings per home have increased since the measures were expanded. In 2019, over 3,000 more households received free upgrades, with over 50% of these receiving deeper measure upgrades compared with only 16% of recipients in 2018 and less than 5% of recipients in 2017.

The annual budget allocated for the scheme in 2020 is over €50 million.

6.3 Residential Sector

The Government has developed and funded a range of schemes with varying degrees of supports – focusing on key sectors and objectives. Existing and recent schemes and funding support measures include the following:

- The Better Energy Homes scheme provides grant aid to private homeowners who wish to improve the energy performance of their home. Grants are provided towards the cost of a range of measures including attic insulation, wall insulation, heating systems upgrades, solar thermal panels and accompanying BER.
- The Better Energy Warmer Homes scheme funds energy efficiency improvements in the homes of the elderly and vulnerable, making the homes more comfortable, healthier and more cost-effective to run.
- The Better Energy Communities schemes support community-based partnerships to improve the energy efficiency of the building stock in homes, schools community and business buildings and energy poor homes. These schemes use community contacts to engage more stakeholders to deliver energy upgrades and to encourage the implementation of deeper and more technically and economically challenging measures. Partnerships can be between the public and private sectors, domestic and non-domestic sectors, commercial and not-for-profit organisations and energy suppliers. The community and business supports leverage considerable additional private investment. The scheme has been in operation for some years and continues to evolve.
- The Sustainable Energy Communities Network works with groups from all around Ireland to build their technical and project management skills focusing primarily on energy efficiency.

- The Warmth and Wellbeing Pilot Scheme was undertaken to measure and validate the health and wellbeing impacts of improving the living conditions of vulnerable people living in energy poverty by providing energy efficiency improvements to the homes of older people and children living with chronic respiratory conditions.
- The Deep Retrofit Pilot Programme was undertaken to establish how best to support deeper levels of renovation in the residential sector, and to gain practical experience of how to develop residential energy efficiency offerings at scale post-2020.
- Building Renovation Passports (BRPs) can help to facilitate and encourage renovation at appropriate stages in the life of a property or its occupants. BRPs are master plans for retrofit and include a record of works (logbook). They can help ensure that any renovation works are planned and implemented in a holistic and technically sound manner, hence helping to prevent “lock-ins" and facilitating a step-by-step approach to deep renovation. By improving the availability of data for valuers and lenders, BRPs can also help to de-risk investments in that area and facilitate phased deep retrofit. To assess this potential, the Irish Green Building Council, in partnership with Limerick Institute of Technology, with support from the SEAI are piloting a BRP for Ireland. This pilot, underway from early 2020 will adapt and pilot the iBRoad passport (logbook and roadmap) for the Irish market.

The Retrofit Taskforce (RTF) was established as a flagship action under Ireland’s Climate Action Plan in 2019. It is tasked with overseeing the design and development of a new national retrofit delivery model/programme to deliver the headline retrofit target of 500,000 retrofits to BER level of B2 (or cost optimal or carbon equivalent) by 2030. The objectives of the RTF and the approach being adopted are covered in more detail at Section 5.7 above.

6.4 Commercial and Public Sector

Initiatives to encourage, support and enable the commercial and public sectors to improve energy efficiency including supporting renovation includes:

- The Climate Action Fund supports initiatives that contribute to the achievement of Ireland's climate and energy targets in a cost-effective manner. It offers the potential for innovative interventions which, in the absence of support from the fund, would not otherwise be developed. Commercial and public sector project may apply to the fund.
- The SEAI Energy Academy is a new online resource that gives businesses free access to high quality energy training.

- The SEAI provides a wide range of information and advisory services to businesses including briefings, workshops, workplace resources, access to energy auditing services and case studies of best practice.
- The organisations in SEAI's Large Industry Energy Network, that account for over 20% of Ireland's energy use, work together to improve energy performance and share experiences.
- Project Assistance Grants are provided to businesses with large energy expenditure to help fund the development of feasibility studies and business cases for energy performance improvements.
- Accelerated Capital Allowances allow businesses to reduce their taxable profits by the level of expenditure on energy efficiency in the year the investment is made.
- Funding is provided to businesses that undertake design, construction and commissioning process that use the Excellence in Energy Efficient Design (EXEED) certification process.
- The Support Scheme for Renewable Heat (SSRH) - supports the replacement of fossil fuel heating systems with renewable energy to contribute towards achieving Ireland's renewable energy and emission reduction targets. The scheme supports commercial, industrial, agricultural, district heating and other non-domestic heat users in the non-ETS sector. The scheme provides two types of support mechanism:
    - An on-going operational support, for up to 15 years, for new installations or installations that currently use a fossil fuel heating system which convert to using biomass or anaerobic digestion heating systems.
    - A grant to support investment in renewable heating systems that use heat pumps.

  In order to avail of the scheme, and to ensure that energy is used efficiently, energy efficiency standards apply which serves as a driver of renovation activity and enhanced outcomes.
- The Better Energy Communities Scheme funds community-based partnerships (which can include homes, community facilities and businesses) to improve the energy efficiency of their buildings.
- The SME Support Programme, operated by SEAI, provides advice and training for SMEs on energy management, particularly in areas such as lighting, heating and cooling.

- The Audit Programme is a mandatory requirement that applies to enterprises over certain employee and financial thresholds. The scheme is operated by SEAI and is supported by advisory measures. These high-quality audits provide a register of investment opportunities for the enterprise, and allow SEAI to gather data on the types of opportunities in the sector which can be used to tailor supports and address market failures.
- The "Triple E" Register (Register of Energy Efficient Equipment), maintained by SEAI, lists the most energy efficient products to enable improved energy efficiency through procurement. This also enables operation of the Accelerated Capital Allowance scheme which offers tax advantages thereby encouraging businesses of any size to choose the most energy efficient equipment when procuring new or replacement energy using equipment.

6.5 District Heating

District heating and cooling in Ireland is at a very low level and is estimated to be less than 1% of heat consumption. This is somewhat due to the nature of Ireland's dispersed settlement structure with low population density. However, even in areas of higher population density, there is little use of district heating.

National policy recognises the contribution that district heating can make to Ireland's energy and climate goals. The National Planning Framework supports the development of district heating networks in Dublin, Cork, Galway, Waterford and Limerick, where technically feasible and cost effective, to assist in meeting renewable heat targets and reduce Ireland's greenhouse gas emissions. The compact and sustainable pattern of development envisaged by the National Planning Framework requires less energy and makes renewables-based systems of energy distribution, such as district heating, more feasible.

