European national strategies to move towards very low energy buildings

Wittchen, Kim Bjarne; Thomsen, Kirsten Engelund

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Statens Byggeforskningsinstitut
AALBORG UNIVERSITET

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Kirsten Engelund Thomsen, SBi
Kim B. Wittchen, SBi
EuroACE

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[1] The WG in EuroACE following the project consisting of: Susanne Dyrbøl, Rockwool International (DK), Trine Albæk, Danfoss (DK), Kurt Emil Eriksen, Velux (DK), Rick Wilberforce, Pilkington (UK), Marleen Baes, Huntsman (BE) and Monique Levy, Saint Gobain Isover (FR).

Introduction

Within the framework of EuroACE (European Alliance of Companies for Energy Efficiency in Buildings) a questionnaire survey was conducted. The aim of this survey was to uncover the current status in the European Member States regarding very low energy and passive buildings – in the following denoted v*ery low energy buildings*. In the context of this survey, both types are intended to indicate buildings that are designed to provide a significantly higher standard of energy efficiency than the minimum required by national Building Regulations. The questions were about the existence of definitions of low energy building and the supporting legislation for promoting very low energy buildings.

This project supports the Commission as stated in the Commission's Action Plan for Energy Efficiency from October 2006: "For new buildings, the Commission will also by the end of 2008 develop a strategy for very low energy or passive houses in dialogue with Member States (MS) and key stakeholders towards more wide-spread deployment of these houses by 2015. The Commission will set a good example by leading the way, as far as its own buildings are concerned."

The Commission is interested in the outcome of this EuroACE project as it covers a crucial item of the forthcoming activities of the Commission on the energy efficiency of buildings. The outcome of the project may feed into forthcoming political decisions by the Commission.

The content of this report follows the order of the questions given in the questionnaire.

The questionnaire was circulated in the autumn 2007 to representatives from the 27 Member States of the European Community plus Croatia, Norway, and Switzerland. Among these countries, 22 answers were returned from: Austria, Belgium (Flanders), Bulgaria, Cyprus, Czech Rep, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy (Piedmont), Luxemburg, Netherlands, Poland, Romania (Bucharest), Slovakia, Sweden, United Kingdom (England & Wales), Norway, and Switzerland. No reply from Greece, Latvia, Lithuania, Malta, Portugal, Slovenia, Spain, and Croatia.

In some countries there is a special situation as the legislation regarding minimum requirements for building energy performance is defined on regional level. This means that definitions for very low energy buildings may differ from region to region. These countries are: Belgium, Spain, Italy, and Romania.

In the questionnaire non-governmental organisations (NGOs) were used as a general explanation of the organisations that are not directly anchored in governmental legislation, e.g. local energy supply companies, grass root organisations, self-appointed certification bodies (even if they have gained more or less official status), etc.

From the responses it was possible to get an overview of the current status for very low energy buildings in Europe. The answers have been analysed in the best possible way and supplemented by knowledge from the project group. The full questionnaire is given in Annex 1.

Sincere thanks to all the persons who kindly helped us with national information for this survey.

Content

Summary

The low energy building definition was introduced at various times across Europe. Some countries have even had different definitions of low energy buildings at different periods of time.

The 22 answers received included 7 countries with an existing official definition and 7 countries with a planned official definition. Four countries have "only" an existing non-governmental definition. Four countries have both existing official and non-governmental definitions of low energy buildings.

The following countries have an official definition concerning very low energy buildings: Austria, Czech Republic, Denmark, Finland, France, Germany and United Kingdom (England and Wales).

Even though the calculation methods are in accordance with the definitions in the EPBD and thus the relevant CEN standards, there are national deviations that make a cross-country comparison of the calculated energy performance difficult.

One way of promoting very low energy buildings is by various direct or indirect actions that make these kinds of buildings more attractive. The most popular support for low energy buildings is e.g. loans with low interest rates to finance low energy buildings. This is done either by means of official subsidies or via private investment organisations. Another possibility is lower taxes for low energy buildings or the introduction of CO_2 taxes. Furthermore mandatory certification schemes are expected to promote very low energy buildings by introduction of grades restricted to buildings with very high energy performance.

It is important to stress the need for MS to introduce a national or regional definition of very low energy buildings in their building regulation and to develop a national strategy towards this level of energy performance to become the standard. This market transformation is a big challenge for the partners in the building sector and has just started the “learning curve” from being a concept of very low energy houses as a “grass-root” concept to becoming an official requirement in a very short time.

