CONCERTED ACTION
ENERGY PERFORMANCE OF BUILDINGS

EPBD implementation in Ireland

Status in December 2016

AUTHORS

Chris Hughes, *Sustainable Energy Authority of Ireland*

NATIONAL WEBSITES

www.seai.ie, www.housing.gov.ie/; www.dccae.gov.ie/en-ie/Pages/default.aspx

1. Introduction

Ireland is transposing the EU requirement for NZEB and major renovations.

The *Building Regulations* for dwellings (residential buildings) are already at an advanced level following updates in 2005, 2008, 2011 and 2017 including mandatory RES contribution for domestic hot water heating, space heating or cooling.

Ireland's cost-optimal calculations and gap analysis report for buildings other than dwellings (non-residential buildings) identified a gap of more than 15% between the current 2008 requirements and cost-optimal energy performance.

The *NZEB Interim Specification for Public buildings owned and occupied by public authorities* was issued in December 2016 for buildings commencing design from early 2017.

Draft Building Regulations and Technical Guidance Documents[1] were published in 2017 for public consultation. The amended *Building Regulations* will require a minimum of 50 - 60% improvement in energy efficiency, air permeability testing and 20% of final energy consumption from RES onsite or nearby

or 10% where the whole building energy performance is improved by 10% compared to the 2008 *Building Regulations*. The improvements and RES requirements calculations use primary energy.

The *Building Regulations* will require energy performance improvement of the building to cost-optimal level where an existing building undergoes a major renovation.

The final *Building Regulations* are planned for publication in November 2017.

2. Current Status of Implementation of the EPBD

2.I. Energy performance requirements: NEW BUILDINGS

The EPBD energy performance requirements for new and existing buildings are transposed into Irish law through the *EC Energy Performance of Buildings Regulations 2006 – 2017*. *Technical Guidance Document Part L* provides detailed guidance for designers, specifiers and other building professionals on compliance with the requirements. The *Dwelling Energy Assessment Procedure (DEAP)* and *Non-dwelling Energy Assessment Procedure (NEAP)* methodologies and software calculate primary energy use and associated CO_2 emissions for space heating and (where applicable) cooling, ventilation, associated motive power and lighting under standardised conditions of use.

2.I.i. Progress and current status of new buildings

Overall maximum permissible energy performance and CO_2 emissions requirements were introduced for residential buildings in 2005, non-residential and public buildings in 2008.

The *Energy Performance Coefficient* and *Carbon Performance Coefficient* are defined as the ratios of calculated primary energy consumption and corresponding CO_2 emissions for the proposed building relative to a reference building.

The *Maximum Permitted Energy Performance Coefficient* and *Maximum Permitted Carbon Performance Coefficient* for new residential buildings are given in Table 1.

Year	2005	2008	2011	2017
Maximum Permitted Energy Performance Coefficient	1.0	0.6	0.4	0.3
Maximum Permitted Carbon Performance Coefficient	1.0	0.69	0.46	0.35

Table 1: Maximum Permitted Energy Performance Coefficient and Maximum Permitted Carbon Performance Coefficient for new residential buildings. The 2017 values are expected to apply from 2020.

Energy from RES is mandatory for new residential buildings since 2008. The minimum requirement is 10 kWh/m^2/year thermal energy or 4 kWh/m^2/year electrical energy.

The *Maximum Permitted Energy Performance Coefficient (MPEPC)* and *Maximum Permitted Carbon Performance Coefficient (MPCPC)* for new non-residential buildings are given in Table 2.

Year	2008
Maximum Permitted Energy Performance Coefficient	1.0
Maximum Permitted Carbon Performance Coefficient	1.0

Table 2: Maximum Permitted Energy Performance Coefficient and Maximum Permitted Carbon Performance Coefficient for new non-residential buildings.

The requirements for new non-residential buildings are under review to provide detailed NZEB guidance and include major renovation performance requirements, which are expected to be finalised in November 2017. Key components of performance requirements will include performance improvement in the order of 60% over the 2008 minimum standards, improved fabric specification, advanced services and lighting specification and 20% of energy to be from RES.

2.I.ii. Format of national transposition and implementation of existing regulations

The *Building Regulations* and accompanying *Technical Guidance Documents* are published by the *Department of Housing, Planning and Local Government*. The *Building Control* section in each local authority is responsible for administrating the *Building Regulations*. The *Sustainable Energy Authority of Ireland* (*SEAI)* is the issuing authority for the administration of the *Building Energy Rating (BER)* or EPC scheme.

DEAP and *NEAP*, compliant with EN 13790, serve the dual purpose of demonstrating compliance with *Part L (Conservation of Fuel and Energy)* of the *Building Regulations* and the generation of the *Energy Performance Certificate (EPC)* and *Advisory Report*.

In *DEAP* the electricity primary energy and CO_2 factors are calculated using forecasts from *SEAI's Energy Modelling unit*.

From	To	Electricity Primary Energy Factor	Electricity CO_2 Factor (kg/kWh)
14th June 2017	Present	2.08	0.409
7th January 2016	13th June 2017	2.19	0.473
17th December 2014	6th January 2016	2.37	0.522
11th December 2013	16th December 2014	2.45	0.555
11th December 2012	10th December 2013	2.42	0.524
1st December 2011	10th December 2012	2.58	0.556
Pre 30th November 2011	30th November 2011	2.7	0.643

Table 3: Electricity primary energy and CO_2 factors used in DEAP.