The Government's Climate Action Plan reaffirms the significant contribution district heating can make to increasing the level of renewable energy in the heat sector and reducing emissions. The Climate Action Plan sets out the need to develop a policy framework for the development of district heating in Ireland. From December 2019 to February 2020, a public consultation was carried out to inform a policy framework for the development of district heating in Ireland.

Two of the successful projects from the first Call for Applications under the Climate Action Fund are district heating projects – Dublin City Council's District heating System and South Dublin County Council's Tallaght District heating Scheme.

6.6 Building Regulations

Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings (EPBD), sets requirements at an EU level for Member States to improve the energy performance of buildings and to make an important contribution to the reduction of greenhouse gas emissions.

Article 9(1) of the Directive requires Member States to ensure that; by 31 December 2020, all new buildings are nearly zero-energy buildings (NZEB); and after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings. The Directive defines a Nearly Zero Energy Building (NZEB) as a building that has a very high energy performance and 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.

Ireland is required to implement NZEB for buildings completed by 31st December 2020. The European Union (Energy Performance of Buildings) 2019 regulations were signed on 29th April 2019. These new regulations improve the energy performance of new dwellings by 70% over 2005 building regulations provisions. Currently 98% of all new dwellings are built to BER level of A3 of better.

Major Renovations to dwellings will be required to achieve a cost optimal performance. This is in line with the National Development plan and will bring dwellings undergoing Major Renovation to a BER level of B2. A major renovation occurs when more than 25% of the building envelope is renovated.

Many of the techniques required to achieve NZEB, such as improved fabric and renewables, have been introduced on a gradual basis into Part L of the Building Regulations since 2007.

NZEB for non-residential buildings was introduced into the Building Regulations in December 2017. This specifies NZEB performance requirements for new non-residential buildings and Major Renovation requirements for existing buildings. These new performance requirements improve the energy and carbon emissions performance in the order of 60% and introduce mandatory renewables on all new non-residential buildings. These regulations apply to works to new and existing buildings which commence after 1st of January 2019 subject to a one year transition.

There has been extensive consultation with the public sector and industry stakeholders to introduce this step change and extensive Regulatory Impact Assessments have been completed. Major Renovations to a cost optimal level also apply to works to existing non-residential buildings from the 1st Jan 2019.

6.7 Policies and Actions on Public Buildings

The energy efficiency improvement for each public sector body is monitored annually based on actual energy uses. This is achieved through the Monitoring & Reporting System operated by SEAI to which each Public Sector body is legally required to report.

Good progress has been achieved on energy efficiency with 27% improved efficiency achieved by end 2018. This improvement has also delivered over €1.3 billion in avoided energy spend and 4.58 million tonnes of avoided emissions. This has been achieved through a combination of behavioural measures, improved energy management and renovation. While the mix of actions taken by each public sector body to achieve its improved energy efficiency performance can be looked at for each body online by viewing their own report card as well as the projects they have undertaken, there is no separate measure of the renovation component.

Sustained consistent energy efficiency progress has been observed in each year measured since the new strategy was introduced – following on a plateau of progress for the two previous years. The improved performance results from a mix of behavioural change, improved energy management and building upgrades or renovation.

The Monitoring & Reporting system will be further enhanced in the coming years to broaden its value in supporting the achievement of this strategy. This will include a mechanism to monitor Display Energy Certificate (DEC) compliance. The DEC is a rating scheme for buildings indicates a building's operational energy performance. The energy performance of the building is rated on a scale of A-G based on the operational energy (utility bills) in the building. In line with the requirements of the EPBD it is publicly displayed within the building.

DCCAE, working with the SEAI and the OPW, delivered a series of capacity development workshops for each Departmental Energy Performance Officer Group during 2019. This series of 19 workshops ensured that each public sector body had the opportunity to participate in a workshop which was designed to help them to get organised and optimise their chances of success. Key to these workshops is identifying and providing guidance on effective and efficient approaches to energy management and renovation in key sectors can guide and encourage public sector bodies along the renovation journey.

In order to encourage investment, Public Sector Bodies who make savings arising from their energy efficiency efforts may retain those savings within their organisational budgets. In addition, the National Development Plan (NDP) provides of €750m in funding over the period to 2027 to improve energy efficiency in public buildings, with a further separate allocation for deep retrofit of schools.

Energy Performance Contracting (EPC) is available to Public Sector Bodies, and for some this may be the appropriate path to resource, or part resource their retrofits. For the public sector uptake of EPCs has been modest to date comprising relatively modest scale projects in some local authority leisure facilities. A larger scale project has recently been delivered in a large hospital. The visibility of such successful projects will, it is hoped, help to promote further uptake of the EPC model.

To assess the scale of investment required, the realistic potential of EPC and the likely additional sale of investment that may be needed, Ireland is availing of EU support under the Structural Reform Support Service (SRSS). This exercise is taking place during 2020. The framework will be developed in consultation with key stakeholders with the overarching objective of facilitating achievement of national public sector renovation objectives. As part of this exercise, the project will assess:

- the present building stock (to provide additional clarity on floor area and condition);
- the capacity of portfolio owners to progress and deliver renovation projects; and
- perceived barriers;

and will:

- provide public sector stakeholders an opportunity to input into the development of the retrofit framework,
- develop and provide guidance for public sector bodies on making strong business cases to access the available National Development Plan (NDP) funding; and
- make Proposals for potential financial mechanisms and investment schedule (including the realistic role for Energy Performance Contracting (EPC) in meeting investment needs).

The Pathfinder Partnership Programmes focus on supporting energy efficiency retrofit in the public sector. These include retrofit improvements for the buildings, test approaches, build best practice and develop a scalable retrofit model which can be replicated across the public sector. To date there have been four elements including central Government buildings, schools, health sector buildings and third level education.

From undertaking these programmes, the knowledge of the key barriers and challenges to implementing large-scale building energy retrofit programmes have been developed. These include:

- the need to develop the capacity, knowledge, skills, processes and approaches to a large scale retrofit programme;

- the challenges related to the building type, use category, availability for retrofit;
- the benefit to developing a clear retrofit structure including energy data collection, building categorisation, retrofit pathway identification, and delivery approach;
- the benefits from testing approaches, and technologies, in terms of applicability and adoption; and
- the supply chain capacity constraints.

The Public Sector Energy Efficiency Strategy and its associated support programme are designed to assist public bodies in achieving the national energy efficiency targets of 33% by 2020, and 50% by 2030. A substantial retrofit programme across public sector buildings will be needed to bring each building in the public sector's portfolio to a BER level of B. EU support under the Structural Reform Service (SRSS) is being availed of by Ireland to help develop a framework for implementing this comprehensive public sector building upgrade programme

6.8 Challenging Segments of the National Building Stock

Based on the 2016 Census it is estimated that some 18% of dwellings fall into the traditionally built category. These buildings are generally constructed with vapour-permeable materials and do not incorporate barriers such as damp-proof courses, vapour barriers and membranes and the like which are considered standard in modern construction. For this reason, traditional building fabric is often referred to as 'breathable' construction which both absorbs and readily allows the evaporation of moisture. Because of this, some approaches to energy insulation retrofit are not suitable as they would cause damage to the structures and adversely impact on the internal living environment and the health of its occupants. This necessitates a varied renovation approach for such buildings.