It is important that the European Commission initiate actions to follow the ambition in the EU Action plan – to develop an EU strategy towards very low energy houses. The current recast of the EPBD is an opportunity, which must not be missed to introduce the requirement to MS to define very low energy buildings and a national strategy towards this level of energy performance.

A strategy for improved energy efficiency of existing buildings is a necessity if the energy consumption is to be reduced significantly over a limited period of time. The life time of buildings ranges from 50 to 100 years and improvement of the existing building stock will thus have much higher impact than the tightening of requirements for new buildings. Belgium (Flanders) plans tighten the requirements for existing buildings.

Most countries have planned revision of their legislation within the next 5 years, and a few countries have also targets for new energy requirement in 2015 and 2020. A long-term objective is an effective instrument to achieve highly energy efficient buildings, as well as a valuable tool and guideline for the construction sector.

Definition of a very low energy building

The definition of very low energy buildings varies significantly across Europe even though the EPBD (Energy Performance of Buildings Directive) give guidelines for the calculations. The variation exists not only in terms of the absolute level of energy consumption in a low energy building, but also the deviation from the minimum requirements as stated in the national Building Regulations (see *Technical issues*). Further the national calculation methods vary from country to country, which makes it rather complicated to compare the absolute values of the energy requirements. The EU project ASIEPI (*ASsessment and Improvement of the EPBD Impact (for new buildings and building renovation*), 2007-2010, will make a benchmarking method in order to compare the current energy performance requirement levels in the MS and to make it possible to follow the evolution of the requirements over time. Therefore it was not the intention of this study to compare the absolute level of requirements for the different definitions used.

Current status of the definition

The status of the definition of low energy buildings in the MS is an interesting subject in the pursuit of low energy buildings in the EU. The question asked was: Does your country have a definition (official or non-governmental (NGO)) of a Low Energy Building or a Passive Building that is significantly better than the minimum requirements?

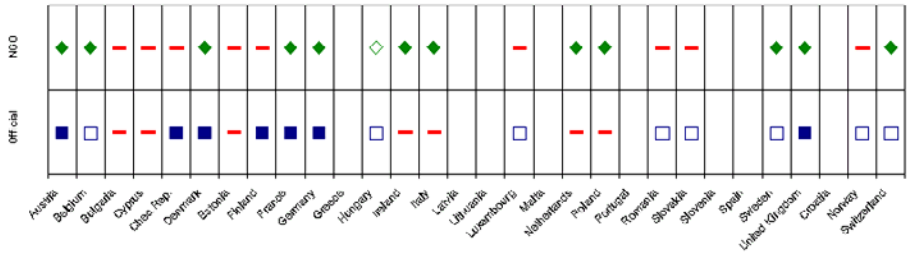


Figure 1. Countries with an existing (filled symbol) or planned (outlined symbol) definition for very low energy buildings (official or NGO definition). Countries without a definition, but which returned the questionnaire is marked by a dash (-). In total 4 MS have existing both official and NGO definitions of very low energy buildings.

Figure 1 shows that 7 countries have an existing official definition and 7 countries have planned an official definition. Five countries have "only" an existing NGO definition without any known plans for introducing an official definition. Four countries have both existing official and NGO definitions of low energy buildings.

The 7 official definitions of very low energy buildings exist in the following countries: Austria, Czech Republic, Denmark, United Kingdom (England & Wales), Finland, France, and Germany.

The planned official definitions are in: Belgium, Luxembourg, Romania, Slovakia, Norway, Sweden, and Switzerland. Though Sweden plans to have a definition of very low energy buildings, it is at a very early stage.

The 5 countries with "only" NGO definitions are Hungary (planned), Ireland, Italy, the Netherlands, and Poland.

Building types

Most of the definitions of low energy buildings are intended for targeted at new buildings. There is however a definition for low energy renovated buildings in the NGO Passive House definition.

Buildings designed for different uses naturally have varying energy consumption not only because of their size, but also due to the activities in the buildings. Thus the definition of low energy buildings would naturally be different for each use of the building.

Table 1. Definition of low energy buildings applies to new (N) and existing (E) buildings and residential (R) and non-residential (C) buildings. No answer to the actual question, but questionnaire returned is indicated by a dash (-). Countries shown in *italics* have not returned the questionnaire.

