TOWARDS NEARLY ZERO ENERGY BUILDINGS IN IRELAND

PLANNING FOR 2020 AND BEYOND

Department of the Environment, Community and Local Government

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Comhshaol, Pobal agus Rialtas Áitiúil
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CONTENTS

NEARLY ZERO ENERGY PLAN (NZEB)

The following is the outline plan for NZEB.
It is intended that this will be an evolving definition.
It is proposed that the definition will be further developed in the light of cost-optimal calculations, industry consultation, review and public consultation as well as further developments in relation to policy and legislation.

SECTION 1 - GENERAL

1.1 Introduction

Energy use and CO_2 emissions associated with the built environment continue to be significant and measures to reduce their impact in both new and existing buildings will continue to be an important component of Government energy and climate change policies. The latest data in respect of CO_2 emissions estimated that a total of 12.6 million tonnes[1] of CO_2 equivalent was generated by the buildings sector in Ireland in 2010. This accounted for 28.8% of 2010 non-ETS emissions.

Fossil fuel combustion for heating in residential dwellings accounted for approximately 7.8 million tonnes or almost 18% of non-ETS emissions for 2010. A further 2.4 million tonnes or over 5% of non-ETS emissions arose from fossil fuel combustion for heating in non-residential buildings (i.e. businesses, hospitals, schools etc). Industrial activities not covered by the European Union ETS accounted for another 2.4 million tonnes (fossil fuels for processing and F-gas emissions) or almost 6% of non-ETS emissions for 2010.

Against this background, improvements in energy efficiency within the buildings sector in tandem with the increased use of renewable energy technologies constitute important policy measures needed to facilitate a reduction in Ireland's energy dependency on fossil fuels and associated greenhouse gas emissions over the period to 2020 and beyond.

[1] Source: *Towards a New Climate Change Policy – Interim report of the NESC Secretariat*, published by the Department of the Environment, Community and Local Government (available from www.environ.ie).

1.2 Ireland's National Building Stock

Traditionally in Ireland, housing design falls into three broad categories, vis-à-vis, bungalows/detached (representing 40% of national stock), semi-detached/terraced (40%) and flats/apartments (20%)[2]. There was an estimated 2,012,000[3] million dwellings in Ireland as at end 2010 of which some 52% were built before the Building Regulations 1991 first came into operation on 1st June 1992. Within the overall figure, a total of 128,014[4] dwellings as at end 2010 were let by local authorities for the purposes of social housing provision.

There is a lack of information on the non-residential buildings stock and it is intended that the Sustainable Energy Authority of Ireland will do a short study on data available in this area in the first quarter of 2013.

1.3 Key Developments – Energy Performance

The residential sector currently accounts for 27.1% of Ireland's overall energy use[5]. Improvement in the energy performance of residential buildings is therefore a critical success factor in reducing Ireland's overall energy demand.

Part L (Conservation of Fuel and Energy) of the Building Regulations 1997 sets out the statutory minimum energy performance standards that apply to the construction of new dwellings. In 2005, the energy use addressed by Part L permitted an energy load of 150 KWh/m^2/annum for a typical dwelling. Benchmarked against the 2005 requirements, Part L requirements were upgraded significantly in 2007 and again in 2011 to yield an aggregate improvement of 60% in both energy efficiency and CO_2 requirements. U-values for key fabric elements in particular are now set at advanced levels (see Appendix 1). Ireland has also made mandatory provision for a reasonable proportion of the remaining energy load to derive from renewable energy sources.

The Building Energy Rating (BER) certification scheme was introduced for new dwellings in 2007. Under this scheme a building energy rating or 'BER' certificate becomes mandatory whenever a dwelling is commissioned or offered for sale or for rent.

The Department of the Environment, Community and Local Government also continues to promote higher standards of energy efficiency in social housing. The 2007 publication *Quality Housing for Sustainable Communities* focused on promoting high standards in design, construction, environmental performance and durability.

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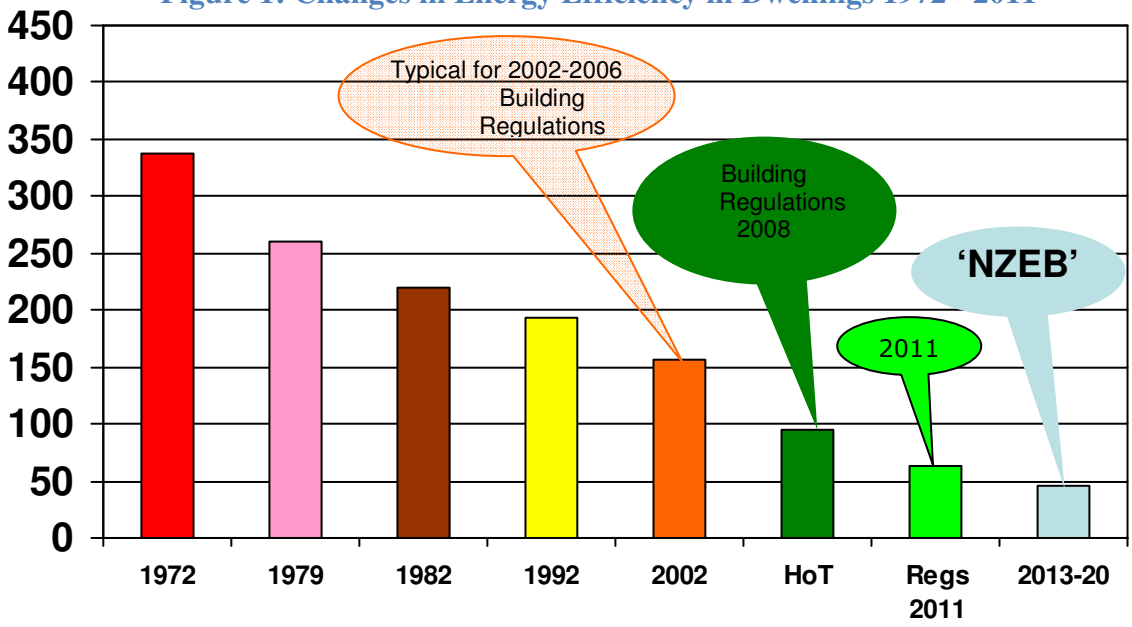
[2] DECLG Housing Statistics1994–2004.
[3] Source: *House Building and Private Rented Statistics*, published by the Department of the Environment, Community and Local Government (available from www.environ.ie).
[4] Source: *Social and Affordable Housing Statistics*, published by the Department of the Environment, Community and Local Government (available from www.environ.ie).
[5] SEAI *Energy in Ireland 1990 – 2010* (September 2011).

A wide range of Government policies have proved successful in setting the context for a change in public perceptions of energy efficiency in buildings. While examples of low energy dwellings do occur in Ireland, the overall number is low. However, this situation is expected to change as the market responds to the high standards of performance now in place under the latest Part L requirements for dwellings during the lifetime of this plan.

Figure 1: Changes in Energy Efficiency in Dwellings 1972 - 2011



Building Regulations for the energy performance of fabric and services in buildings other than dwellings have been in place since 1991. The requirement is to provide that the energy and carbon performance of the new building is such as to limit the calculated primary energy consumption and related CO_2 emissions when calculated in accordance with Annex 1 of Directive 2010/31/EU on the energy performance of buildings.

The requirement for energy performance certificates has been in place for new buildings other than dwellings since 1st July 2008 and for all buildings other than dwellings offered for sale or letting since 1st January 2009.

The requirement for Display Energy Certificates in public sector buildings with floor areas in excess of 1,000 m^2 has been in place since the 1st January 2009.

The public sector aims to improve its energy efficiency by 33% by 2020 as set out in the National Energy Efficiency Action Plan (NEEAP) and, in accordance with the requirements of Directive 2010/31/EU on the energy performance of buildings (recast), will be seen to lead by example in order to demonstrate clearly to all sectors what is possible through a programme of strong and committed actions. Public sector buildings will adopt the

proposed nearly zero-energy standard for new buildings other than dwellings two years in advance of the private sector in 2018.

SECTION 2 - APPLICATION OF DEFINITION

2.1 Definition - Dwellings

By 2020 all new dwellings in Ireland will have an Energy Performance Coefficient (EPC) and Carbon Performance Coefficient (CPC) of 0.302 and 0.305 in accordance with the common general framework set out in Annex I of Directive 2010/31/EU on the energy performance of buildings (recast). This takes account of the energy load for space heating, water heating, fixed lighting and ventilation. For a typical dwelling this will equate to 45 kWh/m^2/annum with a very significant proportion of which will be covered from renewable energy sources produced on-site or nearby.

In terms of BER certificates, this will have the effect that all new dwellings should be rated as A3or higher.

Table 1: Typical performance standards for NZEB for dwellings

	Low Energy[6] Dwelling with Solar Thermal DWH
Primary Energy (kWh/m^2yr)	45
CO_2 Emissions (Kg/m^2yr)	10
EPC	.302
CPC	.305

2.2 Definition – Buildings other than dwellings

By 2020, subject to cost-optimal calculations, it is proposed that all new buildings other than dwellings in Ireland will achieve a 50% to 60% aggregate improvement in terms of energy efficiency and reduction in CO_2 emissions. The energy metrics to be considered will be as described in Annex I of Directive 2010/31/EU on the energy performance of buildings (recast) which includes the energy load for space heating, water heating, cooling, fixed lighting and ventilation.

[6] Typical specification provided in Appendix 1.