The EPBD makes no exception for historical buildings; all buildings should be upgraded for energy efficiency where technically and economically feasible. Historic and traditional buildings are therefore not exempt from renovations objectives. Nonetheless in many cases there will be limitations to the type and or extent of renovation and insulation treatments that would be appropriate.

Recognising the need to achieve improved energy performance of traditional buildings, and the importance of doing so in a way that does not result in damage to the buildings or have other unintended consequences, a project to develop appropriate guidance documentation is underway. This will produce a guidance document for building professionals particularly specifiers and installers. The project is led by the Department of Culture Heritage & the Gaeltacht and is included as action in the Climate Action Plan.

The Department of Culture, Heritage and the Gaeltacht (DCHG) supports and encourages the appropriate reuse and adaptation of the historic building stock in line with the principles set out in its publications 'Energy Efficiency in Traditional Buildings' (2010) and 'Shaping the Future' (2012). The Irish National Committee of the International Council on Monuments and Sites (ICOMOS) published a report entitled 'Deep Energy Renovation of Traditional Buildings - Addressing Knowledge Gaps and Skills Training in Ireland' (March 2018).

To provide building professionals and specifiers (such as architects, engineers and surveyors) with guidance and insights on how to appropriately improve the energy efficiency of traditional buildings, including through renovation, a pilot 10-module course was co-developed with expert input from key stakeholders which was entitled "Fundamentals of Energy Renovation for Traditional Buildings".

6.9 Split Incentive Problems

While homeowners make up the bulk of households in Ireland (over two-thirds), almost 500,000 households live in rented accommodation. There are an estimated 120,000 buildings in the business sector in Ireland with the largest numbers being offices and retail outlets. It is estimated that almost half of commercial buildings are owner occupied.

A split incentive occurs where the benefits do not primarily accrue to the person who pays for the transaction. In the case of rented properties where landlords meet the cost of improvements, the tenants would often reap most of the benefits. Tenants do not control the property and have little incentive to invest – so neither party is motivated to upgrade the building. This problem results in poorer energy efficiency outcomes in both the rented residential and commercial sectors.

An Expert Advisory Group (comprising representatives from relevant Government Departments, the SEAI, and the Residential Tenancies Board) was established in 2019. It was tasked with exploring appropriate options, facilitating stakeholder input through a public consultation and making recommendations to Government. The group has looked at approaches that have been applied or explored elsewhere, considered input from a stakeholder workshop organised by the Irish Green Building Council, and made some further suggestions. They compiled a range of possible measures that might help to address, or be modified into approaches that could help address, the problems.

The range of potential measures that might help to address, or be modified into approaches to help address the problems were set out in an open public consultation which ran from December 2019 to late January 2020. The consultation examined the landlord-tenant split

incentive as well as the issue of multi occupancy building consent. It spanned the private residential and commercial residential sectors.

The consultation provided opportunities for stakeholders to make further suggestions on how to address the split incentive problem, to raise, or comment on, other relevant elements or issues.

The objective of the consultation was to help identify appropriate policy interventions to ensure that the approach taken would minimise adverse impacts on the accommodation situation and on energy poverty. Over 90 submissions were received in response to the consultation.

The inputs from the public consultation are being analysed by the Expert Advisory Group in which will make recommendations.

Key themes that emerged from the public consultation included the benefits of the right tax incentives, grants, technical support and appropriate regulation. Submissions stressed the importance of striking the right balance in any further regulation and of providing reasonable lead in times. In the event that regulatory changes are proposed, it is envisaged that a Regulatory Impact Analysis would need to be conducted in advance of any new regulations being introduced.

For the public sector building portfolio, the latest figures show that approx. 60% of buildings over 500 square metres are owned with the remainder leased from private landlords. To address this split incentive issue in the public sector there is legislation in place which requires Public Sector Bodies to only enter into new rental or leasing agreements for private sector buildings with a BER level of at least A3 with limited exemptions provided the in some circumstances.

7 Smart Technologies & Well-Connected Buildings

7.1 Smart Meters

Mechanical electricity meters will be replaced in every house in Ireland by 2024 under the €1.2 billion National Smart Metering Programme. This should help to promote more renovation activity by helping to raise awareness of energy use and potential for improved efficiency.

The National Smart Metering Programme is a multi-year investment project including the roll out of new digital electricity meters, a communications network to support them, and investment in new IT systems. The Commission for Regulation of Utilities is responsible for the overall coordination of the National Smart Metering Programme.

The Commission for Regulation of Utilities has tasked ESB Networks (the Distribution System Operator) with the roll-out of the smart meters. ESB Networks commenced the meters rollout in September 2019 and the roll out will be delivered in a phased manner. The first phase includes the delivery of 250,000 meters to the end of 2020. Subsequent phases will see approximately 500,000 meters in each of the 4 subsequent years. It should be noted that Covid-19 is impacting the first phase of rollout.

Ireland's smart meter upgrade programme will ensure that consumers have access to new products (such as time of use charging from 2021) and more detailed and accurate information.

Smart meters will make the supplier switching process easier and empower consumers to make a more informed choice for their energy needs. Smart metering will also enable the development of the smart grid and facilitate more flexible, reliable and better network planning.

It is planned that the new products and services will enable consumers to shift some of their consumption to off-peak times of day when electricity is cheaper. In the future, functionality within the meter will allow ESB Networks to find faults quicker and manage the safety of meters more efficiently.

Smart meters will also a key support in migrating towards a carbon free electricity network and will enable smart grids, e-cars, local renewable generation and microgeneration.

7.2 Smart Readiness Indicator

The Smart Readiness Indicator (SRI), which is currently in development, will rate the building on a scale to indicate its "smart" (communication & interface) potential.

The benefit of the indicator will be to show each building's capabilities for more efficient operation and better performance through ICT technologies. For example a modern building in which its energy components were able to interface with one another through the internet would be able to optimise its energy use. This could include making maximum use of on-site generated renewables including timing of use of energy using devices aiming to draw as little as possible from the grid.

The SRI information would be very useful to the building owners providing a template for decision making on energy efficiency options. If all the SRI information were to be collated it would provide key market information for economic operators in the energy efficiency market. If there were a very high percentage of buildings with an SRI then this would also help information policy makers.