	Official	**NGO**	**Official**	**NGO**
Country	**New / existing**		**Residential / non-residential**	
Austria	N+E	N+E	R+C	R+C
Belgium (Flanders)	N	N+E	R+C	R+C
Bulgaria	-	-	-	-
Cyprus	-	-	-	-
Czech Republic	N+E	-	R+C	-
Denmark [1)]	N+E	N	R+C	R
Estonia	-	-	-	-
Finland	N	-	R+C	-
France	N		R+C	
Germany	N+E	N+E	R+C	R+C
Greece				
Hungary	-	N	-	R+C
Ireland	-	N+E	-	R+C
Italy (Piedmont)	-	N+E	-	R+C
Latvia				
Lithuania				
Luxembourg	N+E	-	R	-
Malta				
Netherlands	-	N+E	-	R
Poland				
Portugal				
Romania (Bucharest)	-	-	-	-
Slovakia	N	-	R+C	-
Slovenia				
Spain				
Sweden	-	N+E	-	R+C
United Kingdom (England&Wales)	N	N+E	R	C
Croatia				
Norway	N+E	-	R+C	-
Switzerland	N+E	N+E	R+C	R+C

1) A new definition for non-residential low energy buildings have been made, and will be implemented by July 2008.

Member State's low energy building definitions

The low energy building definition was introduced at various times across Europe. Some countries have even had different definitions of low energy buildings at different times. Table 2 below lists the definitions of very low energy building definitions in European countries as stated in the returned questionnaires. Energy flows included in the requirements may vary from country to country and consequently direct comparison is not possible.

Table 2. Definition of low energy building in European countries. The energy performance limits stated in this table are not directly comparable as the calculation methods differs between the countries. Countries in *italics* and with a "-" means not answered yet

Country	Definition of low energy buildings
Austria	klima:aktiv low energy building standard (30 % better than minimum requirements) and klima:aktiv passive house standard; currently voluntary standard promoted by the Federal Ministry of Agriculture, Forestry, Environment, and Water Management; in the Working Programme of the Austrian Federal Government it is stated that the klima:aktiv standard will become obligatory for receiving social housing subsidies. There is no consistent definition regarding "low energy standard"; usually low energy buildings are buildings with annual heating energy consumption (calculated demand) below 60-40 kWh/m² gross area (higher numbers for single family houses). Usually, passive buildings are defined according to passive house standard (Feist); however, this term is not used consistently, either. Passive house standard 15 kWh/m² (net area according to Feist); in Austria, the indicator 15 kWh/m² refers to useful area in Styria and to heated area in Tirol. NGO: TQ (Total Quality) Building Certification; IBO Building Pass.
Belgium (Flanders)	The definitions will be in a note from the government, not really in a regulation. A note of the government shows that all the parties in the government agree with this definition and will use the same definition if they need to. Discussion about the note was planned for November 2007. As government we wanted to have a definition based on the energy performance of buildings calculation. When using this kind of definition, it is embedded in the system of the EPB (EnergiePrestatie en Binnenklimaat = "energy performance and indoor climate"), following the same procedures. Standard for low energy houses: E60 = 60 % of minimum requirement on energy performance of a house + obligation to measure the air tightness of the house. Standard for low energy office or school: E70 = 70 % of minimum requirement on energy performance of an office/school building + obligation to measure the air tightness of the office. The standards for low energy class are set on a level that is the "economical optimum" (extra cost - savings in x year). Standard for very low energy houses: E40 = 40 % of minimum requirement on energy performance of a house + obligation to measure the air tightness of the house. Standard for very low energy office or school: E55 = 55 % of minimum requirement on energy performance of an office/school building + obligation to measure the air tightness of the office. The standards for very low energy class are set by calculating the measures that are close to the measures in a passive house on a database of 200 houses or 50 office buildings. NGO: Passiefhuisplatform vzw has his own definition of a passive house, like definition in the European PEP project (www.passiefhuisplatform.be). Passiefhuisplatform is not linked to the government, it is a private initiative. The definition is the same as the German definition outlined below.
Bulgaria	No definition.
Czech Republic	Definition is given in "Decree No. 148/2007 Coll., Energy Performance of Buildings and Czech technical standard ČSN 730540" and define: a) the requirements for energy efficiency of buildings, benchmarks and calculation methods for the determination of energy efficiency of buildings; b) the contents and the layout of the energy performance certificate of a building, including the use of previously conducted energy audits; and c) the extent of examinations to be passed by individuals with respect to the details to be included in the energy performance certificate of a building. The Decree No. 148/2007 gives the values of specific energy consumption in kWh/(m2.year) for 8 specified building types. The specific energy consumption is divided into classes (A-G rating) where the C class is reference values equal to the minimum requirement. Class B is defined as an efficient building and class A is an extremely efficient building. For a single-family house the level of energy consumption is: A: less than 51 kWh/(m^2 year) B: 51 – 97 kWh/(m^2 year) C: 98 – 142 kWh/(m^2 year) The only definition of very low energy and passive energy houses is in CSN 730540-2, part A5 where Low Energy Buildings and Passive Buildings are defined according to prof. Feist (50, resp. 15 kWh/m^2 year). In the standard there are only recommendations on how the structures should be made in case of Low energy or Passive buildings. It states that U values should be better "than recommended level" which means, that it should be better than 66 % of presently demanded U-values. For passive houses the recommendation is that the thermal loses of such a building should