In accordance with the definition for nearly zero-energy buildings as provided for under Article 2 of Directive 2010/31/EU of the energy performance of buildings (recast), it is envisaged that a very significant proportion the building energy demand will be covered from renewable energy sources including energy from renewable sources produced on-site or nearby.

Information sources providing data for the profile and range of buildings other than dwellings in Ireland are limited. Available databases include Central Statistics Office planning permission data and the Building Energy Rating (BER) database which contains approximately 12,000 non residential BERs. These data sources were analysed in order to produce Ireland's Cost Optimal curves.

Based on the Cost Optimal analysis of non residential buildings for the Energy Performance of Buildings Directive (recast) the improvement from current building standards to an intermediate and final NZEB target are described in Table 2 below.

Table 2: Target typical improvement levels for buildings other than dwellings

Target	Year	Improvement on TGD L 2008 Buildings other than Dwellings performance level
Intermediate	**2014**	**40% +**
Final	**2020**	**~ 60%**
Note: Targets will be further refined when developing new technical performance standard Technical Guidance Document L-Buildings other than Dwellings		

Typical floor areas for new buildings other than dwellings based on planning permissions for buildings other than dwellings are provided in Table 3

Table 3 Average size of buildings other than dwellings based on Planning Data for Ireland 2005-2007[7]

Building Type	Average New Build area granted planning permission	Total average area granted planning permission
Hotels Restaurants	2,643 m^2	512,666 m^2

[7] CSO 2008 (The following buildings have been excluded from this table: Buildings for agriculture, forestry, horticulture, fruit growing, viniculture, fishery purposes, mining, energy, water, industry and manufacturing handicraft).

Cafes		
Buildings for trade and other economic activities	1,481 m^2	1,476,000 m^2
Office and administration buildings	1,279 m^2	478,333 m^2
Buildings for health & welfare	1,595 m^2	237,666 m^2
Buildings for entertainment & recreation	960 m^2	239,666 m^2

SECTION 3 - TARGETS – NEW BUILDINGS

3.1 Dwellings

3.1.1 Single Family Houses

Part L (Dwellings) 2011 of the Building Regulations already marks an important step on the road to zero energy buildings and brings Ireland to an advanced level of energy performance. This 2011 step change may be regarded as the intermediate step necessary to advance towards 2020 performance levels. A draft standard for dwellings in 2015, which will be Ireland's NZEB standard, is currently being developed for publication by or before 2015. This NZEB standard will be passed into legislation in the timeframe between 2015 and 2020 but may be applied on a voluntary basis once published.

The energy performance for a typical dwelling in compliance with Part L (Dwellings) 2011 is shown in Table 4. The performance standard is set through backstop values for the parameters specified in Annex I of Directive 2010/31/EU on the energy performance of buildings (recast) and via a whole dwelling energy performance and carbon performance parameter which equates to 60% better than Ireland's Part L (Dwellings) 2005 standard.

The backstop values for thermal performance and efficiencies are set at such a level as to ensure optimum passive performance of the dwelling with renewables supplying energy to meet a significant proportion of the remaining energy demand of the dwelling. These backstop values are outlined in Appendix 1.

Table 4: Typical dwelling in compliance with Part L 2011

Example Dwelling - Results		
	Dwelling heated by mains gas	**Dwelling heated by oil (with secondary heating by LPG)**
Primary energy [kWh/m^2 yr]	61	61
CO_2 emissions [kg/m^2 yr]	12	15
EPC	0.40	0.40
CPC	0.37	0.45

An important element of Part L (Dwellings) 2011 is the requirement for onsite or nearby renewables to meet the energy demand of the dwelling. The Technical Guidance Document to Part L sets this at:

- 10 kWh/m^2/annum contributing to energy use for domestic hot water heating, space heating or cooling; or

- 4 kWh/m^2/annum of electrical energy; or

- a combination of these which would have equivalent effect.

This is a key step in the roadmap towards NZEB in providing 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; currently, the above renewables requirement equates to 17% of the energy used by a typical dwelling.

As the energy performance of the dwelling improves the above requirement will increase to equate to 22% of the energy used by the dwelling. It is also envisaged that as the costs of renewable technologies drop they will become more cost effective as alternative solutions to meet a greater proportion of the remaining energy requirements.

Work has already commenced with regard to the development of a framework for achieving nearly zero energy dwellings in order to fulfil Ireland's obligations under Directive 2010/31/EU within the prescribed timeframe. The EPC and CPC performance standard of 0.305 and 0.302 respectively for achieving nearly zero energy in new dwellings will be announced for public consultation during the latter half of 2013.

Preliminary work towards developing a standard to support this NZEB EPC and CPC performance level is already underway. The standard will provide for further improvements to building fabric, enhanced levels of air-tightness, improved thermal bridging details as well as addressing the anticipated greater future deployment of improved ventilation strategies.

It is envisaged that the proposed standard will, when finalised, be released for use on a voluntary basis by construction professionals by 2015. The proposed standard will subsequently be incorporated into a future review to Part L (Dwellings) of the Building Regulations in order to ensure its application on a statutory basis on and from 31st December 2020.

It should be noted that a number of industry representatives have indicated that challenges to the achievement of low energy building standards are increasing as a result of the low level of construction taking place due to the global economic downturn. In particular, issues such as additional costs, creating capacity in construction skills and experience levels as well as extended turnaround times from planning approval stage to completion stage are presenting tangible barriers in the construction sector.

3.1.2 Apartment Blocks

In the context of Part L (Dwellings) of the Building Regulations 2011, the requirements of Regulations L1, L2 and L3 respectively together with the technical guidance provided in Technical Guidance Document L – Conservation of Fuel and Energy – Dwellings (2011) applies equally to both single family houses and apartment blocks. Accordingly, the achievement of nearly zero-energy within the apartment sector will mirror the process as set out in paragraph 3.1 (Single Family Houses) above.

3.2 Buildings other than dwellings

The data available to model advanced energy performance of buildings other than dwellings is limited. Notwithstanding this, a similar level ambition as for dwellings will be pursued.

This will be achieved by optimising performance levels for fabric and services, promoting cooling through natural ventilation as an alternative to air-conditioning and encouraging the use of renewables as appropriate. It is important to note that the approach to improving the energy performance of buildings other than dwellings is dependent on the function, internal loads and occupancy of the building. Approaches to buildings with high cooling loads will be different to those with high heat demands. Therefore the approach should be to optimise the fabric and services performance depending on the energy load profile of the building.

The efficiency of services will have a significant impact on the performance of non-residential buildings. Also, in some non-residential buildings there should be significant opportunities to use renewables and low carbon technologies such as CHP and free cooling as an alternative to air-conditioning. The cost optimal study is being used to inform the evolving proposals for upgrading standards for buildings other than dwellings.

It is also planned to consult with an industry stakeholder group in 2013 to set the intermediate target for buildings other than dwellings. Table 5 summarises indicative performance levels based on the results of Ireland's cost optimal study. This presents a

similar level of ambition to Dwellings with a 40% plus improvement planned for 2014 and an indicative improvement level of 60% for 2002 over 2008 standards.

It is intended that there will be an intermediate target in 2014 and a second step in 2020 to bring new non-residential buildings to nearly zero energy standard.

The planned improvement for an intermediate target and a final NZEB target will be as set out in Table 2. The intermediate target will be to cost optimal levels in 2014 ie. 40% plus. The final target for Nearly Zero Energy Building will be in the order of approximately 60%, defined in 2018 for public sector buildings and specified in regulation in 2020 for all buildings.

The cost optimal range and a proposed NZEB range for each building type is shown in Table 5. These ranges are based on the results of the Cost Optimal study. The method of implementation of these performance levels will be decided during the revision of Technical Guidance Document L-Buildings other than Dwellings in 2013/ 2014 and for NZEB in 2018.

The cost optimal results will be further assessed when setting future performance levels to take account of practicality/buildability of the technical solutions and the available spread of technical solutions. Appropriate technical solutions should be available to all building types to meet regulatory performance levels. An appropriate spread of technologies should also be available to meet any regulatory performance levels put in place. Appropriate consideration will also be given to the investor perspective and the sensitivities of the study around future energy prices and discount factors.

Table 5: Indicative Intermediate and NZEB ranges for Buildings other than dwellings based on cost optimal curves

	Indicative Current Requirement	Cost Optimal range	Proposed NZEB range
	kWh/m2/yr	kWh/m2/yr	kWh/m2/yr
Retail AC	726	227-338	200 -260
Hotel AC	507	243-330	243-285
NV Office	247	35-103	35-70
AC Office	366	101-179	100-135
Primary	111	8-80	40-50

school			

3.2.1 Offices

Ireland has recently completed a study to develop cost optimal calculations and a gap analysis for buildings other than dwellings in order to -

(a) fulfil the requirements of Article 5 of Directive 2010/31/EU on the energy performance of buildings (recast), and

(b) inform the review to Part L (Buildings other than dwellings) of the Building Regulations that is proposed to commence the first half of 2013.

The outcome of the cost optimal study provides the advice necessary to support a suite of robust recommendations aimed at achieving an average 40% plus improvement in the energy performance of buildings that fall within the category of office.

Figure 2 and Figure 3 show the results of the cost optimal study from a macroeconomic perspective for a naturally ventilated and air conditioned offices respectively. The red line indicates the current performance required for a typical reference building. The lowest point on the curve represents the lowest lifecycle cost for a particular solution. A range on the left hand side of the curve as indicated in Table 5 has been selected to indicate the possible nearly zero energy building range. This shows the potential for significant improvement within the cost optimal range in 2014 for offices.