The challenge is to get a meaningful level of SRIs for buildings. A European Commission report[21] envisages getting householders to fill out a questionnaire to assess the SRI. Building owners would need to complete SRIs in significant numbers for the data to be useful to policy makers. The establishment of the National Smart Metering Program will facilitate an SRI program.

7.3 Supporting Technologies and Smart Solutions

The value of technologies and smart systems to help improve energy efficiency is recognised and being promoted in Ireland.

Research on attitude and approaches to improved energy efficiency in the business sector has shown that there is a marked preference for approaches with shorter payback periods which often leads to a preference for and more uptake of technological solutions even in basic forms.

An overview of the technologies in use in 2017 by businesses found these ranged from basic meters, to sensors telematics to Building Management Systems. Amongst the respondents there was a high willingness (over 90%) to use digital technologies if technologies suitable to their needs were available. Key influencers were the perceived effectiveness and short payback periods associated with technological solutions that can assist a business improve its energy efficiency.

For Public Sector bodies, the Office of Public Works has been running a state-wide staff energy conservation campaign, entitled Optimising Power at Work, in Central Government buildings (since 2008) and in Public Sector buildings (since 2014). One of the main factors

[21] https://www.buildup.eu/sites/default/files/content/sri_1st_technical_study_-_executive_summary.pdf

for the success of the programme is the availability of real-time, accurate, energy consumption data for each building. Every participating building has been fitted with energy monitoring equipment that automatically records electrical and thermal energy usage every 15 minutes. The collected energy data is available through a web portal. The data is used to monitor progress, set targets and prepare energy reports for energy teams in the individual buildings.

The Optimising Power at Work programme also targets the optimisation of existing Building Management Systems in each building. This involves regularly checking set points, time-schedules and calibration of sensors to ensure that heating, hot water and ventilation systems are operating as efficiently as possible and only when necessary.

Over the past three years, a joint programme between DCCAE, SEAI and the Office of Public Works, more than 50 large Central Government buildings have had their lighting systems upgraded to high efficiency LED. All of these systems have been fitted with automatic lighting controls to allow occupancy sensing, daylight-linking and dimming, in suitable areas.

8 Energy Savings and Wider Benefits

The cost of a public subsidy provided to stimulate deep renovation may be more than offset by the benefits that result from it. In the context of public buildings, energy efficiency improvement can ease pressure on public finances (i.e. budgets of public authorities) by generating increased tax revenues through increased economic activity and by reducing expenditure on energy and unemployment benefits.

The financial benefits are not only about saving money: energy efficiency renovations lead to improved indoor air quality and thermal comfort which have productivity benefits and result in fewer days of work missed. For instance, it is estimated that every €1 invested in insulation, results in €0.78 benefit in reduced days of work missed[22]. Productivity improvements due to better air quality can reach 8-11%[23].

Furthermore, the environmental benefits from reductions in carbon emissions and energy use can enhance organisational green credentials, image and improve public relations.

8.1 Energy Savings

Energy efficiency contributes to meeting energy and climate goals. The three key pillars of energy policy – namely security of supply, competitiveness and sustainability – can be progressed through energy efficiency measures.

Less energy demand, due to efficiency measures, lowers the effort required to achieve the renewable energy targets (for example, a reduced number of installed wind turbines or biomass boilers would be required). There are economic and social benefits of energy efficiency, including direct savings, lower fuel costs, more controlled investment in supply, and there is increasing evidence for improved health and well-being. The energy efficiency measures will contribute to Ireland's Climate Action Plan objective of reducing CO_2 or equivalent emissions from the built environment by 40%-45% relative to 2030 projections.

An energy efficiency improvement of 16% relative to the 2001–2005 baselines is anticipated by 2020 in the latest projections, achieving 80% of the 20% target for 2020.

Ireland's National Energy & Climate Plan provides detail of the level of energy savings expected by 2030. The figure and table below provide a summary by sector based on the 'with additional measures' scenario. Further details are set out in the National Energy & Climate Plan.

[22] http://bpie.eu/wp-content/uploads/2019/04/Implementing-the-EPBD_BPIE_2019.pdf

[23] https://www.worldgbc.org/news-media/health-wellbeing-and-productivity-offices-next-chapter-green-building

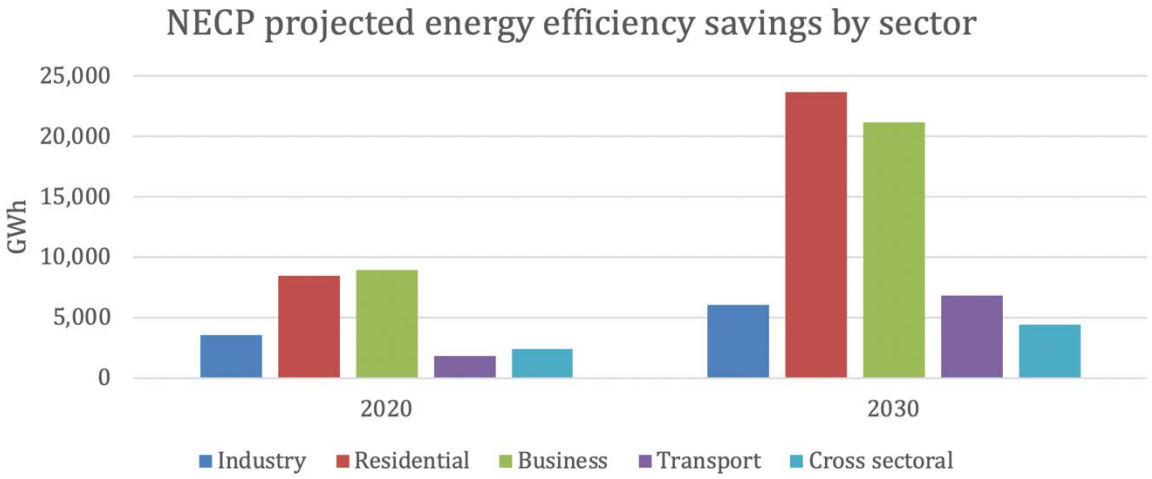

Figure 17: National Energy & Climate Plan projected energy efficiency savings by sector

NECP Projected Energy Efficiency Savings		
Primary Energy Savings (GWh)	**2020**	**2030**
Industry	3,564	6,032
Residential	8,436	23,662
Business	8,918	21,166
Transport	1,839	6,859
Cross sectoral	2,347	4,451
Total Savings	**25,103**	**62,171**

Table 10: NECP Projected Energy Efficiency Savings

Energy Efficiency Policies (GWh)	2018	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Primary Energy Savings	19,326	25,103	28,142	31,277	34,834	38,347	41,877	45,859	49,692	53,650	57,758	62,171
Final Energy Savings	17,266	21,780	24,408	27,212	30,314	33,479	36,940	40,830	44,394	48,141	51,952	56,159
Supply-Side Energy Savings	6,983	6,747	8,665	11,114	11,533	12,850	16,342	18,747	19,490	20,167	20,456	21,626
Total Primary Energy Consumption	170,922	181,716	179,266	177,385	174,817	173,225	171,582	165,273	165,125	163,388	161,571	159,146
Total Final Energy Consumption	143,061	150,446	149,231	148,035	146,073	144,611	143,197	140,563	138,114	135,475	132,708	130,493

Table 11: Energy savings trajectory (WAM)

In addition to the summary set out above and detailed information included in the National Energy & Climate Plan, each support measure is subject to regular review and evaluation ensuring value for money. These reviews and evaluations examine key metrics such as the cost per unit of primary energy reduced and the cost per tonne of carbon abated.