For non-residential buildings, the *NEAP* electricity primary energy and CO_2 factors are given in Table 4. The factors will be updated to the current *DEAP* factors as part of the software update planned for 2017.

From	To	Electricity Primary Energy Factor	Electricity CO_2 Factor (kg/kWh)
2008	Present	2.7	0.643

Table 4: Electricity primary energy and CO_2 factors used in NEAP.

The cost-optimal calculations and gap analysis for the EPBD were completed in 2013. The requirements for new residential buildings are in the cost-optimal range and are informing the upcoming NZEB requirements. The energy performance levels for existing residential buildings are set on a component basis and were last updated in 2011. The energy performance levels for new non-residential buildings were last revised in 2008 and the *Regulation and guidance* is currently undergoing a review process to be completed in October 2017. The major renovation requirement is in place for existing residential buildings and will be added for existing non-residential buildings before the end of 2017.

Quality assurance and disciplinary procedure audits are an important tool in safeguarding the integrity of EPCs through continuous enforcement of assessors' compliance with the *Code of Practice*. SEAI is finalising a comprehensive audit selection module providing automated support for audit selection activities.

Building control officers in local authorities are empowered to carry out inspections and, where necessary, undertake enforcement action in order to ensure compliance. Penalties include a fine of up to 5,000 €, or up to three months in prison, or both. Enforcement is complemented by a "*rights based"* approach, focussed on creating a compliance culture.

2.I.iii. Action plan for progression to NZEB for new buildings

The *Building Regulations* for new residential buildings are already at an advanced level. The typical energy performance of new residential buildings is expected to be 45 kWh/m^2/year or less with an *Energy Performance Coefficient* less than or equal to 0.3 and a *Carbon Performance Coefficient* of less than or equal to 0.35. Renewable energy continues to be required. Approximately 2% of all new and existing residential buildings achieve the NZEB standard as shown in Table 5. Sixty four percent (64%) of the new homes built in the 2010-2017 period may be considered NZEB.

													% of row
Period of Construction	Energy Rating												Total
	A	B1	B2	B3	C1	C2	C3	D1	D2	E1	E2	F	G	
1700-1899	0	0	1	2	2	3	4	7	10	9	10	14	38	17,535
1900-1929	0	0	1	2	2	3	4	7	10	9	10	14	37	36,637
1930-1949	0	0	1	3	4	5	7	9	12	10	10	13	26	33,092
1950-1966	0	0	1	3	5	6	8	11	14	11	11	13	17	51,684
1967-1977	0	0	1	3	6	9	12	16	17	11	9	9	8	68,661
1978-1982	0	0	1	3	8	13	15	18	18	10	6	5	3	46,803
1983-1993	0	0	1	4	9	13	16	20	18	9	5	4	3	76,569
1994-1999	0	0	1	5	10	15	19	20	15	7	5	3	1	82,730
2000-2004	0	0	1	7	15	22	22	15	9	4	3	2	1	124,731
2005-2009	1	3	11	21	23	17	9	6	4	2	1	1	0	121,610
2010-2017	64	17	10	5	2	1	1	0	0	0	0	0	0	19,492
Total	2	1	3	7	11	13	13	13	12	7	5	5	7	679,544

Table 5: Number of residential buildings at NZEB standard.

The *Building Regulations* for new non-residential buildings are undergoing review and will be finalised in 2017. RES will become mandatory following the publication of the *2017 Building Regulations*. One percent (1%) of all non-residential buildings may be considered at or near the NZEB standard based on an analysis of all EPCs published from 2008. The *Department of Education and Skills* use an advanced energy standard

for all new buildings and this is reflected in the 23% of school and college buildings with an A3 or better BER or EPC.

Non-Domestic Building Energy Ratings

Quarter 1 2017

% of row

Building Type (2009-2017)	Energy Rating							Total
	A	B	C	D	E	F	G	
Retail	0	14	42	17	9	6	12	17,070
Office	1	9	32	25	13	8	13	10,044
Restaurant/public house	0	7	29	36	18	6	4	4,117
Hotel	0	15	42	27	9	4	3	639
Warehouses	0	18	33	19	9	6	14	6,122
Workshops/maintenance depot	0	9	23	24	13	10	20	1,674
Industrial process building	2	36	26	16	9	3	9	997
Hospitals and primary health care	4	16	23	21	15	10	11	716
Community/day centre	3	24	32	17	9	6	9	682
Nursing residential homes and hostels	7	39	29	17	4	1	3	318
Schools and colleges	23	27	22	17	6	2	3	633
Sports facilities	2	30	29	17	8	6	8	382
Other	2	15	24	18	12	8	20	738
Total	**1**	**14**	**35**	**21**	**11**	**6**	**12**	**44,132**

Table 6: Number of non-residential buildings at NZEB standard.

The *Department of Education and Skills* is at the forefront of design with respect to sustainable energy efficiency in schools.