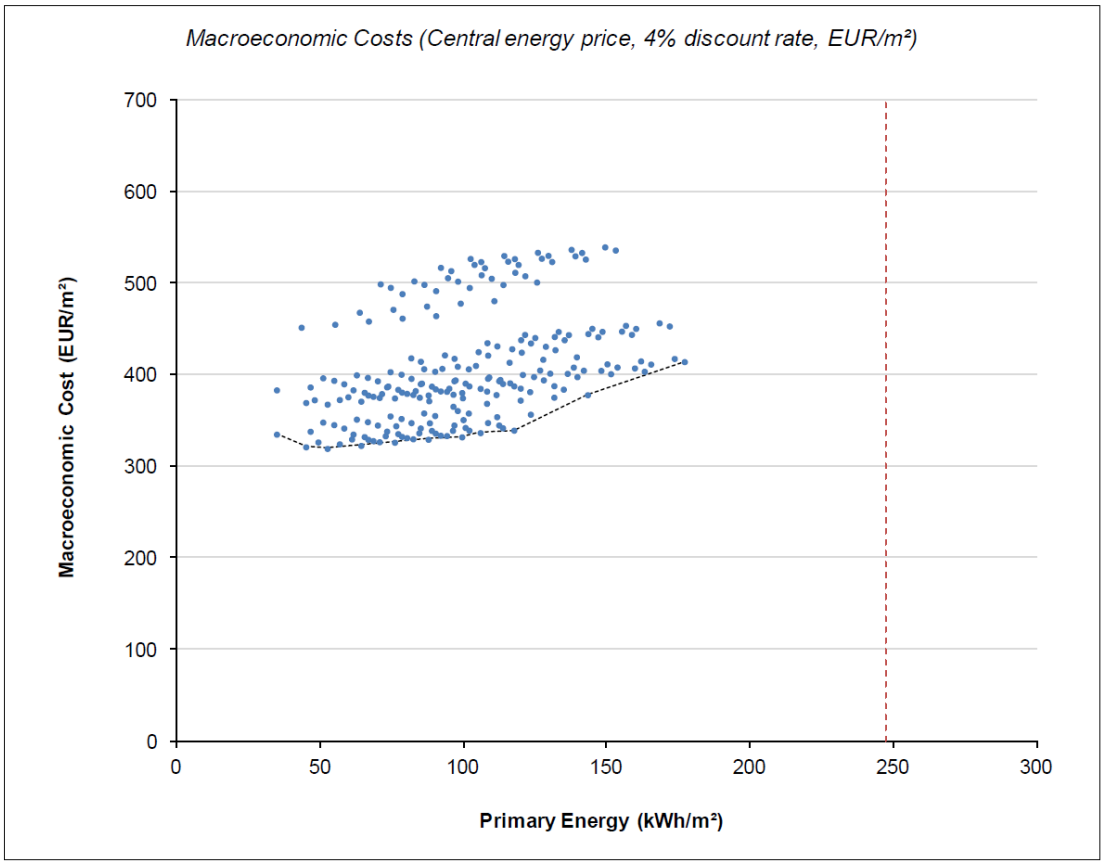


Figure 2: Results of Cost Optimal analysis for naturally ventilated offices

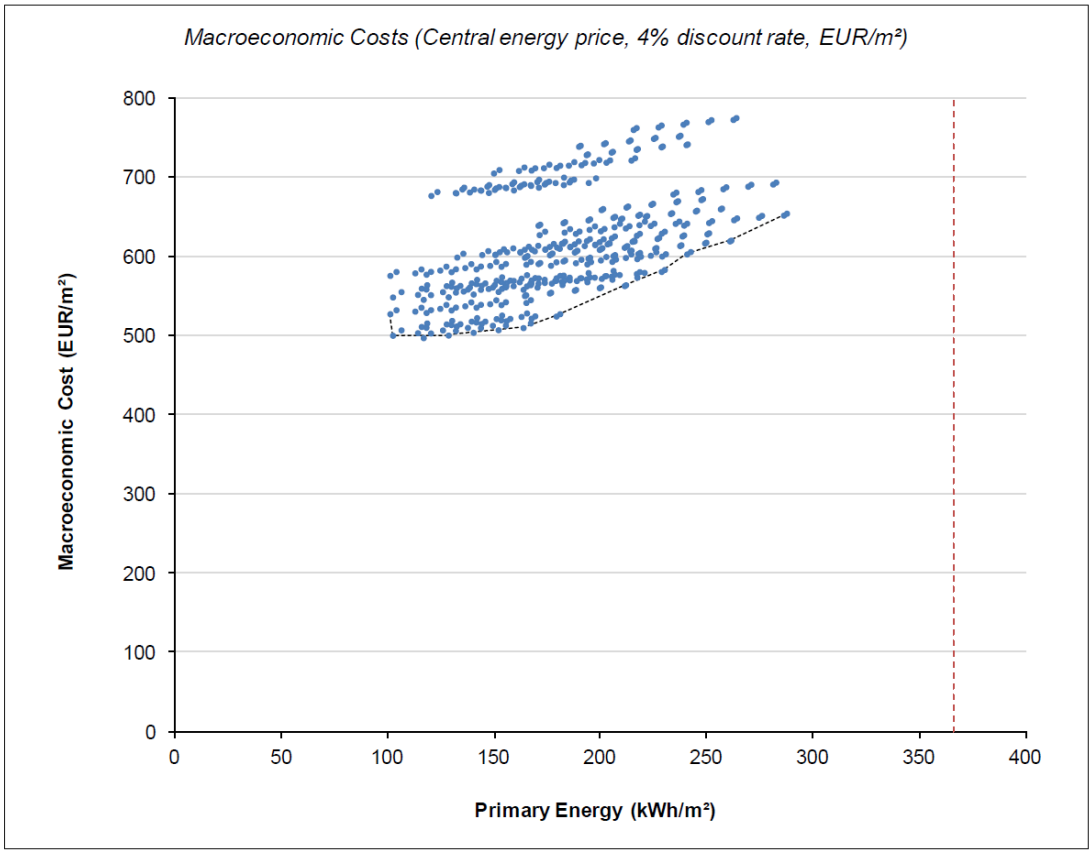


Figure 3: Results of Cost Optimal analysis for air conditioned offices

The proposed review to Part L (Buildings other than dwellings) is due to conclude in 1st half 2014 and will also be informed by a public consultation. Transitional arrangements to cater for buildings already within the planning system will be provided in accordance with the arrangements that apply under Ireland's building code.

A further review to Part L (Buildings other than dwellings) is proposed for 2018 which will aim to achieve an approximate 60% aggregate improvement in the energy performance of buildings that fall within the category of office by 31st December 2020.

Further research is needed in the area of office building design and the performance levels will be informed by cost optimal calculations. Current studies show that the most effective improvements for office buildings are in the areas of services-improved specific fan powers, lighting efficiencies and controls, reduced air permeability, reduction of solar gain and photovoltaics[8][9].

[8] Target Zero Guidance On The Design And Construction Of Sustainable, Low Carbon Office Buildings.
[9] Proposed changes to Part L (Conservation of fuel and power) of the Building Regulations 2012/13 in England Consultation stage impact assessment.

Air-conditioning is a highly intensive energy load. The climate in Ireland is such that outside air cooling should be viable in most buildings as free cooling. Where free cooling is available this has the potential to significantly reduce the energy consumption of traditional air conditioned buildings[10][11][12].

3.2.2 Educational Buildings

In the context of the current Part L (Buildings other than dwellings) of the Building Regulations (2008), the requirements of Regulations L1 and L4 respectively together with the technical guidance provided in Technical Guidance Document L – Conservation of Fuel and Energy – Buildings other than dwellings (2008) applies equally to both all non-domestic buildings that fall within the scope of Ireland's Building Regulations. Accordingly, the achievement of nearly zero-energy within the private educational sector will mirror the process as set out in paragraph 3.3 (Offices) above. Based on the current performance of 60kWh/m^2/yr for primary schools and the cost optimal curves lowest lifecycle cost of 60kWh/m2/yr for primary schools it is anticipated that an indicative value in the region of 55-60 kWh/m^2/yr will be the intermediate target for primary schools. This will be further assessed in the development of TGD L Buildings other than Dwellings 2014.