Country	Definition of low energy buildings
	be less than 0.3 W/m^{2}K – according to an EN 832 calculation and additionally meet some U-value requirements for some structures: roof 0.12; and windows 0.8 W/m^{2}K .This recommendation is on the level of approx. 50 % of the present demands in the Building Regulations.
Cyprus	No definition.
Denmark	In the current Building Regulation two low energy classes are defined. Low Energy Class 2 and Low Energy Class 1. The two classes are defined as having a calculated energy performance that is 75 and 50 per cent respectively better than the minimum energy performance for new buildings. The minimum requirement for residential buildings is given by: 70 + 2200/A kWh/m² per year (A is the heated gross floor area). For other buildings the minimum requirements is given by: 95 + 2200/A kWh/m² per year. The minimum requirement for non-residential buildings includes electricity for building integrated lighting. Included in the calculated energy performance of a building is energy for heating, ventilation, cooling and domestic hot water. Further energy consumption of electricity for running the building (pumps, fans) multiplied by a factor 2.5 is being included. Additionally, a fictive cooling energy consumption, as a penalty for having too high (+26 °C) indoor temperature in the building, is included in the energy performance. This fictive amount of energy is calculated as the energy needed to bring the indoor temperature down to 26 °C using a mechanical cooling system with a COP of 2 multiplied with the electricity factor of 2.5. In other buildings than residential, electricity for artificial lighting is included in the energy performance as well. NGO: There are ongoing work related to implementation of three different low energy definitions in Denmark: BOLIG+ (www.boligplus.org) will be a dwelling fulfilling the low energy class 1 requirement (50 % below the minimum energy performance in the Building Regulation for new buildings) without production of electricity. Renewable energy must be used to reduce the consumption of fossil fuels. The building must not take more energy from the supply grid than it can deliver back. The energy that is delivered back to the grid must be at least of the same quality (usability) as the energy taken from the grid. Further the building must produce electricity for a family of electricity conscious residents (about 2100 kWh electricity per year for a family). Another group of people are working on introducing the German "Passiv Haus" standard in Denmark. This definition should follow the definition given by the Passivhaus Inttitut in Germany. A third insensitive is the Nordic Swan label for buildings. A swan labelled house meets the requirements in the Building code for a low energy house class 1 or 2. Further there is requirements regarding the quality of the house, the indoor climate, the environmental impact from building materials is minimal, use of unhealthy materials is limited, and the environment and health profile is ensured by inspection from an independent consultant.
Estonia	No definition.
Finland	In Finland a description of Low Energy Building is given in the Building Code, part D3, given in June 2007: In designing a Low Energy Building the calculated heat loss (building envelope, ventilation and infiltration should not be more than 60 % of the heat loss calculated according to reference values stated in Building Regulations. NGO: As Finland did not have any definitions of low energy building in the building code, many organisations have used almost the same definition as Denmark: Low Energy building is a building designed to achieve heating energy consumption at least 50 % lower than a building designed according to requirements set in the current Building Regulations for new buildings.
France	The “arrêté ministeriel” from 8th May 2007 defines regulatory requirements for energy performance of buildings. This arrêté defines five levels: HPE, HPE EnR, THPE, THPE EnR, and BBC. BBC means "Low Energy Consumption Building". For new dwellings: the annual requirement for heating, cooling, ventilation, hot water and lighting must be lower than about 50 kWh/m² (in primary energy) (40 kWh/m² to 65 kWh/m², depending on climatic area and altitude). For other buildings: the annual requirement for heating, cooling, ventilation, hot water and lighting must be at least 50 % lower than what required by the current building regulation for new buildings. Optional requirements: For renovation, the Grenelle de l’Environnement is likely to adopt a BBC label of 80 kWh/m^2 per year for heating, cooling, ventilation, hot water and lighting, starting in 2009. NGO: Several labels or certification schemes exist, i.e. EFFINERGIE®.The EFFINERGIE® label is issued by certifiers agreed by the State to deliver the BBC label. More info on www.effinergie.org and www.isolonslaterre.org.