8.2 Wider Benefits

In additional to direct benefits such as reducing primary energy use and greenhouse gas emissions, there are a range of wider benefits associated the policies in measures set out above.

While home and building owners in Ireland benefit from energy efficiency upgrades, many of these measures also benefit society more widely. For example, the electrification of heating (coupled with the parallel decarbonisation of the electricity network) helps reduce air pollution.

It is recognised internationally[24] that energy efficiency actions can support existing workforces and create new jobs, and boost economic activity in key labour-intensive sectors. SEAI analysis shows that around 60% of expenditure on home energy efficiency retrofits goes towards labour, delivering strong employment growth.[25]

Investment in retrofit also has a track record of delivering longer-term benefits such as increased competitiveness, and positive impact on public budgets. For that reason, investment in retrofit supports delivery on both short term (stimulus and job creation) and long term (public funds savings) public policy objectives.

According to the IEA[26], efficiency leads to productivity gains in particular by lowering maintenance costs and increasing production yields per unit of input. In addition, improvements in operation and process reliability, which can result from efficiency gains, lead to reductions in equipment downtime, shutdowns or system failures. Optimising processes to enhance efficiency can also reduce staff time required to enhance operations and scheduling while reducing the risk of human errors.

The IEA also point out[27] that energy efficiency measures can deliver financial benefits to public budgets through both increased income and decreased expenses. Local governments

[24] IEA (2020), *Sustainable Recovery*, IEA, Paris https://www.iea.org/reports/sustainable-recovery

[25] SEAI (2011), https://www.seai.ie/publications/Economic-Analysis-of-Residential-and-Small-Business-Energy-Efficiency-Improvements.pdf

[26] IEA (2019), *Multiple Benefits of Energy Efficiency*, IEA, Paris https://www.iea.org/reports/multiple-benefits-of-energy-efficiency

[27] As above.

can directly reduce operational costs by implementing energy efficiency measures, which lead to energy savings, and therefore less spent on energy bills. Furthermore, Governments can achieve increased income through sales tax on more valuable energy efficient products and services, as well as increased real estate tax on more valuable energy efficient buildings. Governments also receive indirect financial savings through reduced social welfare expenses spent on energy subsidies.

In some instances, polices and measures target energy and non-energy outcomes. The Warmth and Wellbeing pilot scheme is aiming to objectively measure and validate the health and wellbeing impacts of improving the living conditions of vulnerable people living in energy poverty with chronic respiratory conditions. Since 2016, over 1,200 homes have received free upgrades, including attic and wall insulation, window and door replacement and heating system upgrades where needed. The average cost per home completed to date is circa €23,000.

The scheme is a joint policy initiative between the Department of Communications, Climate Action and Environment and the Department of Health and is being delivered by a team comprised of officials from the Sustainable Energy Authority of Ireland (SEAI) and Health Service Executive (HSE). An independent analysis validating and objectively measuring the health and wellbeing impacts is being carried out by the London School of Hygiene and Tropical Medicine, in collaboration with the Health Service Executive.

The scheme is open to people aged 55 and over or aged 12 and under who are living with chronic respiratory conditions in households that are in receipt of certain welfare payments. The scheme works on a referral basis and an approved surveyor identifies which upgrades are most suitable for the home. Improvements include attic and wall insulation, boiler replacement and window and doors replacement where necessary. Appropriate ventilation is also provided in line with retrofitting standards.

In addition to the climate and energy impacts, initial reports have indicated that the upgrades are delivering benefits to the health and wellbeing of participants and if the research confirms this empirically then it will be used to inform future Government decisions about approaches to retrofitting.

Annex 1: Public Consultation

A number of public consultations have taken place in relation to the Energy Performance of Buildings Directive including a specific public consultation to inform the development of the Long-Term Renovation Strategy. This was carried out from December 2019 to January 2020 in parallel with a consultation on removing barriers to energy efficiency in the rental sector by addressing the split-incentive problem[28]. These public consultations were open to all organisations and individuals.

A draft outline of Ireland's Long term Renovation Strategy (LTRS) was provided as part of this consultation. Respondents were asked to comment on the proposed LTRS using the response template. In total, there were 22 responses to the LTRS consultation. The consultation was designed to engage as many stakeholders as possible in a clear, organised and transparent manner.

In some cases the responses were a compilation of views. For instance, the Irish Green Building Council ran a stakeholder workshop on the LTRS. The input from the workshop supplemented the more extensive series of consultation workshops the Irish Green Building Council conducted for the 2017 strategy. This formed the basis for the Irish Green Building Council's input to the LTRS process.

Over 70 submissions received on the split-incentive consultation have been analysed and are now being considered by the Expert Advisory Group. They will make recommendations in the context of the Retrofit Task Force Report on what new policy measures might be warranted.

Three public consultations on the Energy Performance of Buildings Directive have taken place. Two consultations concerning the implementation of the NZEB and major renovations requirements of the Directive were held. The consultation in relation to non-residential buildings was held in 2017 and a total of 49 submissions were received and reviewed[29]. The consultation in relation to residential buildings was held in 2018 and 66 submissions were received and reviewed[30].

[28] Full details on both of the consultations can be found here: https://www.dccae.gov.ie/en-ie/energy/consultations/Pages/Public-Consultation-on-removing-barriers-to-energy-efficiency-in-the-rental-sector.aspx

[29] https://www.housing.gov.ie/housing/building-standards/tgd-part-l-conservation-fuel-and-energy/public-consultation-review-part-l

[30] https://www.housing.gov.ie/housing/building-standards/tgd-part-f-ventilation/public-consultation-review-part-l-f-building

The consultation in relation to a number of EPBD requirements, and primarily the requirement for installation of electric vehicle recharging infrastructure took place in 2017 and 16 responses were received from individuals and organisations[31]. These organisations included a number of construction professional registration bodies, a Local Authority, energy supplier associations, architects, engineers, a housing body, a non-profit organisation, an independent statutory body and an educational institution.