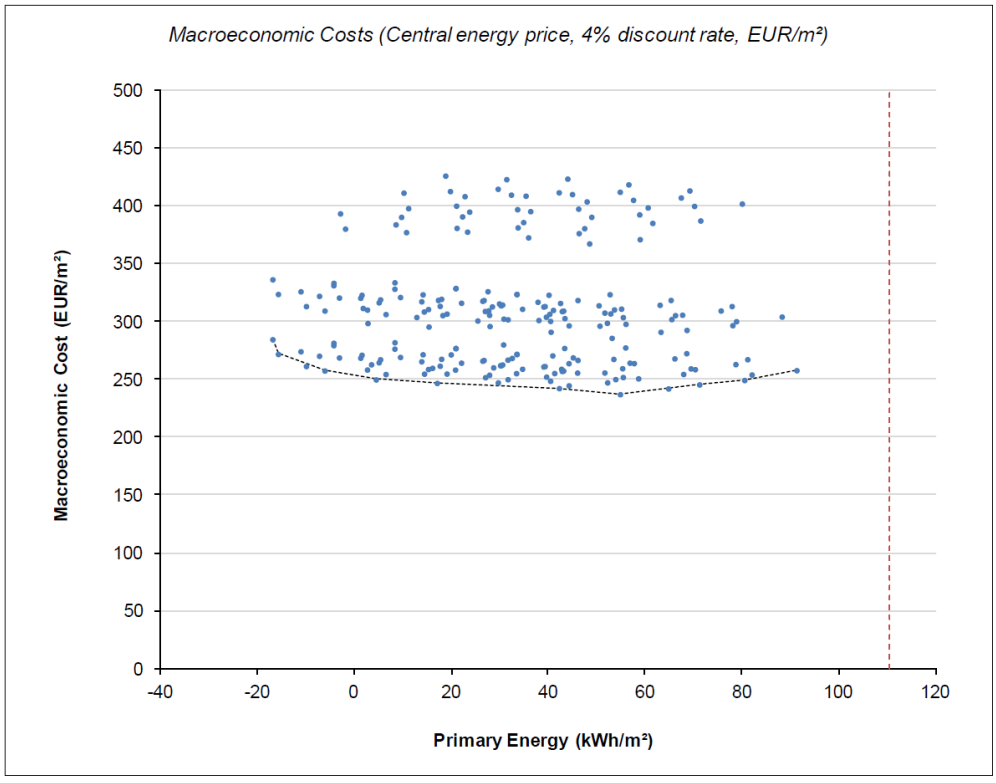


Figure 4: Results of Cost Optimal analysis for primary schools

[10] http://www.enob.info/en/analysis/analysis/details/performance-of-buildings-across-the-year/
[11] Olsen, E.L. and Chen, Q. 2003. "Energy consumption and comfort analysis for different low-energy cooling systems in a mild climate," *Energy and Buildings*
[12] Air conditioning Maximising comfort, minimising energy consumption, Carbon Trust 2007.

3.2.3 - 3.2.7 Hospitals, Hotels and Restaurants, Sports Facilities, Wholesale and Retail Trade and Miscellaneous

In the context of the current Part L (Buildings other than dwellings) of the Building Regulations (2008), the requirements of Regulations L1 and L4 respectively together with the technical guidance provided in Technical Guidance Document L – Conservation of Fuel and Energy – Buildings other than dwellings (2008) applies equally to all non-domestic buildings that fall within the scope of Ireland's Building Regulations. Accordingly, the achievement of nearly zero-energy within the private hospital, hotel and restaurant, sports, retail sectors will mirror the process as set out in paragraph 3.3 (Offices) above.

Having regard to certain sector specific considerations, the following points are relevant: -

- given the high heat load in hospitals, improvements in fabric performance and the supply of heating from low carbon or renewable sources appear to be viable options. Further analysis of cost optimal calculations and demonstration projects will further inform performance in this category; and

- given the high heat load in hotels and restaurants, improvements in fabric performance and the supply of heating from low carbon or renewable sources appear to be viable options. Further analysis of cost optimal calculations and demonstration projects will further inform performance in this category.

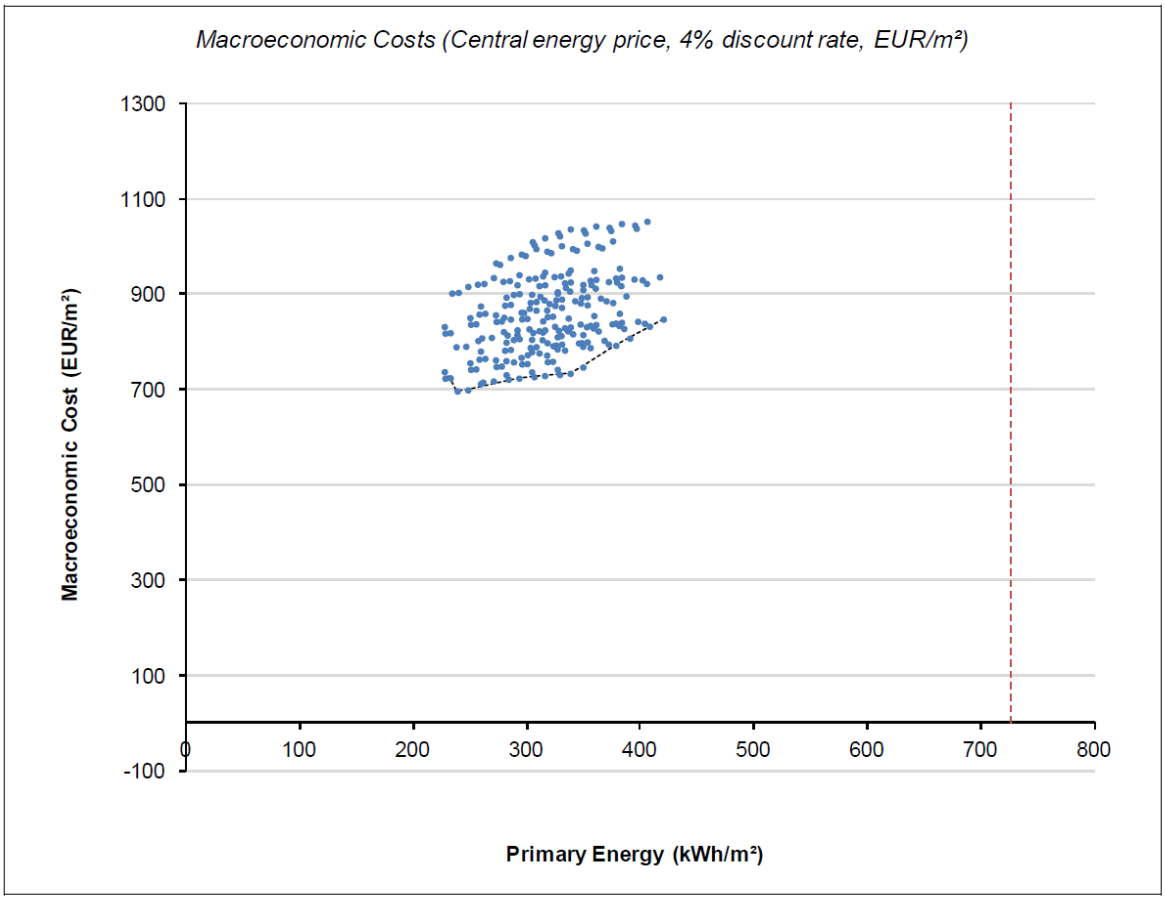


Figure 5: Results of Cost Optimal analysis for retail buildings

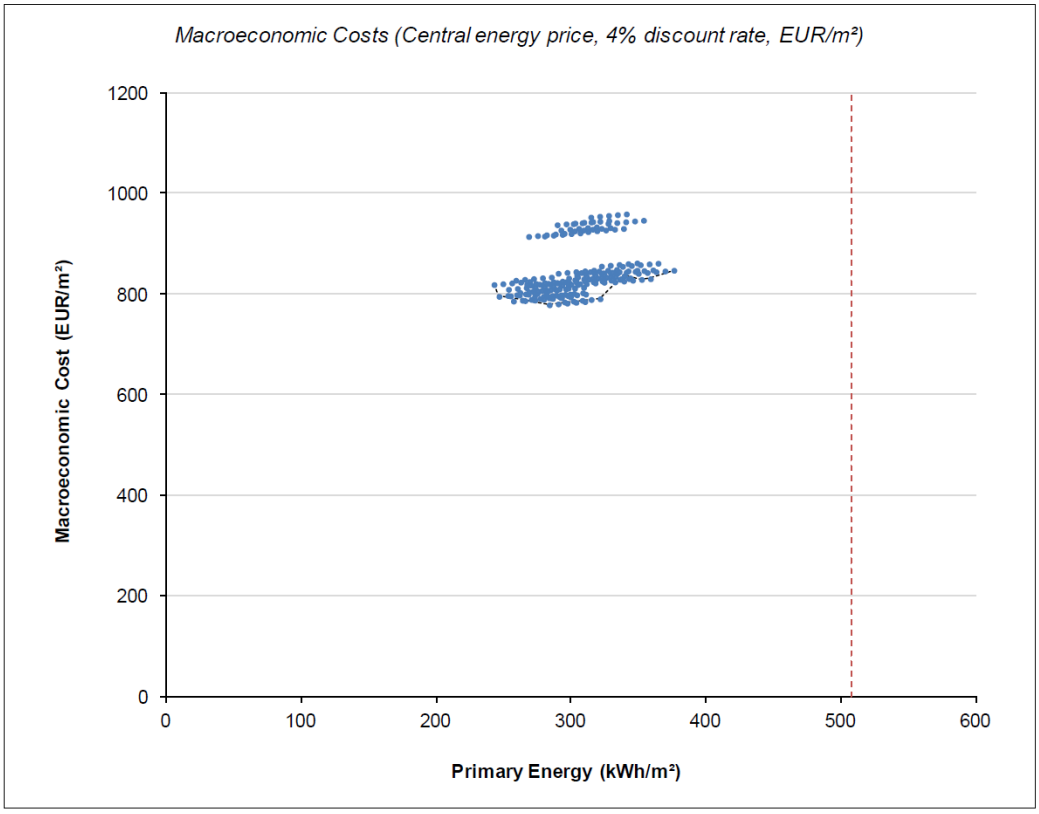


Figure 6: Results of Cost Optimal analysis for hotels

SECTION 4 - TARGETS – PUBLIC BUILDINGS

4.1 General

The approach for buildings other than dwellings in the public sector will be the same as that for all buildings other than dwellings as described in Section 3.1. Public sector buildings will lead by example by achieving their defined nearly zero energy standard two years in advance of the private sector. The NZEB standard will be developed at least two years in advance of 2020 in order for the public sector to adopt it. For the 2014 Part L regulations, it is normal practice to apply a two year transition period. Again public buildings will lead by adopting a one year transition period.