Colaiste Choilm is a three-storey low energy 550 student post primary school in Tullamore, Co. Offaly. The sustainable feature includes rainwater recovery system, 120 m^2 solar panels, intelligent lighting systems and biomass boilers. This project, completed in 2011, is testing sustainable design approaches and technologies. The successful elements will be incorporated into the specifications for all future post-primary schools. The main achievements of the sustainable energy project at Colaiste Choilm can be summarised as providing a quality sustainable educational facility, researching low-energy design solutions and renewables in a post-primary school and achieving an A2 energy rating.

2.I.iv. Requirements for systems and / or building components for new buildings

The overall energy, carbon and RES energy performance levels specified in the *Building Regulations* and *Technical Guidance Documents Part L* are in the nature of backstop minimum performance levels so as to ensure reasonable levels of performance for all factors affecting energy use, irrespective of the measures incorporated to achieve compliance.

Meeting the minimum individual performance levels specified will not necessarily mean that the overall level specified for primary energy consumption and related CO_2 emissions will be met. One or more of the following performance levels specified, will need to be exceeded to achieve this: use of RES, fabric insulation, airtightness, boiler efficiency, building services controls, insulation of pipes, ducts and vessels, and mechanical ventilation systems.

Maximum elemental U-value (W/m^2K)[1, 2]		
Column 1 Fabric Elements	**Column 2 Area-weighted Average Elemental U-Value (Um)**	**Column 3 Average Elemental U-value – individual element or section of element**
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.16 0.20	 0.3
Walls	0.21	0.6
Ground floors[3]	0.21	0.6
Other exposed floors	0.21	0.6
External doors, windows and rooflights	1.6[4]	3.0
Notes: *1. The U-value includes the effect of unheated voids or other spaces.* *2. For alternative method of showing compliance see paragraph 1.3.2.3.* *3. For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 1.3.2.2.* *4. Windows, doors and rooflights should have a maximum U-value of 1.6 W/m^2K when their combined area is 25% of floor area. However areas and U-values may be varied*		

Table 7: Maximum Element U-Values (W/m2K) for residential buildings.

Permitted variation in combined areas (A_{ope}) and average U-values (U_{ope}) of external doors, windows and rooflights	
Average U-value of windows, doors and rooflights (U_{ope}) (W/m^2K)	Maximum combined area of external doors, windows and rooflights (A_{ope}), expressed as % of floor area (A_f)
0.8 1.0 1.2 1.3 1.4	58.9 44.8 35.1 31.9 29.2
1.5 **1.6** 1.7 1.8 1.9	26.9 **25.0** 23.3 21.9 20.6
2.0 2.2 2.4 2.6	19.4 17.5 15.9 14.5
Note: *Intermediate values of "combined areas" or of "U-values" may be estimated by interpolation in the above Table.* *Alternatively the following expression may be used to calculate the appropriate value:* $A_{ope} / A_f = 0.3475 / (U_{ope}-0.21)$ *This expression may also be used to calculate appropriate values outside the range covered by the Table.*	

Table 8: Permitted Variation in combined areas and average U-Values of external doors, windows and rooflights in residential buildings.

2.II. Energy performance requirements: EXISTING BUILDINGS

2.II.i. Progress and current status of existing buildings

In general, *Building Regulations* apply to the construction of new buildings and to extensions and material alterations to existing buildings. In addition, certain parts of the *Regulations*, including *Part L*, apply to existing buildings where a material change of use takes place. The maximum elemental U-Value W/m^{2}K for material alterations or material change of use is shown in Table 9. Guidance is given on: insulation levels to be achieved by the plane fabric elements, thermal bridging and limitation of air permeability.

Maximum elemental U value (W/m^{2}K)[1,2] for Material Alterations or Material Change of Use		
Column 1 Fabric Elements	**Column 2 Area-weighted Average Elemental U-Value (Um)**	**Column 3 Average Elemental U-value – individual element or section of element**
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.25 0.25	 0.35
Walls Cavity walls[5] Other walls	 0.55 0.35	 0.60
Ground floors[3]	- 0.45[6]	-
Other exposed floors[3]	0.25	0.60
External doors, windows and rooflights	1.60[4]	3.0

Notes:
1. *The U-value includes the effect of unheated voids or other spaces.*
2. *For material alterations, the U-values relate to the new works.*
3. *For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 2.1.2.2.*
4. *For extensions and material change of use, windows, doors and rooflights should have a maximum U-value of 1.6 W/m^{2}K when their combined area is 25% of floor area. However areas and U-values may be varied as set out in Table 6 and paragraph 2.1.2.4.*
5. *This only applies in the case of a wall suitable for the installation of cavity insulation. Where this is not the case it should be treated as for "other walls".*
6. *This U value only applies where floors are being replaced.*

Table 9: Maximum Elemental U-Value (W/m2K) for Material Alteration and Material Change of Use for residential buildings.

For buildings undergoing major renovation, the *draft 2017 Building Regulations for non-residential buildings* require that the building is upgraded to the cost-optimal level of energy performance in so far as this is technically, functionally and economically feasible. The following improvements are normally considered to be cost-optimal and will typically be economically feasible when more than 25% of the surface area of a building is being upgraded: upgrading heating, cooling, ventilation and lighting systems. As an alternative, the whole building performance achieves the performance levels specified in Table 10 where technically, functionally and economically feasible this can be considered the cost-optimal level of performance.