The comments resulted in changes to the wording in the TGD (Technical Guidance Document) L for Dwellings and for Buildings other than Dwellings to provide more clarity on the requirements, but there was no change to the proposed regulations.

In addition to these public consultations – extensive stakeholder engagement took place with other Government Departments and state agencies, building control authorities, construction industry professionals, and other organisations representing the construction industry.

[31] https://www.housing.gov.ie/housing/building-standards/energy-performance-buildings/public-consultation-review-building

Annex 2: Implementation of Ireland's LTRS 2017-2020

The following table provides an update on progress in relation to the expected outputs set out in Ireland's Long-Term Renovation Strategy covering the period 2017 to 2020.

Reference	Expected Output	Update on Progress
S1 P3	Fiscal measures to help achieve the greater levels of energy saving and carbon mitigation from the Built Environment post 2020.	The Climate Action Plan, an all of Government policy approach to tackle decarbonisation, was published in June 2019. It sets out a number of fiscal measures including the Climate Action Fund. It provides important clarity and signalling on carbon pricing including Government commitment to Implement a carbon tax rate of at least €80 per tonne by 2030, accompanied by a trajectory of increases over successive annual Budgets.
S1 ii P6	The Warmth & Wellbeing Scheme a joint energy and health policy initiative providing deep measures to people with chronic respiratory conditions and including a specialised research project to measure the health and wellbeing benefits of energy efficiency.	Implementation of pilot scheme is close to completion. Successful upgrades of over 1,200 homes in the pilot area. An initial review of the energy impacts of the scheme has shown that the average Building Energy Rating of participating homes improved from a D2 to a B3 with carbon emissions reducing by on average 2.2 tCO2/year. Results of the health-based research are not yet available. Anecdotal reports of participants feeling healthier in general, and requiring fewer visits to the GP and fewer prescription medications

Reference	Expected Output	Update on Progress
		for respiratory conditions.
S1 ii P6	Pre and post renovation Building Energy Rating certificates to more accurately measure the increase in energy efficiency for individual houses.	This has been introduced under the Deep Retrofit Pilot scheme, with the aim of rolling it out more extensively across other retrofit schemes.
S1 ii P6	The Public Sector Energy Performance Monitoring and Reporting System established by SEAI in 2009 provides data to measure the progress to the target of a 33% improvement in energy efficiency by 2020 by public bodies.	The M&R data has enabled the publication of annual progress reporting (available on the SEAI website) and provides an evidence base to track public sector performance and facilitate improved energy management. It is a key support to the implementation of the Public Sector Energy Efficiency Strategy.
S1 ii P6	Behavioural Economics Unit established by SEAI in 2017 to provide analysis and advice for policy formation and scheme implementation.	The Behavioural Economics Unit is now operational. Its research and advice and insights from improved understanding of behavioural science are informing policy approaches and energy efficiency scheme enhancements.
S1 ii P6	Re-designed consumer friendly Building Energy Rating (BER) Certificates and the introduction of pre and post renovation BER's.	Development of the enhanced BER Advisory Report is substantially complete and is expected to be launched in 2020. Requirement for pre and post renovation BERs have also been introduced under the Deep Retrofit Pilot scheme, with the aim of rolling this out more extensively across other retrofit schemes.

Reference	Expected Output	Update on Progress
S1 ii P6	The EXEED programme supporting energy management certification for commercial energy users.	The EXEED programme is operational since 2017. EXEED incentivises, rewards, and facilitates energy efficiency in businesses. The programme has two objectives; to help businesses, both public and private, improve energy efficiency, and to embed energy efficient design thinking that will continue to benefit the organisation.
S1 ii P6	Public Sector Energy Efficiency Strategy embedding energy management in business planning and resource management.	The Strategy includes supports and measures to embed energy management including: • Structured approach to energy management which public sector bodies at a minimum must implement; • Governance Structure requiring each public sector body to appoint a senior officer as an Energy Performance Officer accountable for energy performance and strategic leadership; • Increased supports and resources under the SEAI Public Sector Programme specifically in terms of training and mentoring services in energy management best practices, organisational metrics, etc.
S1 iii P6	Energy Audits in the commercial and public sectors.	National legislation updated to bring all large enterprises under the

Reference	Expected Output	Update on Progress
		Energy Audit Scheme. The SEAI established the Energy Auditing Compliance Scheme to allow obligated organisations to report compliance. The SEAI also offers guidance and support to organisations to assist them in meeting their legal obligations.
S1 iii P6	The EPBD requires that all new buildings should be Near Zero Energy Buildings (NZEB) by 31st December 2020 and all buildings acquired by public bodies by 31st December 2018.	The European Union (Energy Performance of Buildings) 2019 regulations were signed on 29th April 2019 and require NZEB to apply to new dwellings which commence construction after 1st of November 2019. Major Renovations to dwellings will be required to achieve a cost optimal performance. NZEB for non-residential buildings was introduced into the Building Regulations in December 2017 and applies from 1 January 2019. This specifies NZEB performance requirements for new non-residential buildings and Major Renovation requirements for existing buildings
S1 iii P6	The EPBD also requires that any existing building undergoing major renovation is required to be brought up to cost optimal level for energy performance.	Regulations to implement the requirement for buildings undergoing major renovations to be brought up to cost optimal level were introduced to Building regulations for non-residential buildings in 2017 and for dwellings in 2019.
S1 iii P6	Consider Introduction of minimum energy efficiency standards in the rental sector post 2020.	A Public Consultation 'Removing Barriers to Energy Efficiency in the Rental Sector by Addressing the Split Incentive Problem' was launched in Q4 2019. Analysis of the submissions will inform policy

Reference	Expected Output	Update on Progress
		recommendations. This option of regulation was included as one of the potential policy approaches in that Consultation. The public consultation results will inform the decision on further policy measures.
S1 iii P6	The Deep Retrofit Pilot scheme a pilot scheme running from 2017-20, funding deep fabric upgrades and switching from fossil fuel to a minimum A3 BER	The Deep Retrofit Pilot Scheme operated as a time bound pilot to investigate the challenges and opportunities of deep retrofit in Ireland. The scheme provided 50% funding to homes upgrading to a very high level of efficiency, incorporating renewables.
S1 iii P6	Introducing heat pumps and increased insulation grants to the existing Better Energy Programme	Introduced in 2018. A grant for the installation of a heat pump, where the home meets a certain level of efficiency was introduced. Grant amounts were also increased for insulation to encourage the fabric first approach to renovation.
S1 iii P6	Deeper retrofit in the public sector, on a pilot basis in central government and schools 2017-18, to establish replicable procurement and works packages	Since 2017, funded by DCCAE the SEAI have developed a series of energy efficiency retrofit partnership programmes focusing on energy efficiency retrofit in public sector buildings and schools. The overall objective of the Programmes is to test more effective approaches and models to better manage and deliver a scalable model for energy retrofit investment. Between 2017 and 2019, DCCAE has provided funding of over