4.2 Offices

Effective energy efficient design strategies should be incorporated in all public sector projects at the early design stage, so that energy efficiency and other environmental measures are incorporated into the project from inception. Passive design strategies should be incorporated and prioritised in all new build projects and, where practical, in existing building projects. This will support the realisation of specific targets, e.g. achieving the desired Building Energy Rating (BER) in the most efficient manner.

The procurement procedures for consultants, including architectural and engineering design services, will include both qualitative and quantitative assessment criteria and demonstration of consultants' environmental design experience and/or qualifications. The assessment criteria will be proportionate to the nature, size and complexity of the project. All buildings will be designed and constructed to comply with all Parts of the Building Regulations.

The BER methodology will be used to assess new buildings. In addition, for public buildings above a certain floor area, a further energy rating is required in the form of an annual Display Energy Certificate which shows the actual energy consumed in the building compared to a benchmark on a scale from A1 to G. The Display Energy Certificate is intended to encourage public authorities to adopt environmentally responsible and efficient use of energy in buildings. They will be used to monitor on-going energy use and assess the effect of renovation works and energy management initiatives.

Under Ireland's European Communities (Energy End-use Efficiency and Energy Services) Regulations 2009 (S.I. No. 542/2009), public bodies are required to only purchase

or lease buildings with a BER of B3 or higher (from 1st January 2012) and A3 or higher (from 1st January 2015) unless specified exemptions are invoked. In addition, the European Communities (Renewable Energy) Regulations 2011 require public bodies to fulfil an exemplary role (in the context of Directive 2009/28/EC on the promotion of the use of energy from renewable sources) when constructing or renovating public buildings after 31st December 2011.

Reusing existing buildings will, subject to positive environmental outcomes, be given priority over new-build construction. Available best practice will be utilised in respect of refurbishment projects. When retrofitting for energy efficiency, public bodies will consider using Energy Performance Contracting or similar models, if available, which may also be accompanied by third party finance to avoid up-front capital costs and any negative cash flow burden on the public body.

The 2010 publication *Energy Efficiency in Traditional Buildings* advises on best practice in respect of traditionally built buildings, and the ways in which historic buildings can be sympathetically altered to improve their energy efficiency. In addition, the Office of Public Works has developed best practice in relation to: treatment of historic buildings, retrofitting of services, and recommended strategic approaches. The traditionally constructed solid masonry walled buildings which comprise a majority of the country's historic building stock require specialist attention and advice to avoid damage in the attainment of particular Building Energy Ratings not only to their architectural and historical interest, but also to their fabric. However, their energy performance can be enhanced in many simple, cost effective ways and the upgrading and reuse of such buildings by public bodies will be considered in tandem with new construction.

Green procurement provides a framework that will allow the Irish public sector to play a consistent and exemplary role across its entire procurement profile. This will be an important element in driving the energy efficiency agenda in the wider context of climate change and energy policy. In terms of energy efficiency such an exemplary procurement role is legally mandated by the above-cited European Communities (Energy End-use Efficiency and Energy Services) Regulations 2009. Moreover, the European Union (Energy Efficient Public Procurement) Regulations 2011 (S.I. 151 of 2011) place obligations on public bodies relating to the procurement of energy efficient products from the Energy Efficient Equipment (Triple E) register maintained by the Sustainable Energy Authority of Ireland (SEAI). With regard to renewable energy, under the European Communities (Renewable Energy) Regulations 2011, public bodies are required to fulfil an exemplary role (in the context of Directive 2009/28/EC on the promotion of the use of energy from renewable sources) when constructing or renovating public buildings after 31st December 2011.

Key objectives of green procurement are to improve energy efficiency and to reduce energy consumption and associated costs. Public procurement ranges from the purchase of everyday supplies or services to formal tendering and placing of contracts for large infrastructural projects. As such, the scope for energy-efficiency in public procurement is vast. It ranges from the routine (e.g. purchase of an energy efficient light fitting, tendering an electricity supply contract) to the complex (e.g. outsourcing of energy services, deep retrofit via energy performance contracting).

Prior to the consideration of options for renewable energy supply, it is always advisable to improve energy efficiency. The Government is committed to energy efficiency improvements of the order of 20% by 2020, with an even more challenging target of 33% set for the public sector. No matter what the source of the energy supply, using less of it by being more efficient makes good business sense and is clearly more sustainable.

Energy efficiency will be integrated into public sector construction projects in accordance with the three-part energy efficiency procurement framework set out below. It will be evaluated from both supply and demand side perspectives. The aim will be to reduce primary energy demand, maximise delivered energy efficiency and secure energy supply in the least carbon intensive manner practicable. The three-part framework will comprise: –

- energy-using products, e.g. purchasing or leasing equipment, vehicles or buildings as new or as replacement for existing assets;

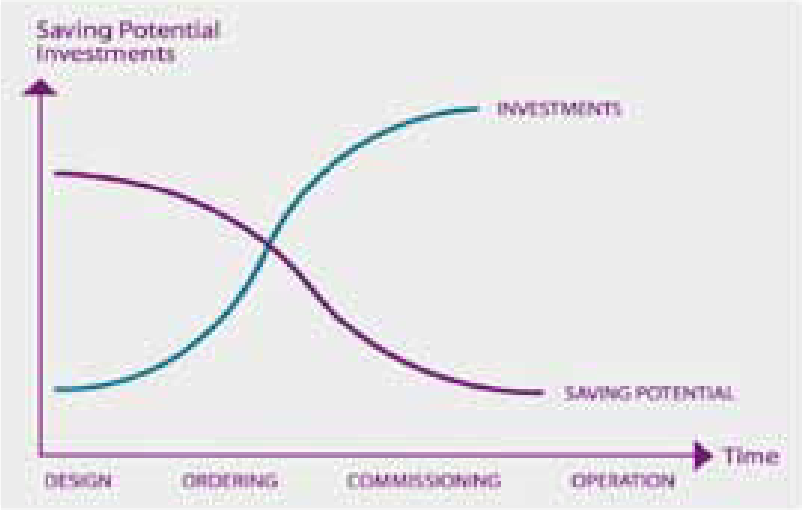
- energy services – procuring a service directly related to the use of energy within the organisation, e.g. design and implementation of energy-efficiency retrofit works or an onsite power generation solution, provision of energy supplies in the form of fuel or power;

- capital projects, e.g. constructing a new building, wastewater plant, hospital or light rail system.

The use of model contracts can facilitate the integration of energy efficiency into the public procurement of energy, energy services and capital projects. These model contracts provide a framework for the implementation of innovative approaches to energy efficient procurement. Where appropriate, therefore, public bodies will procure products, services and capital works using model forms of contracts, such as those developed by the National Procurement Service, the Sustainable Energy Authority of Ireland or the Department of Education and Skills.

Having particular regard to buildings, it pays to both consider and integrate energy efficiency at the earliest possible stage in capital projects. Figure 7 below illustrates how energy saving potential is much greater if identified in the design phase – and how investment to achieve energy efficiency is much reduced if made during this stage. As well as being more cost-effective, it is also easier if energy efficiency is integrated into capital projects from the outset.

Figure 7: Energy saving potential at design stage



Energy Efficient Design (EED) is a methodology that facilitates the design, construction and management of projects so that they consume the minimum quantity of energy during subsequent operation. EED should always be driven by a sound business case, and should represent an optimum balance between project capital investment expenditure and operational energy and other costs. In addition, it should either achieve a lower capital cost than less efficient alternatives, or else seek a prudent payback period when operational savings are accounted for. The benefits of EED include: -

- it saves money by reducing energy usage arising from projects in the operational phase;

- it saves money by reducing capital costs in both utilities and processes; and

- it provides a framework for saving even more money through the development of energy management systems for new projects.

A range of national guidelines is in place to assist public bodies in integrating energy efficiency into the design of projects and to align contractual arrangements with best practices in energy management. For example, contracts for capital projects should always

incentivise the maximum possible energy efficiency on the part of those with responsibility for the design, procurement, operation and maintenance of significant public sector energy using projects. In seeking to maximise their own interests, contractual parties will improve the energy performance of the entire system/project. In light of the above, public procurers should adhere to the following:

- public bodies procuring capital are strongly encouraged to seek advice on energy efficient design at the earliest possible stage in the project's planning.

- public bodies should incorporate the principles of Energy Efficient Design at the design stage of capital projects.

- when procuring capital works, public bodies should follow the guidance set out in the national guidelines on energy efficient procurement for capital projects, including the Guidelines for the Appraisal and Management of Capital Expenditure Projects in the Public Sector.

4.3 Educational Buildings

In Ireland, the Minister for Education and Skills is responsible for policy planning, quality assurance, resourcing, regulation and evaluation in the matters of education and training. Currently, there are a little over 3,300 primary schools, approximately 730 post primary schools and some 33 third level institutions which are aided by the Department of Education and Skills. The Department is also responsible for the delivery of the Government's *School Building Programme* which is prioritising over €2 billion in investment in school buildings over the next five years.

In the context of schools, Ireland's Department of Education and Skills has been at the forefront of design with respect to sustainable energy efficiency in school buildings and this performance has been recognised at both national and international level with sustainable energy awards for excellence in Design and Specification. Low energy design has been incorporated in school design on a hybrid basis by maximising natural resources and utilising technologies. Maximising natural resources involves focusing on areas such as passive solar design, good natural daylight, natural ventilation and air infiltration. The Department has focused on utilising technologies in a number of areas including heating, lighting, water efficiency and air tightness testing, which are incorporated in the Department's technical guidance documents used for the design and building of schools.