Whole Building Cost Optimal Level	
Building Type	**Major Renovation - Cost Optimal Performance kWh/m²/yr**
Retail Air Conditioned	338
Office Natural Ventilated offices and other Buildings	124
Office Air Conditioned	180
Hotel Air Conditioned a	342
Schools	60
Other Air Conditioned Buildings	338
Other Naturally Ventilated Buildings	124

Table 10: Whole building cost-optimal level of performance for major renovations.

The major renovation requirement will be added to the *Building Regulations* for residential buildings in 2018.

2.II.ii. Plans to improve the existing building stock

Buildings represent a significant proportion of Ireland's total energy consumption. The residential sector alone accounts for approximately 27% of all energy usage and emits some 10.5 million tonnes of CO_2 annually. Because the potential for energy savings is so high, the buildings sector has become a priority area for the Government in trying to meet its ambitious climate and energy targets for 2020 and beyond.

In 2014, The *Department of Communications, Climate Action and Environment (DCCAE)* published Ireland's first ever national renovation strategy[2] which seeks to provide a pathway towards reducing emissions from buildings in the residential and non-residential sectors. This strategy sets out the measures currently in place to reduce emissions in these sectors and the factors that will be considered in developing new measures. The strategy has been prepared to fulfil Article 4 of the EED, which requires all MSs to set out long-term strategies for mobilising investment in the renovation of buildings.

This strategy reaffirms the Government's commitment to delivering on its ambitious targets to achieve a 33% energy saving in the public sector and a 20% improvement in energy efficiency for the economy as a whole by 2020. This transition will not happen by itself. This strategy sets out a clear pathway to overcoming the barriers to renovation works and achieving the national targets by building on the success of existing policy measures, with the addition of new ambitious policy goals, designed to mobilise investment to increase the rate of renovation in the economy.

In the residential sector, the progress to date achieved by the *Better Energy programme* will be built upon with the launch of *Better Energy Finance*. This programme will be designed in a manner that acknowledges the constraints identified in this strategy and will make a compelling case to consumers on the merits of

energy efficiency. It will also ensure that there are a variety of financial options open to those consumers when they are considering undertaking renovation works. The national smart meter rollout will also help to overcome barriers by providing consumers with detailed information on their energy usage at their fingertips.

In the public sector, the energy management tools developed by *SEAI* will allow public sector organisations to take direct control over their energy bills, delivering an unprecedented level of control to each individual organisation. The promotion of exemplar projects through the *National Energy Saving Framework* will provide templates for public sector organisations considering efficiency projects, while the launch of the new *Energy Efficiency Fund* will ensure that sufficient finance is available to support new projects.

In the commercial and industrial sector, the most important barriers to overcome are the split incentives and the availability of finance. By requiring each energy supplier to work with their customers to deliver significant energy savings each year, the Government is encouraging energy suppliers to become advocates of efficiency rather than simply energy vendors.

2.II.iii. Regulation of system performance, distinct from whole building performance

A building shall be designed and constructed to limit the amount of energy required for its operation and the amount of CO_2 emissions associated with this energy use insofar as is reasonably practicable.

For new residential buildings, the requirements are:

1. providing that the energy performance is such as to limit the calculated primary energy consumption and related CO_2 emissions insofar as is reasonably practicable, where both energy consumption and CO_2 emissions are calculated using *DEAP*;
2. providing a reasonable proportion of the energy consumption by RES;
3. limiting heat loss and, where appropriate, availing of heat gain through the fabric;
4. providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;
5. providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;
6. providing to the owner sufficient information about the building, the fixed building services and maintenance requirements

2.II.iv. Encouragement of intelligent metering

For buildings with a heat demand of more than 100 kW a full *Building Management System (BMS)* should be installed to control the boiler(s). A *BMS* linked to the heating plant will provide sequential controls of multiple boilers, full-zoned time control and weather compensation where applicable, frost protection or night set-back optimisation and monitoring and targeting.

2.II.v. Financial instruments and incentives for existing buildings

The Better Energy Warmer Homes Scheme (BEWHS) improves the energy efficiency and comfort conditions of homes occupied by vulnerable households in receipt of the *National Fuel Allowance Scheme* through the

installation of draught proofing, attic insulation, lagging jackets, low energy light bulbs and cavity wall insulation, where appropriate.

Better Energy Homes is a Governmental programme, which gives fixed cash grants for insulation and heating system upgrades, helping to make your home more comfortable and cheaper to run. It is available to all owners of homes built before 2006.

Better Energy Communities has supported 300 community energy efficiency projects over the last five years. As a result, over 15,000 homes and hundreds of community, private and public buildings have received energy efficiency upgrades, supporting several hundred jobs each year.

The Energy Efficiency Obligation Scheme (EEOS) is implemented pursuant to the Energy Efficiency Directive 2012, Article 7. The Directive imposes a legal obligation on retail energy sales companies to achieve energy savings.

The Accelerated Capital Allowance (ACA) is a tax incentive for companies paying corporation tax which aims to encourage investment in energy efficient equipment. The *ACA* offers an attractive incentive whereby it allows companies to write off 100% of the purchase value of qualifying energy efficient equipment against their profit in the year of purchase.

2.II.vi. Information campaigns / complementary policies

The SEAI promotes grants available to homeowners. In 2017, *SEAI* ran a campaign to drive grant applications for *Better Energy Homes*. The radio, press and online campaign resulted in a 30% increase in website visits.