Reference	Expected Output	Update on Progress
		€28m which has funded energy retrofits in over 80 OPW buildings and 30 schools. A total of €9.5m is allocated for 2020 Programme
S1 iv P6	DCCAE and SEAI will continue to work to make relevant market players aware of the DEEP as a resource and encourage its use by market players in Ireland.	Funding was made available for the continuation for SME and Public Sector pilot schemes.
S2 vii P12	The Department of Culture, Heritage and the Gaeltacht (DCHG) supports and encourages the appropriate reuse and adaptation of the historic building stock in line with the principles set out in our publications 'Energy Efficiency in Traditional Buildings' (2010) and 'Shaping the Future' (2012). DCCAE will work with DCHG to support further research on the subject, including the compilation of best practice case studies in energy retrofitting leading to the preparation and publication of guidance for designers, specifiers and installers.	DCHG convened a project steering group including officials representing DCCAE, DHPLG, DES, OPW, SEAI and the Heritage Council to oversee the development of guidance on enhancing the energy efficiency of traditional (or pre-1940) buildings in line with Action 50 (d) of the Climate Action Plan 2019. The DCHG has determined that, due to limited resource availability and the need for high-level expert advice, the services of a Contractor with appropriate skills and experience is required to assist in the preparation of this guidance document. A Request for Tender prepared by the project steering group has been published (August 2020) on the E-tenders website.
S2 viii P12	Switching from fossil fuel to renewable heating technologies.	A new heat pump grant introduced and the grant for replacement of oil and gas boilers was removed. Increased grant amounts were made available for insulation measures to promote fabric first

Reference	Expected Output	Update on Progress
		approach and enable future fuel switching.
S2 viii P12	Gathering the data to make a robust business case for investment to realise the tangible multiple benefits of energy efficiency for individuals and the State.	Pilot schemes will be evaluated and inform the development of a new delivery model for retrofit. Commitments have been made under the Government's Climate Action Plan.
S2 viii P12	Building the case for low cost financing.	Pilot schemes will be evaluated and inform the development of a new delivery model for retrofit.
S2 viii P12	Building the capacity of the supply chain, including for the historic built environment.	Government commitments in the National Development Plan and Climate Action Plan have provided certainty to the market for building capacity in the area of retrofitting and renewable technologies. A CPD training course focusing on historic & traditionally built buildings has been developed and run.
S2 viii P13	Expanding existing measures - Homes: grants for all householders who wish to install attic insulation, wall insulation, solar thermal heating, heating controls.	The measures were expanded with additional funding allocated.
S2 viii P13	Expanding existing measures - Warmer Homes: free energy efficiency upgrades for people in or at risk of energy poverty, providing attic and cavity wall insulation, ventilation, draught proofing, lagging jackets, energy	The measures were expanded with additional funding allocated.

Reference	Expected Output	Update on Progress
	efficiency light bulbs and energy advice.	
S2 viii P13	Expanding existing measures - Communities: for community energy projects, involving partnerships between residential, commercial and public buildings which is funded on a competitive basis.	The measures were expanded with additional funding allocated.
S2 viii P13	While heat pumps are already available under the Communities scheme, a dialogue is now underway with participating communities with a view to phasing out all supports for fossil fuel systems in 2019.	No supports for fossil fuels were provided in 2019 scheme.
S2 ix P13	Warmth and Wellbeing: This three-year pilot is providing energy efficiency improvements to the homes of older people and children suffering from chronic respiratory conditions. There is a lot of international evidence pointing to the health and wellbeing impacts that can result from improved energy efficiency. This joint policy initiative between DCCAE and the Department of Health will test this in an Irish context and provide evidence and case studies which will highlight these benefits to people.	The implementation of pilot scheme is close to completion. With the successful upgrade of over 1,200 homes in the pilot areas. An initial review of the energy impacts of the scheme has shown that the average Building Energy Rating of participating homes improved from a D2 to a B3 with carbon emissions reducing by on average 2.2 tCO2/year. Results of the health based research are not yet available.
S2 ix P13	Deep Retrofit Programme: This programme aims to	The Deep Retrofit Pilot Scheme was launched in 2017 as a time

Reference	Expected Output	Update on Progress
	establish how best to support deeper levels of renovation in the residential sector, with a view to gaining practical experience of how to develop a residential energy efficiency offering post-2020. The programme will fund deep retrofits on groups of older homes to learn and inform how to best address the challenge of moving toward deeper renovation.	bound pilot to investigate the challenges and opportunities of deep retrofit in Ireland. The scheme provided 50% funding to homes upgrading to a very high level of efficiency, incorporating renewables. Results will be available from this pilot scheme in the coming months.
S2 ix P14	Enhanced Building Energy Rating Documentation: More consumer-friendly Building Energy Rating documentation will be introduced to help householders to understand the results of their BER and how to improve the energy performance of their home. It will also include information on different measures and likely costs and will also feature the emissions levels associated with the dwelling more prominently to help raise awareness of these emissions and how they could be managed.	The development of the enhanced BER Advisory Report is substantially complete and is planned to be launched in 2020. It is designed to provide information to illustrate the practical steps that can be taken to improve the energy rating and comfort of the home – the benefits of doing so and supports available.
S2 ix P14	Rental sector – consultation in 2018: While grant schemes are already available to landlords, take-up has been low. The proposal is to introduce minimum standards for energy efficiency in the rented sector from	Public Consultation on Removing Barriers to Energy Efficiency in the Rental Sector by Addressing the 'Split-Incentive Problem' has been undertaken. Analysis of the submissions will help to inform future policy recommendations. The public consultation results will

Reference	Expected Output	Update on Progress
	2020, in consultation with stakeholder groups. Other countries such as the UK and New Zealand have recently introduced minimum energy efficiency standards for their rented properties. An analysis of the impact of such a regulation has been undertaken and will be published alongside a consultation document asking respondents to outline what supports might be necessary to enable this legislation to have the desired effect of improving the quality of housing for people who are renting while also contributing to minimising energy losses and GHG emissions from inefficient housing stock.	inform the decision on further policy measures.
S2 ix P14	Building Regulations for major renovations:	Major Renovations to dwellings are required to achieve a cost optimal performance. This is in line with the National Development plan and will bring dwellings undergoing Major Renovation to a BER level of B2. A major renovation occurs when more than 25% of the building envelope is renovated. These requirements were introduced into Part L of the building regulations in 2017 for non dwellings and in 2019 for dwellings.
S3 iii P20	Continued support for the Large Industry Energy Network	The Large Industry Energy Network (LIEN) comprises c. 190 of