Policy in the Department of Education and Skills is supported by a strong research programme with thirty nine research projects at various stages including the website

www.energyineducation.ie which is a joint partnership with the Sustainable Energy Authority of Ireland aimed at promoting low energy design and energy management and reduction in use to designers, school managements, teachers and students.

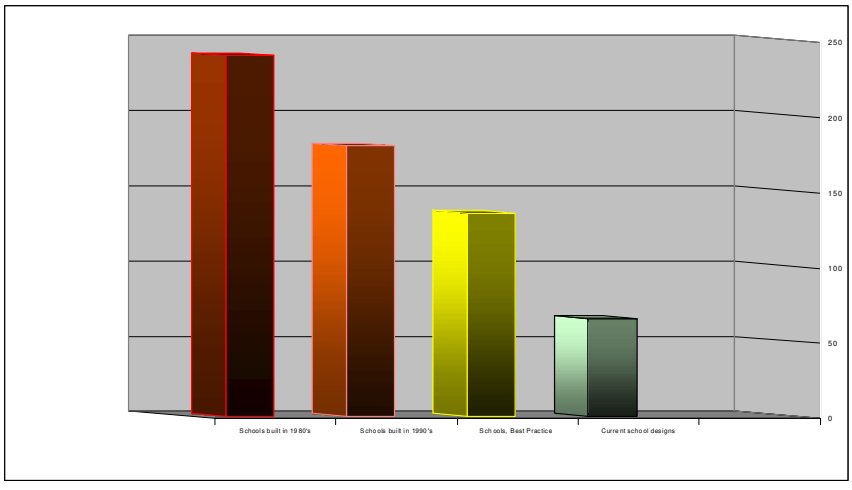
The Department has developed a number of key areas and these have formed the basis of all new school design and major refurbishment projects. These have included tighter development of passive solar design, natural day-lighting to a standard of between 3.5 and 4.5 Daylight Factor and natural ventilation and air infiltration control. The standard for air tightness was set initially at $5m^3/hr/m^2$; the Department is currently testing a higher standard of $3m^3/hr/m^2$ at 50 paschal and of $0.9m^3/hr/m^2$ on a number of research projects.

Post primary and primary schools that are designed and built in accordance with the Department's technical guidance documents (TGDs) must achieve an A3 Building Energy Rating and are capable of being more than twice as energy efficient than schools built to best international practice. Specific energy efficiency in existing schools was targeted also in 2009 with the attic and cavity wall insulation scheme and in 2010 with the water conservation scheme, all devolved projects must also comply with the Departments technical guidance documents.

All new technologies and approaches are tested to ensure compatibility with school design and operational requirements. Successful and repeatable results are then incorporated into all new school designs and refurbishments.

In the interest of sustainability, the potential of renewables will be maximised in school design although it is critical that renewable applications are properly suited to the needs of schools rather than applied for the sake of having a renewable tag on a school. It is also critical that the demand for energy is minimised before further investment takes place in renewable energy applications. The Department of Education and Skills has been using test schools to evaluate the suitability of renewable energy options for schools for the past seven years. Over 40% of the research programme features renewable aspects.

Figure 8: Energy used in Primary Schools $kWhr/m^2/year$



In terms of planned future actions over the short term (i.e. to 2014), the Department of Education and Skills, through its energy research and development policy, has increased energy efficiency in school buildings dramatically, in particular over the past seven years and this policy will continue to improve energy conservation into the future. Specific feedback from the various research strand projects will be monitored and included where feasible in ongoing school design with the aim of increasing the energy efficiency of future school buildings beyond the current high levels.

With regard to the possibility of a Retrofit Programme, preliminary analysis suggests that the majority of the school sector market may not prove attractive to the private sector seeking a commercial return on investment for energy upgrades. This is due to the combination of a number of issues, namely, school short operation hours, relatively short number of operational days, low ratio between energy bills and required investment and relatively small scale particularly in the primary sector along with geographical and management diversity. This is something that will need to be borne in mind as will the potential for customised Energy Service Company (ESCO) models for schools taking into account financing models including a possible mix of private sector and central Government funds, returns on investment etc. Despite the obvious challenges, it is desirable that an appropriate model is developed for the education sector and this is one of the tasks being undertaken by the national energy performance contracting (EPC) group being led by the Department of Communications, Energy and Natural Resources; the output of which will be an approved EPC procurement methodology for public sector bodies.

In addition, while the Government is commencing a capital review, given the severe demographic challenge and requirement for the provision of significant new school places over the next eight years, it will be very challenging to find funding for a school retrofit programme.

Post 2014 to 2020, the medium to long term goals of the Department of Education and Science will be to continue to reduce energy consumption in a cost effective and affordable manner in future schools buildings. The Department's passive house research strand is one area of focus that will address potential requirements for new buildings to consume 'nearly zero' energy. The passive research strand involves the research, design and construction of two four classroom primary schools.

The outcome of this research strand has been the delivery of two quality educational facilities via an integrated team approach to a passive schools standard. However, of equal importance will be the opportunity to evaluate and encompass passive design features which will provide feedback on building construction and compliance issues that can be used in general school design. The project will also act as a life learning tool to pupils and staff and the wider community. Feedback from all of the above will inform future school design and identify the optimum level of passive design opportunities for incorporation in Irish school design standards.

The Department of Education and Skills has, through its ongoing energy research programme, reviewed the application of renewable technologies in school buildings with respect to technical, environmental, economic feasibility and operational issues. The applications tested include solar (thermal and photovoltaic), wind and biomass. The outcomes from these reviews conclude that it is not appropriate to include these renewable applications in the design of a school building at this time due to operational and management issues. In this context, it should be noted that a sustainable solution involves the matching of a sustainable resource with the end user's needs and not just the application of that resource.

In view of the above, it is critical that, in the context of schools, policies developed in relation to nearly zero energy buildings give careful consideration as to how the issue of renewables will be applied in order to ensure that such renewables provide a benefit to the school and will not become either a management, operational or financial burden.

4.4 Hospitals and Healthcare

The achievement of nearly zero-energy within the public hospital and healthcare sector will mirror the process as set out in paragraph 4.1 (General) above.

SECTION 5 – POLICIES AND MEASURES – NEW BUILDINGS

5.1 Promotion of New Nearly Zero Energy Buildings

5.1.1 Dwellings

Part L (Dwellings) of the Building Regulations (2011) already marks an important step on the road to zero energy and puts Ireland at the forefront of Member States in terms of energy efficiency standards for new dwellings. As this is an advanced level of energy performance, it is intended that this is the intermediate step and is already in place to achieve 2020 performance levels. It is proposed to develop a draft standard in 2015 which will be Irelands NZEB standard. This NZEB standard will be passed into legislation in the timeframe between 2015 and 2020.

The energy performance for a typical dwelling in compliance with Part L (Dwellings) 2011 is shown in Table 7. The performance standard is set through backstop values for the parameters specified in Annex I of Directive 2010/31/EU on the energy performance of buildings (recast) and via a whole dwelling energy performance and carbon performance parameter which equates to 60% better than Ireland's 2005 standard.

The backstop values for thermal performance and efficiencies are set at such a level as to ensure optimum passive performance of the dwelling with renewables supplying energy to meet a significant proportion of the remaining energy demand of the dwelling. These backstop values are outlined in Appendix 1.

Table 7: Typical dwelling in compliance with Part L 2011

Example Dwelling - Results		
	Dwelling heated by mains gas	**Dwelling heated by oil (with secondary heating by LPG)**
Primary energy [kWh/m^2 yr]	61	61
CO_2 emissions [kg/m^2 yr]	12	15
EPC	0.40	0.40

CPC	0.37	0.45

An important element of Part L (Dwellings) 2011 is the requirement for onsite or nearby renewables to meet the energy demand of the dwelling. The Technical Guidance Document to Part L sets this at:

- 10 kWh/m^2/annum contributing to energy use for domestic hot water heating, space heating or cooling; or

- 4 kWh/m^2/annum of electrical energy; or

- a combination of these which would have equivalent effect.

This is a key step in the roadmap towards NZEB in providing 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; Currently the above renewables requirement equates to 17% of the energy used by a typical dwelling.

As the energy performance of the dwelling improves the above requirement will increase to equate to 22% of the energy used by the dwelling. It is not intended to increase the renewable requirement for dwellings in Building Regulations; however, it is envisaged as the cost of renewable technologies drop it will become more cost effective for renewables to meet increased energy requirements for the dwellings.

5.1.2 Buildings other than dwellings

The data available to model advanced energy performance of buildings other than dwellings is limited. It is intended to have a similar level ambition as that for dwellings.

This will be achieved by optimising performance levels for fabric and services, promoting cooling through natural ventilation as an alternative to air condition and encouraging the use of renewables as appropriate. It is intended that the recently completed cost optimal study is used as reference data to inform the proposed standards for Buildings other than Dwellings. In order to achieve the same level of ambition as for Dwellings the intermediate target is proposed to be an aggregate 40% plus improvement in 2014 and an aggregate approximate 60% improvement in 2020. It is intended that by setting an ambitious target for energy performance of Buildings other than Dwellings this will necessitate the use of renewables to meet the required performance level.

5.2 Current Status

Part L (Conservation of Fuel and Energy) of the Building Regulations sets out the statutory minimum energy performance standards for new buildings. The regulations were upgraded in 2005 to provide for the introduction of the Dwellings Energy Assessment Procedure calculation methodology and software to demonstrate compliance with Part L requirements and in 2008 to provide for the introduction of the Non Domestic Energy Assessment Procedure.