Figure 1 home energy grants image

SEAI's National Deep Retrofit Conference 2017 established the landscape for the decade or more of deep retrofitting ahead. The deep retrofitting of Ireland's building stock is recognised as one of our biggest energy efficiency challenges. It is also viewed by many as a major economic and employment opportunity. The conference is an annual review and information sharing platform across all stakeholder groups as to best practice and innovation, research findings and delivery of deep retrofit in Ireland across all demographics, geographic areas, technologies and building types.

2.III. Energy performance certificate requirements

SEAI as the issuing authority is responsible for the administration of the EPC scheme. Over 30% of residential and non-residential buildings have an EPC. The EPC is on the list of documents checked by the legal representatives when a building sale or rental is completed. A legal representative is not mandatory, particularly for residential buildings, when a building or building unit is offered for rent.

The total number of *BERs* for residential buildings is given in Figure 1. In a multi-unit residential building each unit has a unique EPC. In 2016, over 87,000 residential buildings or building units received an EPC.

DOMESTIC BERs BY GRADE (On Public Register and Not Expired - Current)

Energy Rating	Quantity
A1	48
A2	4,169
A3	15,501
B1	8,718
B2	20,925
B3	50,188
C1	77,337
C2	90,342
C3	91,028
D1	92,045
D2	80,556
E1	47,133
E2	37,126
F	37,456
G	50,926
Total	**703,498**

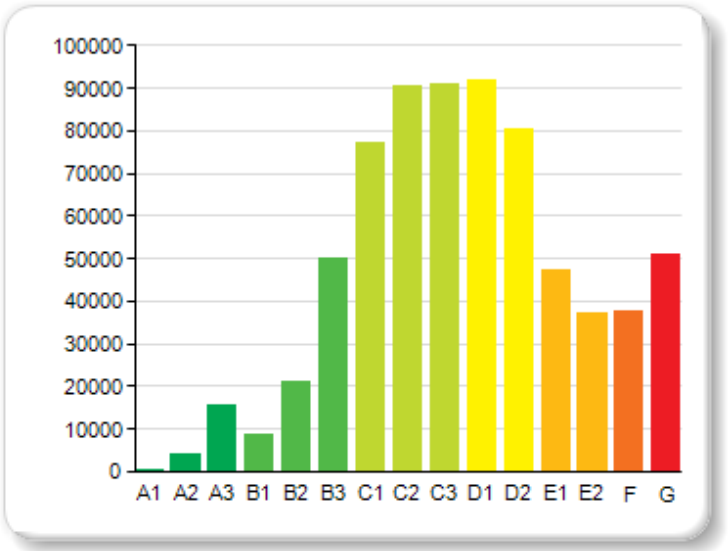

Figure 2. EPCs for residential buildings.

The *Energy Performance of Buildings Directive (EPBD) Compliance Study*[3] reported compliance rates for sales and rentals. In general, EPC production in the rental market is less well monitored and controlled than in the new construction and building sales sectors. The legal systems for checking compliance with the use and issue of EPCs in sales and new construction do not exist for a large proportion of tenancy agreements in most MSs.

SEAI carried out research in 2015 as part of the pathways report to unlocking the energy efficiency opportunity. The focus of this research with 1,500 consumers was to ascertain their propensity to borrow to fund retrofit and to establish what the important factors were in encouraging the decision to undertake financing.

The research found that of the consumers who had investigated ways to reduce energy use through energy efficiency investment but had not acted upon those yet, 74% indicated that lack of funding had a strong relevance in this. Financing is not the only barrier to encouraging home retrofit; our various pieces of research shows that other issues, such as targeted promotion, advice and support. are also essential to stimulate engagement, provide consumer knowledge for decision making and assistance to enable action. *SEAI* is updating the residential BER advisory report format and content in 2017 and 2018. as part of the deep retrofit pilot project.

2.III.i. Quality Assessment of EPCs

The selection of EPCs for audit is carried out on both a targeted and random basis with due consideration of risks associated with the EPC assessment processes. *SEAI* randomly selects a statistically significant percentage of all the EPCs issued annually and subject those certificates to verification. Routine follow up audits identify if findings from previous audits have been adequately resolved. In addition, *SEA*I may, under its *Quality Assurance System and Disciplinary Procedures*, require EPC Assessors to participate in mentoring visits arranged by its auditors to facilitate further training.

SEAI publishes a detailed *Code of Practice and Quality Assurance and Disciplinary Procedure*. The impact of errors is sized to determine the audit outcome: compliance, severity 3, severity 2 and severity 1. Findings of non-compliance may lead to the accumulation of penalty points and/or revocation of the EPC data file(s) as follows:

Severity of non-compliance	Penalty points	Revocation of EPC
Compliance	0	No
Severity 3	1	No
Severity 3 (Advisory)	0	No
Severity 2	2	Yes
Severity 2 (Advisory)	0	Yes
Severity 1	3	Yes
Severity 1 (Advisory)	0	Yes

Table 11: Classification system for audit findings of non-compliance.

Suspension or termination of registration of an EPC assessor may result where 10 penalty points or more are accumulated within the previous 2-year period.