Reference	Expected Output	Update on Progress
S3 iv P21	(LIEN).	Ireland's top commercial and industrial energy users who between them account for c 20% of national energy use. Supports to LIEN include: • Ongoing mentoring support - (Relationship Manager) • Special Working Groups to help co-create solutions • Networking events - seminars & workshops
S3 iii P20 S3 iv P21	The promotion of the EXEED initiative.	The promotions of supports under the EXEED, a key initiative for commercial enterprises, have continued.
S3 iii P20 S3 iv P23	Energy Audits for larger enterprises. The potential to leverage these audits and the opportunities will be further explored.	Legislation updated to bring all large enterprises under the Energy Audit Scheme. Compliance checking now available. There is scope to highlight non-compliance
S3 iii P20	Encouragement for the upgrade of equipment through the Accelerated Capital Allowance Scheme.	The ACA continues to promote the most efficiency products through the Triple-E Register, thereby incentivising energy efficiency within the market.
S3 iii P20 S3 iv P23	SME supports; pilot schemes for Lighting upgrades and Dairy farm Grants	The Dairy Farm grant and lighting support pilot schemes commenced in 2017 and continued for three years.

Reference	Expected Output	Update on Progress
S3 iv P20	Adoption of strategic approach for the commercial sector	Learning from the experience of the pilot schemes a new free online training and education platform specifically designed for small and medium enterprises was developed. The SEAI Energy Academy provides a suite of learning modules targeting specific areas of opportunity for businesses, including Audio Visual Case Studies with signposting to more resources & supports. Along with the online SEAI Energy Academy, DCCAE held a Commercial Energy Efficiency Survey in late 2017. Participants were asks to demonstrate their awareness of the benefits energy efficiency delivers for businesses and the supports currently available to improve energy efficiency. It provided an opportunity for businesses to have their voices heard on how they could be better supported to improve their energy efficiency.
S4 iv P26	New governance structure to ensure senior leadership on energy efficiency in the public sector. Public sector bodies are required to appoint Energy Performance Officers (EPOs) at senior level with decision making powers on finance, personnel and facilities.	A governance structure has been established and is being implemented as required under the Public Sector Energy Efficiency Strategy. The DCCAE along with colleagues in SEAI and OPW facilitated the delivery of an EPO Workshop Programme during 2019 to all 19 Government Departmental Groups.
S4 iv P26	The establishment of a central project pipeline process and enhanced project development assistance.	SEAI continue to work with the public sector to develop project pipeline. Potential projects are identified via a number of channels:

Reference	Expected Output	Update on Progress
		SEAI Gap to Target Tool, SEAI Monitoring & Reporting (M&R) system, energy audits, OPW Asset Renewal Plan, etc.
S4 iv P26	Funding (by DCCAE) for a number of renovation pilot pathfinder projects in schools and central government.	See update for Ref S1 iii P6. Between 2017 and 2019, DCCAE allocated capital funding of €28m for Pathfinder Retrofit Programmes with a further €9.5m allocated for the 2020 Programme
S4 iv P27	Clarification on the retention of savings achieved by public sector bodies from energy efficiency measures which can be redeployed within the organisation, designed to encourage investment in more energy efficiency measures.	This clarification has been provided in the Public Sector Energy Efficiency Strategy.
S4 iv P27	The requirement under the Energy Performance of Buildings Directive (EPBD) that all new buildings owned and occupied by public authorities must be of 'nearly zero energy buildings' (NZEB) standard after 31 December 2018, two years in advance of the private sector who must meet that standard by December 2020. In addition, where a building undergoes a major renovation, the whole building will be required to achieve	NZEB for non-residential buildings was introduced into the Building Regulations in December 2017 and applies from 1 January 2019. This specifies NZEB performance requirements for new non-residential buildings and Major Renovation requirements for existing buildings and applies to all buildings – including public buildings. In December 2016 a circular was issued to all public service bodies advising them of the requirement for all new buildings owned and

Reference	Expected Output	Update on Progress
	a cost optimal performance.	occupied by public authorities to achieve NZEB performance after 31st December 2018. It was accompanied by specifications and guidelines on how this could be achieved in practice, and to apply to all buildings owned and occupied by public authorities commencing design from 1 January 2017.
S4 v P27	Leadership and Governance - Provides for improved leadership & accountability - New Governance arrangements for senior management in Government Departments to provide leadership and prioritise energy management in their Departments to better ensure prioritisation of energy management in public sector bodies under their remit.	Under the Public Sector Energy Efficiency Strategy all legally obligated reporting public sector bodies are required to appoint a senior officer as the organisation's Energy Performance Officer (EPO).
S4 v P27	Management and Networking - Departmental EPOs will report on their Group's energy performance. An EPO network has been established and workshops organised to facilitate the sharing of experience, expertise and discuss issues barriers and how best to address them.	An EPO Departmental Group Workshop Programme was delivered in 2019 to all 19 Departmental Groups.
S4 v P28	Project pipeline – There is a need to encourage and support Public Sector Bodies to identify and focus on	Through the Pathfinder Partnership SEAI have developed a pipeline of projects in the public sector. They include retrofit improvements for the buildings, testing of approaches, building best

Reference	Expected Output	Update on Progress
	larger scale retrofit projects.	practice and developing the capacity for a scalable retrofit model.
S4 v P28	Partnership Pilot Projects - Funding has been provided for partnership pathfinder pilot projects. This will involve the delivery of advice and capital retrofits. A key value of these pilots is in the learning derived and the demonstrator effect. Outcomes will inform and further help to promote wider implementation in the public sector.	The information collected along with programme outcomes and outputs on the various approaches applied and tested are currently feeding into the development of comprehensive building retrofit programme for the whole of the public sector. In addition, a study funded by the EU's Structural Reform Support Scheme (SRSS) will inform the design and development of a framework for a comprehensive retrofit programme for the public sector.
S4 v P29	Recognising the importance and potential of upgrading the public lighting assets all 31 local authorities are co-operating together on a National Public Lighting Upgrade Project. If successfully implemented this project would enable local authorities meet their 33% efficiency target. An asset inventory has been developed and approaches to delivering and financing the upgrade are currently being explored.	The National Public Lighting Upgrade Project is currently underway. aims to retrofit approximately 280,000 public lights and potentially saving 84,500 MWh/year of final energy and 37,000 tonnes of CO2/year for Local Authorities.