The Building Energy Rating (BER) certification scheme was introduced for dwellings in 2007 and buildings other than dwellings in 2009. Under this scheme the energy certification of a dwelling is mandatory whenever a building is commissioned or offered for sale or rent.

Any new building commissioned with a floor area exceeding 1,000 m^2 is required by law to undertake a feasibility study to examine the potential for availing of alternative energy sources.

5.3 Use of Renewable Technologies

Renewable technologies are a mandatory requirement for all new dwellings refer to section 5.1.1.

5.4 Cost Optimal Improvements

Part L of the Building Regulations Conservation of Fuel and Energy for dwellings is within the cost optimal range.

Part L of the Building Regulations Conservation of Fuel and Energy for buildings other than dwellings is scheduled to be reviewed in 2nd half 2013 and 1st half 2014 to achieve cost optimal performance levels for Buildings other than Dwellings.

5.5 List of Measures

5.5.1 Dwellings

The following table outlines the key activities which are critical to maintaining and advancing progress towards achieving nearly zero energy status for new dwellings: -

Key Measure	Responsible Agency	Target Date

Driving Compliance with Building Regulations Part L 2011 through: - - Mandatory certification of Part L compliance by designers, builders and assigned certifiers.	DECLG / Local Authorities	Ongoing from March 2014
Preparation of Cost-Optimal Calculations for new Dwellings.	SEAI & DECLG	1st quarter of 2013
Build Up Skills Initiative (BUSI).	Limerick Institute of Technology, Dublin Institute of Technology, Blanchardstown Institute of Technology	Ongoing -2013
Promotion of Nearly Zero Performance Standards (see 3.1.1 above) as a voluntary standard.	DECLG	2014/2015
Amending Building Regulations Part L to require Nearly Zero-Energy Performance Standards (see 3.1.1 above) as soon as feasible to do so.	DECLG	To be reviewed annually from 2015.
Upgrading DEAP software every 2 years to take account of developments in relation to regulatory, technological, and primary energy matters.	SEAI	On and from 2014

5.5.2 Buildings other than dwellings

The following table outlines the key activities which are critical to maintaining and advancing progress towards achieving nearly zero energy status for new buildings other than dwellings: -

Key Measure	Responsible Agency	Target Date
- Building Control amendment Regulations 2012 will require lodgement of drawings, professional inspection and certification of compliance with building regulations for all significant building projects (compliance with energy efficiency and renewables requirements included).	DECLG / Local Authorities	March 2014
Preparation of Cost-Optimal Calculations for new buildings.	DECLG	1st quarter of 2013
Identification of potential energy savings and appropriate targets for different categories of buildings to inform a series of step changes for upgraded Building Regulations Part L requirements.	DECLG	Review complete by end 2013.
Amending Building Regulations Part L on phased basis to achieve	DECLG	1st step change 2014 2nd step change 2018

Nearly Zero Energy Performance Standards by 2020.		
Upgrading NEAP software to take account of developments in relation to regulatory, technological, and primary energy matters.	SEAI	On and from 2014
Build Up Skill Initiative (BUSI).	Limerick Institute of Technology, Dublin Institute of Technology, Blanchardstown Institute of Technology	2012/2013

SECTION 6 – POLICIES AND MEASURES – PUBLIC BUILDINGS

6.1 Promotion of Nearly Zero Energy

For public sector measures to promote Nearly Zero Energy Buildings refer to section 4.

6.2 Use of Renewable Technologies

Any new building commissioned with a floor area exceeding 1,000 m^2 is required to undertake a feasibility study to examine the potential for availing of alternative energy sources.

6.3 Cost Optimal Improvements

Part L of the Building Regulations Conservation of Fuel and Energy for buildings other than dwellings is scheduled to be reviewed in 2nd half 2013 and 1st half 2014 to achieve cost optimal performance levels for Buildings other than Dwellings.

Public sector buildings will lead by example by achieving their defined nearly zero energy standard two years in advance of the private sector. The NZEB standard will be developed at least two years in advance of 2020 in order for the public sector to adopt it. For the 2014 Part L regulations, it is normal practice to apply a two year transition period. Again public buildings will lead by adopting a one year transition period.

6.4 List of Measures

The following table outlines the key activities which are critical to maintaining and advancing progress towards achieving nearly zero energy targets for public sector buildings: -

Key Measure	Responsible Agency	Target Date
Obligation on all public bodies to develop and maintain energy management programmes.	DCENR	Ongoing from 2013
Public bodies	DCENR / SEAI	Ongoing from

contracting the development of capital projects with projected energy consumption in excess of 1 GWh per annum will be obligated to integrate energy efficient design principles during project development phase[13].		2013
National Energy Performance Contracting Framework - Model contracts will be developed to spearhead the deployment of Energy Performance Contracting (EPC) and Energy Service Companies (ESCos).	DCENR / SEAI	Ongoing from 2013
Any new building commissioned with a floor area exceeding 1,000 m^2 is required to undertake a feasibility study to examine the potential for availing of alternative energy sources.	DECLG	Ongoing
Energy monitoring and reporting systems will be developed to facilitate public bodies in reporting energy efficiency in their own annual reports.	DCENR / SEAI	
Develop an inventory of public sector buildings	DCENR / OPW	2013

[13] Public bodies must adhere to the overall appraisal principles and requirements of the new Public Spending Code (www.publicspendingcode.per.gov.ie)

SECTION 7 – POLICIES AND MEASURES – EXISTING BUILDINGS

7.1 Market Activation of Nearly Zero Energy

7.1.1 Irish Definition of NZEB for existing dwellings

By 2020 the target energy load for space heating, water heating, fixed lighting and ventilation in existing dwellings will be of the order of 125 to 150 kWh/m2/yr kWh/m^2/annum with a reasonable proportion of the remaining energy use of the dwelling coming from renewable energy sources onsite or nearby.

In terms of Building Energy Rating (BER) Certificates this nearly zero energy target for existing buildings equates to a BER rating of C1 or higher.

7.1.2 Current Status

Part L (Conservation of Fuel and Energy) of the Building Regulations also sets out the statutory minimum energy performance standards for existing dwellings undergoing extension, material alteration or which are undergoing conversion from a building previously used for non-residential purposes. U-values for key fabric elements in particular are now set at a reasonably good performance levels.

The Building Energy Rating (BER) certification scheme was introduced for existing dwellings in 2009. Energy certification is now mandatory whenever a dwelling is offered for sale or rent or when a homeowner applies for an SEAI-funded grant for retrofitting of energy efficient measures. The BER Certificate is accompanied by an Advisory Report, with recommendations for cost effective improvements to energy performance, allowing householders to plan for further improving the energy performance of the dwelling and saving money on their energy bills. Currently some 320,000 BER certificates for dwellings are in place (representing some 16% of the total housing stock).

Grant schemes funded by the Department of Communications, Energy and Natural Resources and administered by the Sustainable Energy Authority of Ireland (SEAI) include the Better Energy Homes Scheme for private homeowners and the Better Energy: Warmer Homes Scheme for low-income families. In addition, in 2009, the Department of Environment Community and Local Government introduced a scheme to improve the energy efficiency of the stock of social houses owned by local authorities through the investment of €20 million to upgrade vacant houses, and apartment complexes, to achieve a minimum BER

of C1, as well as a €5 million investment in a number of demonstration projects which will inform future energy efficiency improvement works.

The ongoing *Power of One* Campaign has brought the message of the importance of energy efficiency to all consumers and has provided practical steps to help the public improve their own personal energy efficiency through small changes in behaviour and choices.

Planning exemptions for renewable technologies in domestic dwellings (which enable the installation of certain exempted technologies, such as micro wind turbines, solar panels, heat pumps and biomass boilers to be installed on or within the curtilage of a dwelling, subject to certain conditions relating to siting, scale and operation) have been in place since 2007.

7.1.3 Detailed performance standards for NZEB Kwh/m^2/yr

In its *Roadmap for moving to a competitive low carbon economy in 2050*[14] the European Commission established a long-term objective of decreasing the CO_2 emission levels for the building sector by 88% - 91% in 2050, compared to 1990 levels.

Ireland's Climate Change Targets require Ireland to achieve 6,000 GWh PEE[15] of savings from the existing residential stock. This equates to 1 million dwellings making a contribution of 48kWh/m^2/yr.

To avoid a 'lock in' effect due to sub optimal improvements the target for retrofit is set such that each individual element is improved to a minimum of the cost-optimal performance level. This will ensure that if only one element is improved at each stage it will be improved at least to the cost-optimal level.

Subject to cost optimum calculations being performed the cost-optimum performance level for a whole dwelling when each element is improved to the cost-optimum level is currently estimated to be in the order of 125 kWh/m^2/yr to 150kWh/m^2/yr primary energy when calculated using the Building Regulations and Energy Performance of Buildings Directive DEAP software to EN 13790.

To bring the performance of buildings below 125kWh/m^2/yr will require the addition of renewables, active ventilation systems. Decarbonisation of the grid will also help reduce the carbon impact of existing dwellings and increase the feasibility of electrical energy efficient technologies.

[14] COM(2011) 112 final, A Roadmap for moving to a competitive low carbon economy in 2050.
[15] NEEAP

7.2 Existing Buildings other than Dwellings

7.2.1 Current Status

Part L (Conservation of Fuel and Energy) of the Building Regulations also sets out the statutory minimum energy performance standards for existing buildings undergoing extension, material alteration or conversion from a building previously used for different purposes.