2.III.ii. Progress and current status of EPCs on public and large buildings visited by the public

In Ireland, all large buildings (those with a total useful floor area over 500 m^2 and, since July 2015, over 250 m^2) that are frequently visited by the public should have an EPC on display. This requirement applies irrespective of whether the building is occupied by a public authority.

The *Building Control section* in each authority is responsible for monitoring and enforcing the requirement to display EPCs in public buildings and large buildings often visited by the public. The number of EPCs published for display in 2016 was 384, indicating a low compliance rate.

An *EU Energy Performance of Buildings Directive (EPBD) Compliance Study*[4] identified the following challenges with EPCs on public and large buildings visited by the public: validity of the EPC, awareness of building managers, level of interest shown by the public, compliance checks made, influence on energy management and EPC cost.

2.III.iii. Implementation of mandatory advertising requirement status

SEAI published advertisement guidelines[5] which can be summarised as follows:

- A person offering a property for sale or rent on or after 9th January 2013, or their agent, shall ensure that the energy performance indicator of the current EPC for the building is stated in any advertisements, where such advertisements are taken relating to the sale or letting of that building.
- Prospective buyers and renters will be shown the EPC rating (Alphanumeric value) along with other prescribed content (dependent on the particular medium) in a prominent location in each specific advertisement.
- Where images of the property are used, then the presentation of the alphanumeric value will be by way of *the prescribed EPC Alphanumeric Rating Motif for the particular property rating.*
- The *EPC Alphanumeric Rating Motif* artwork files will be made available in electronic format from the *SEAI* website or on request to info@ber.seai.ie.

These requirements apply to advertisements, meaning a public announcement in: newspaper, magazine, brochure, leaflet, advertising notice, vehicle, radio, television, internet (including apps and social media) and direct mail.

2.IV. Inspection requirements – heating systems, air conditioning

2.IV.i. Report on equivalence of model A and B for Heating Systems

In September 2012, Ireland notified the European Commission of its decision to avail of the alternative approach provided under Article 14(4) of Directive 2010/31/EU. As set out in that notification, the approach implemented in Ireland centres on the implementation of an effective information campaign aimed at encouraging regular heating system inspections/maintenance and the replacement of inefficient heating systems with high efficiency alternatives. Similar awareness measures have been ongoing in Ireland since 2006. These have been complemented by a range of additional incentives to encourage heating system upgrades. This approach continued throughout the reporting period from 30th June 2011 to 30th June 2014.

2.IV.ii. Progress and current status on heating systems

An analysis of the annual energy saving potential arising from a hypothetical regular inspection scheme complying with Article 14(1)–(3) of Directive 2010/31/EU and the alternative approach adopted in Ireland, conducted in Q3 of 2013, showed that the alternative approach in Ireland, consisting of an awareness scheme and capital grants for heating system upgrades, would yield over three times the energy and CO_2 savings that would be achieved by a hypothetical inspection scheme over the reporting period from June 2011 to June 2014. SEAI intends to run a similar suite of measures over the next 3-year period.

The updated equivalence analysis indicates that the energy savings achieved as of December 2013, which can be attributed to the implementation of alternative measures, will exceed the estimated energy savings of 93.2 GWh that could arise from a hypothetical regular inspection scheme (by a factor of 3).

The alternative measures analysed in this report are the key initiatives that will continue to deliver energy savings in the reporting period from 30th June 2014 to 30th June 2017.

2.IV.iii. Progress and current status on AC systems

Ireland confirmed to the European Commission that it is availing of the alternative equivalence measures provided for under Article 15(4) of Directive 2010/31/EU with regard to the provision of advice to users on the replacement of AC systems and/or on other modifications to AC systems which may include inspections to assess the efficiency and appropriate size of AC systems. The roll out, inter alia, of information campaigns, the provision of advice to the users of AC systems and other promotional measures will deliver significantly better results than mandatory inspections and will, accordingly, represent a better use of resources for the State.

2.IV.iv. Enforcement and impact assessment of inspections

In opting for the alternative approach set out in Article 15(4) of Directive 2010/31/EU, the proposed approach is to deliver an effective communications campaign coupled with other support actions that will encourage regular inspection of AC systems with associated maintenance, modification and replacement of inefficient installations. The focus is on establishing a well-structured set of initiatives, led by Governmental bodies, aligning with business interests of energy efficiency products and service providers, especially key influencers, in the AC systems sector. This approach is likely to achieve greater energy efficiency improvements when compared to an inspection regime.

The use of AC in residential buildings in Ireland is insignificant. The analysis, conducted during the third and fourth quarter of 2013, shows that the alternative approach in Ireland, consisting of an awareness scheme, promotional and financial support, would yield over 30% more energy and CO_2 savings that would be achieved by a hypothetical inspection scheme over the reporting period from June 2011 to June 2014. The costs of inspecting each AC system and the administration of the hypothetical regular inspection scheme have not been quantified as part of this study. These potential costs are likely to significantly reduce the potential annual energy and CO_2 savings arising from the introduction of a hypothetical regular inspection scheme.

Impact assessment, costs and benefits

Ireland has opted for alternative measures for Directive 2010/31/EU Articles 14 and 15. Consequently enforcement, penalties and quality control of inspection reports do not arise. The impact assessment of the alternative measures is quantified in the reports submitted to the European Commission.