The Building Energy Rating (BER) certification scheme was introduced for existing building other than dwellings in 2009. Energy certification is now mandatory whenever a building is offered for sale or rent or when a building owner applies for an SEAI-funded grant for retrofitting of energy efficient measures. The BER Certificate is accompanied by an Advisory Report, with recommendations for cost effective improvements to energy performance, allowing owners to plan for further improving the energy performance of the building and save money on their energy bills.

The Accelerated Capital Allowances Scheme [16], whose purpose is to encourage businesses to purchase plant and machinery that is highly energy efficient and thus make significant savings on energy costs and reduce carbon emissions,has provided a substantial tax incentive to industry to invest in a range of energy efficient technologies and systems.

Planning exemptions for renewable technologies in commercial, industrial and agricultural settings (which enable the installation of certain exempted technologies, such as micro wind turbines, solar panels, heat pumps and biomass boilers to be installed on or within the curtilage of a dwelling, subject to certain conditions relating to siting, scale and operation) have been in place since 2007.

7.2 Use of Renewable Technologies

Renewables are demonstrated in existing buildings other than dwellings mainly through public sector bodies.

7.3 Cost Optimal Improvements

[16] http://www.seai.ie/Your_Business/Accelerated_Capital_Allowance

Part L of the Building Regulations Conservation of Fuel and Energy for buildings other than dwellings is scheduled to be reviewed in 2nd half 2013 and 1st half 2014 to achieve cost optimal performance levels for Buildings other than Dwellings

7.4 List of Measures

7.4.1 Dwellings

The following table outlines the key activities which are critical to maintaining and advancing progress towards achieving nearly zero energy targets for existing dwellings: -

Key Measure	Responsible Agency	Target Date
Preparation of Cost-Optimal Calculations for existing Dwellings.	SEAI & DECLG	1st quarter of 2013
Revising Advisory Reports which accompany BER Certificates to highlight cost optimal measures.	SEAI	2013
Introduction of Pay As You Save (PAYS) framework to incentivise homeowner investment in energy efficiency improvements.	SEAI	2013
Build Up Skills Initiative (BUSI).	Limerick Institute of Technology, Dublin Institute of Technology, Blanchardstown Institute of Technology	2012
Publication of "Code of Practice for Retrofitting Energy Efficiency Measure in Dwellings".	DCENR / DECLG / SEAI / NSAI	2013
Amending Building	DECLG	2015.

Regulations Part L to require upgraded Energy Performance Standards for existing buildings other than Dwellings undergoing extension, renovation/alteration, or change or use.		
Upgrading DEAP software every 2 years to take account of developments in relation to regulatory, technological, and primary energy matters	SEAI	On and from 2014
Retrofit Programme of Local Authority owned stock of social housing units.	DECLG & Local Authorities	Ongoing
Consideration of minimum thermal efficiency standards in the rental sector	DoECLG/DCENR	2013
Working with industry to build capacity and develop quality of energy efficiency products and practitioners (Training Schemes, Installer Schemes, Product Certification, etc).	DECLG / DCENR / SEAI / CIF / FAS / NSAI	Ongoing
Media campaign promoting Energy Efficiency in Homes.	SEAI	Ongoing

Publication of Building Energy Rating in Advertising literature.	SEAI & DECLG	2012
Introduction of Pay As You Save (PAYS) framework to incentivise homeowner investment in energy efficiency improvements.	DCENR / SEAI	2014

7.4.2 Buildings other than dwellings

The following table outlines the key activities which are critical to maintaining and advancing progress towards achieving nearly zero energy targets for existing buildings other than dwellings: -

Key Measure	**Responsible Agency**	**Target Date**
Preparation of Cost-Optimal Calculations for existing buildings.	DECLG	1st quarter of 2013
Revising Advisory Reports which accompany BER Certificates to highlight cost optimal measures.	SEAI	2013
Developing capacity to deliver higher energy performing buildings – Build Up Skills Initiative (BUSI).	Limerick Institute of Technology, Dublin Institute of Technology, Blanchardstown Institute of Technology	2012
Amending Building Regulations Part L to require upgraded Energy Performance	DECLG	2015 &

Standards for existing buildings undergoing extension, renovation/alteration, or change or use.		2018
Upgrading NEAP software to take account of developments in relation to regulatory, technological, and primary energy matters.	SEAI	2014
Working with industry to build capacity and develop quality of energy efficiency products and practitioners (Training Schemes, Installer Schemes, Product Certification, etc).	DECLG / DCENR / SEAI / CIF / FAS / NSAI	Ongoing
Ensuring Small and Medium Enterprise sector has access to necessary supports to reap financial benefits of investment in energy management practices.	DCENR & SEAI	Ongoing
Extend Accelerated Capital Allowance products list and Triple E register to encourage energy efficient investment.	DCENR & SEAI	Ongoing
Local Energy Agencies.		

National Energy Performance Contracting Framework - Model contracts will be developed to spearhead the deployment of Energy Performance Contracting (EPC) and Energy Service Companies (ESCos).	DCENR / SEAI	2013

APPENDIX 1

Table A1: Specification for NZEB Low Energy Dwelling

Element or System	2005 Part L Building Regulation Reference Standard	2011 Part L Current Building Regulation Specification	2015-2018 NZEB Standard
Dwelling Size and Shape	Semi detached 2 storey house. Overall internal dimensions: 7m wide x 9m deep x 5.1m high. Total floor area 126m2 Rectangular shape with no irregularities.		
Opening areas (Windows & doors)	25% of total floor area. The above includes one opaque door of area1.85m2, any other doors are fully glazed.		
Walls	U = 0.27 W/m2K	U = 0.13 W/m2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK	U =0.15 W/m2K eg 150mm Cavity wall with100mm Cavity insulation of conductivity .022W/mK & 40mm Insulated Board of conductivity .022W/mK
Roof	U = 0.16 W/m2K	U = 0.11 W/m2K e.g. 360 mm insulation of conductivity 0.04 W/mK, between	U = 0.14W/m2K eg 280mm insulation of

		and over ceiling joists	conductivity .04W/mK between & over joists
Floors	U = 0.25 W/m2K	U = 0.14 W/m2K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK	U =0.15 eg slab –on-groun floor with 110mm insulatio of conductivity 0.023W/mK
Opaque door	U = 3.0 W/m2K	U = 1.5W/m2K	U = 1.5W/m2K
Windows & Glazed doors	U = 2.2 W/m2K Double glazed, low-E hard coat Frame factor 0.7 Solar energy transmittance 0.72 Light transmittance 0.80	Double glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 1.3 W/m2K, solar transmittance = 0.63)	Triple glazed low E (En= 0.05, soft coat) 16mm gaps both argon filled, PVC frames (U = 0.8 W/m2K,)
Living area fraction	25% of total area	25% of total area	25% of total area
Shading and Orientation	All glazing orientated E/W; Average overshading	All glazing orientated E/W; Average overshading	All glazing orientated E/W Average overshading
Number of sheltered sides	2	2	2

Allowance for Thermal Bridging at junctions	0.11 x total exposed surface area (W/m2K)	0.05 x total exposed surface area (W/m2K)	0.04x total exposed surfac area. (W/m2K)
Internal heat capacity Category.	Medium	Medium	Medium
Ventilation system	Natural Ventilation with intermittent extract	Natural Ventilation with intermittent extract	Mechanical ventilation with heat recovery 85% efficiency.
Air permeability	Infiltration due to structure 0.5ac/h (10m3/m2/h)	Infiltration due to structure 0.35ac/h (7m3/m2/h)	Infiltration due to structure 0.15ac/h (3m3/m2/h)
Chimneys	1	None	None
Open flues	None	None	None
Extract Fans	3	3	1
Draught Lobby	None	1	None

Primary Heating Fuel (Space and water)	Gas	Gas	Gas
Heating System	Boiler & radiators water pump in heated space	Boiler & radiators water pump in heated space	Boiler & radiators water pump in heated space
Boiler	Gas Boiler 78%	Gas Boiler 91.3%	Gas Boiler 91%
Heating System Controls	Programmer + room thermostat + TRVs boiler interlock	Time and Temperature Zone Control	Time and Temperature zon controls
Hot Water System	Stored hot water, heated by boiler separate time control for space and water heating	Solar water heating system with evacuated tube collector of aperture area = 5.0m2, _0 = 0.6, a1 = 3.0 W/m2K, facing SE/SW at 30 degrees and unshaded, twin coil cylinder 330 litre with 100 mm insulation Remainder of demand met by space heating boiler, separate time control forspace and water heating, cylinder temperature controlled by thermostat	Solar water heating system with evacuated tube collector of aperture area = 5.0m2, _0 = 0.6, a1 = 3.0 W/m2K, facing SE/SW at 3 degrees and unshaded, tw coil cylinder 330 litre with 100 mm insulation Remainder of demand met by space heating boiler, separate time control forspace and water heating cylinder temperature

			controlled by thermostat
Primary water heating systems	Primary pipework uninsulated cylinder temperature controlled by thermostat	Insulated primary pipework between boiler and cylinder	Insulated primary pipework between boiler & cylinder
Secondary Space heating	Open fire	Gas fire, closed front, fan assisted, balanced flue – efficiency 80%	Biomass wood pellet stove closed front, 72% efficienc
Low Energy Light Fittings	None	100%	100%

Table A2: Backstop values for New Dwellings to Current Building Regulations Part L 2011

Table 1	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 as set out in Table 2.*

Maximum permitted Air Permeability $7m^3/hr/m^2$