3. A success story in EPBD implementation

The EPBD has provided the framework for understanding and improving building energy performance and raised awareness on energy consumption in buildings resulting in a more prominent role in energy policy. When the EPBD was transposed into national legislation in 2006, *SEAI* established a national database for all EPC related information. The national database of EPC is essential for collecting statistical insights in the energy performance of the existing building stock. The database is used to inform renovation strategies and to enable stakeholders in the supply chain to better understand the market for their products.

The *Central Statistics Office (CSO)* is Ireland's official statistics office. The *CSO* combines EPC data with other data sources including the national census. The *CSO* publishes comprehensive EPC data. Residential

buildings' EPC ratings for the 1st quarter of 2017 can be accessed at www.cso.ie/en/releasesandpublications/er/dber/domesticbuildingenergyratingsquarter12017/.

A total of 20,604 EPCs for residential buildings were published in the first quarter of 2017, bringing the cumulative total of EPCs to 745,347. The number of EPCs published in 2017 represents an increase of 4.9% compared with the same period in 2016.

Detached houses and semi-detached houses are the most common residential building types since 2009, each representing 26% of the total. They also had similar energy ratings with approximately 50% of each residential type receiving a rating of "C" or higher. Mid-floor apartments had the highest percentage of "A" and "B" ratings at 30%.

Dublin's postal district code area 18, with an average building age of 17 years, had the highest proportion of combined "A" and "B" rating at 38%. In contrast, Dublin 7 had the highest proportion of combined "F" and "G" rating at 27%, with an average building age of 56 years. Residential buildings with a *BER* rating in Dublin 10 had an average age of 42 years, and was the only Dublin postal district or county with no "A" or "B1" EPCs.

Overall, heating oil and natural gas were the two most prevalent main space heating systems accounting for 78% of all residential buildings (39% each), followed by electricity (15%). Of the residential buildings using natural gas, 20% were rated "A" or "B", compared with 9% for those using heating oil. Of the residential buildings built between 2010 and 2017, the majority used natural gas (58%), followed by electricity (23%) and heating oil (17%).

Table 12, which presents the energy rating by residential building type, is one of many tables published by the *CSO*.

Domestic Building Energy Ratings

Quarter 1 2017

% of row

Dwelling Type	Energy Rating					Total
	A-B	C	D	E	F-G	
Apartment	29	29	20	11	11	4,391
Ground-floor apartment	12	31	26	18	13	38,693
Mid-floor apartment	30	36	21	8	6	46,881
Top-floor apartment	14	27	27	16	16	40,055
Basement Dwelling	5	17	17	22	39	198
Maisonette	21	33	24	10	12	6,999
House	15	41	24	9	12	37,900
Detached house	12	37	25	11	15	179,948
Semi-detached house	10	41	27	12	10	178,343
End of terrace house	10	36	24	14	16	49,012
Mid-terrace house	13	37	23	13	14	97,124

Table 12. Energy ratting by residential building type.

SEAI provides grant funding for home energy upgrades and an EPC is mandatory to record the improvement. The purpose of rating is recorded as part of the EPC and one of the categories is grant aided works.

Total applications	286,039
Total homes completed	201,550
Total grants paid	€208,136,906

Table 13. The Better Energy Homes *scheme statistics from its launch in March 2009 to 30th April 2017.*

The *Better Energy Warmer Homes* is available to home owners who cannot afford to invest in energy efficiency upgrades. The *Department of Social and Family Affairs* identifies eligible low-income families. Applicants must be in receipt of one of the following: Fuel Allowance as part of the National Fuel Scheme, Job Seekers Allowance for over six months and have a child under seven years of age, Working Family Payment, Single Parent Payment, or Domiciliary Care Allowance.

The service involves the installation of standard energy efficiency measures appropriate to the eligible household subject to *SEAI* survey, budget allocation and available capacity. The service is provided at no cost to the household.

Better Energy Communities has supported 300 community energy efficiency projects over the last five years. As a result, over 15,000 residential buildings and hundreds of community, private and public buildings have received energy efficiency upgrades, supporting several hundred jobs each year.

In 2016, funding provided for energy efficiency upgrades to more than 2,600 homes and almost 300 community and commercial facilities. The total investment in energy efficiency is almost 48 million €, supporting more than 700 direct and indirect jobs right across the country.

4. Conclusions, future plans

The EPBD implementation in Ireland has provided detailed information and requirements to document the current energy efficiency of buildings. The minimum energy performance of residential buildings has undergone revisions in 2005, 2008 and 2011. RES is mandatory in new homes. The *Building Standards* will be further strengthened to align with NZEB requirements. The *Building Standards* for non-residential buildings will be improved by 40-60% in 2017, with a mandatory 20% of the energy demand being supplied through RES. The major renovation requirement will be added for all buildings.

http://seai.ie/Your_Building/BER/Advertising_of_BER/BER-Advertising-Guidelines-Issue-2-.pdf will continue to promote and support the renovation of existing buildings.

The existing housing stock in Ireland continues to pose one of the greatest energy efficiency challenges. A considerable portion of the current building stock performs poorly when compared against a building built to the current standards. The *Deep Retrofit Pilot programme* has been launched explicitly to tackle this challenge.

Deep retrofit is the significant upgrade of a building toward NZEB requirements where it is practically feasible and achievable. Rather than upgrading isolated parts of the house, the whole home should be assessed as a system, looking at how energy is used and retained. All aspects of the building fabric, airtightness, ventilation and RES should be assessed.

SEAI are commencing the first of multi-annual pilots which will investigate the challenges and opportunities that deep retrofit present. The learning from these pilots will inform *SEAI's* approach and support towards the large scale deep retrofit of buildings in Ireland. The initial focus will be on the residential market.

The government has allocated 5 million € in 2017 to support this pilot.

Funding will be provided to projects which demonstrate an integrated, comprehensive strategy for significantly improving home energy performance. Projects will generally comprise:

- whole house solution which includes a fabric first approach;
- minimum *BER* uplift of 150-200 kWh/m^2/year to minimum *BER A3;*
- deployment of RES solutions supporting transition from fossil fuels.

To maximise the learnings from the pilot, *SEAI* aims to fund a range of projects which support:

- a range of building archetypes;
- development toward large-scale deployment;
- regulatory development;
- multiple customer benefits.

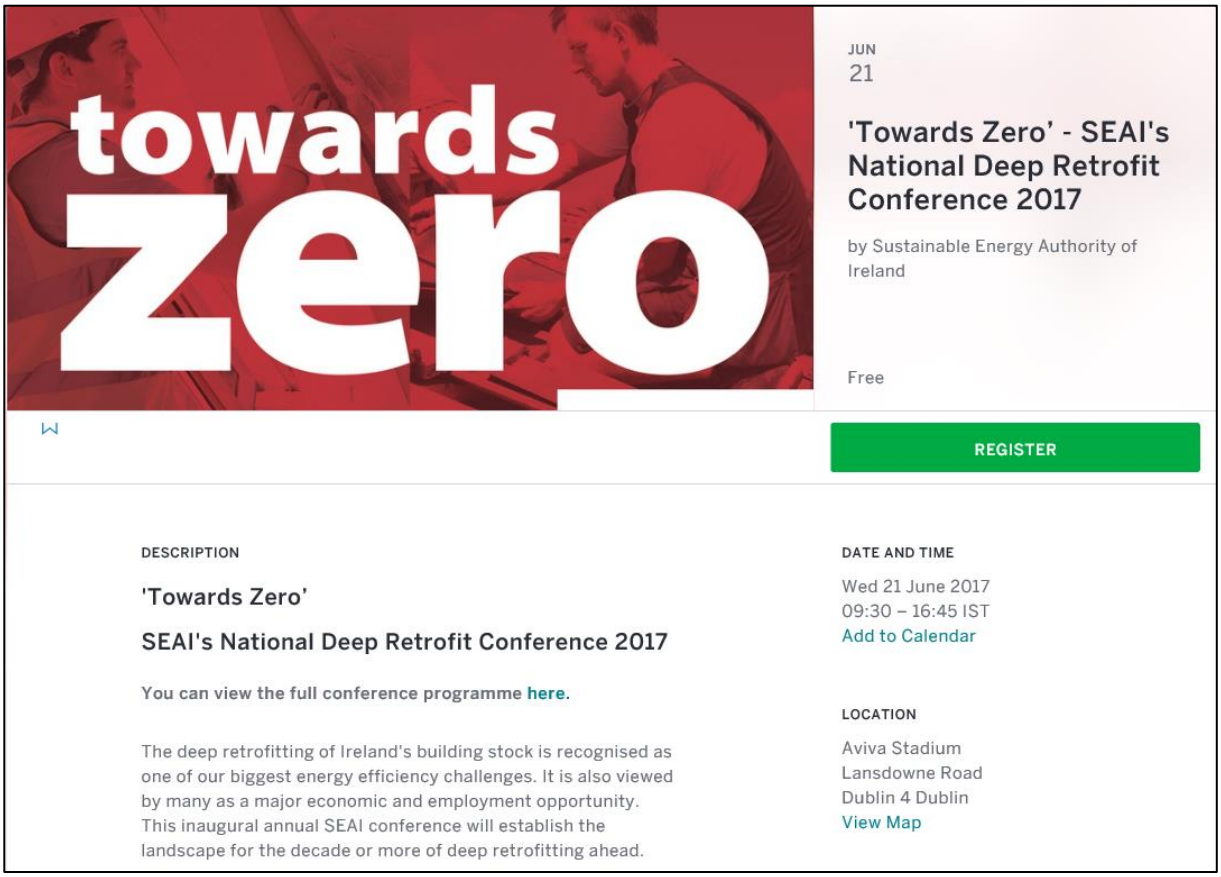

Figure 3. SEAI's National Deep Retrofit Conference.

Endnotes

1. www.seai.ie/sustainable-solutions/nearly-zero-energy-buildi-1
2. www.dccae.gov.ie/en-ie/energy/topics/Energy-Efficiency/ireland's-national-renovation-strategy/Pages/Ireland's-Renovation-Strategy.aspx
3. https://ec.europa.eu/energy/sites/ener/files/documents/MJ-04-15-968-EN-N.pdf
4. https://ec.europa.eu/energy/sites/ener/files/documents/MJ-04-15-968-EN-N.pdf
5. http://seai.ie/Your_Building/BER/Advertising_of_BER/BER-Advertising-Guidelines-Issue-2-.pdf

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