Country	Definition of low energy buildings
Germany	Official definitions concerning the public subsidies for (residential) Low Energy Buildings are subject of the programs run by the (state-owned) Kreditanstalt für Wiederaufbau, Frankfurt (KfW). These programs are mainly fed by public sources. The current requirements are 60 % (KfW60) or 40 % (KfW40). In addition, there is also a subsidy program for "Passiv-Häuser", which is defined in accordance with the Passiv-Haus-Institute as "KfW-40-buildings with an annual heat demand lower than 15 kWh/m²". NGO: The Passiv Haus definition is commonly used in Germany. Heating demand less than 15 kWh/m^2 heated area per year for heating. The total annual primary energy requirement must however not exceed 120 kWh/m^2.
Greece	-
Hungary	NGO: There is some initiative, rules, definitions are under discussion. It might end up being the official definition.
Ireland	There is no official Irish definition of a low energy or passive house. As close as we can get to an official description is from the official Building Energy Rating certificate for new dwellings, with primary energy consumption calculated according to the official DEAP (dwelling energy assessment procedure) methodology: it is stated that "A1 rated dwellings are the most energy efficient" – so from this it is clear that an A1-rated house would represent a low-energy demand house. The statement is not an official definition of a low-energy house; it is just an informative description. NGO: "A house that has been designed & built to the highest level of comfort while having the minimum energy requirement. Free solar gains are maximised and heating is produced by renewable energy technologies"….source: *Buyers guide – low energy houses – Sustainable Energy Ireland Renewable Energy Information Office*.
Italy (Piedmont)	No official definition. NGO: CasaClima - Buildings with a calculated heat demand less than 10 kWh/m² per year is considered passive, and called CasaClima Gold. If this result is achieved only with natural insulation materials it is defined as Gold +.
Latvia	-
Lithuania	-
Luxembourg	Definition is given in draft "Regulation on Energy Performance in Residential Buildings" which is planned to come into force by 1st January 2008.
Malta	-
Netherlands	No official definition. NGO: The German Passiv Haus definition is being used.
Poland	Currently such definition neither exists nor is planned to be introduced in the near future. NGO: In Poland the German definition of a passive house introduced by Pasivhaus Institut in Darmstadt is being used. Taking under consideration that the meteorological conditions in winter are a little more severe than in Germany, the condition reducing the heating load in a passive house to 10W/m^2 is neglected.
Portugal	-
Romania	No definition.
Slovakia	No definition.
Slovenia	-
Spain	-
Sweden	No definition.
United Kingdom (England & Wales)	Definitions are given in "Code for Sustainable Homes" (CSH). There are six levels of the Code, with mandatory minimum standards for energy efficiency and water efficiency at each level. For example, Code Level 1 represents a 10 % improvement in energy efficiency over the 2006 Building Regulations. Code Level 6 would be a completely zero carbon home (heating, lighting, ventilation, hot water, and all appliances). Currently the Code is voluntary for private sector housing, Government is considering whether, from April 2008, all new homes should be required to have a rating according to the Code. NGO: The Code is developed from the Building Research Establishment (BRE) Ecohomes scheme.
Croatia	-

Country	Definition of low energy buildings
Norway	The Norwegian government has in a central document declared that low energy building should be the standard for new buildings. A precisely definition of low energy standard has not been given so far. Passive building is at the moment regarded as a building where the heating demand is less than 15 kWh/m² year, but a more precisely definition will be given in a new national standard in 2008.
Switzerland [1)]	NGO: Minergie: two labels exist: Minergie (42 kWh/m^2) – (as from 01.01.2009 less than 38 kWh/m²) - and MinergieP (30 kWh/m^2). Minergie is a private society and that their labels are registered trade marks. Energy consumption includes heating, hot water and ventilation. Additionally, appliances must meet certain requirements. SIA: the Swiss society of engineers and architects, which prepares and publishes Swiss building standards, will soon publish a certification scheme according to EN 15217 and 15603, EPBD-compatible. Buildings labelled "A" according to this scheme are low energy buildings, using half of the primary energy consumed by buildings complying with today's standards.

1) Energy regulation and thus tightening of the energy requirements is decided canton vice.

Political issues

Current legislation and strategies for the future

One questions asked for a description of the current legislation regarding very low energy buildings, the policy for developing national strategies and existing plans for tightening the energy requirements.

The figure below shows when official definitions (blue rhombus) and NGO definitions (orange squares) of low energy buildings were introduced. Further the triangles indicate when tightening of the energy requirements are planned.

A planned tightening of the energy requirements, as shown in the figure, do not say anything about the level of the tightening, but only about when it is planned that it enters into force.

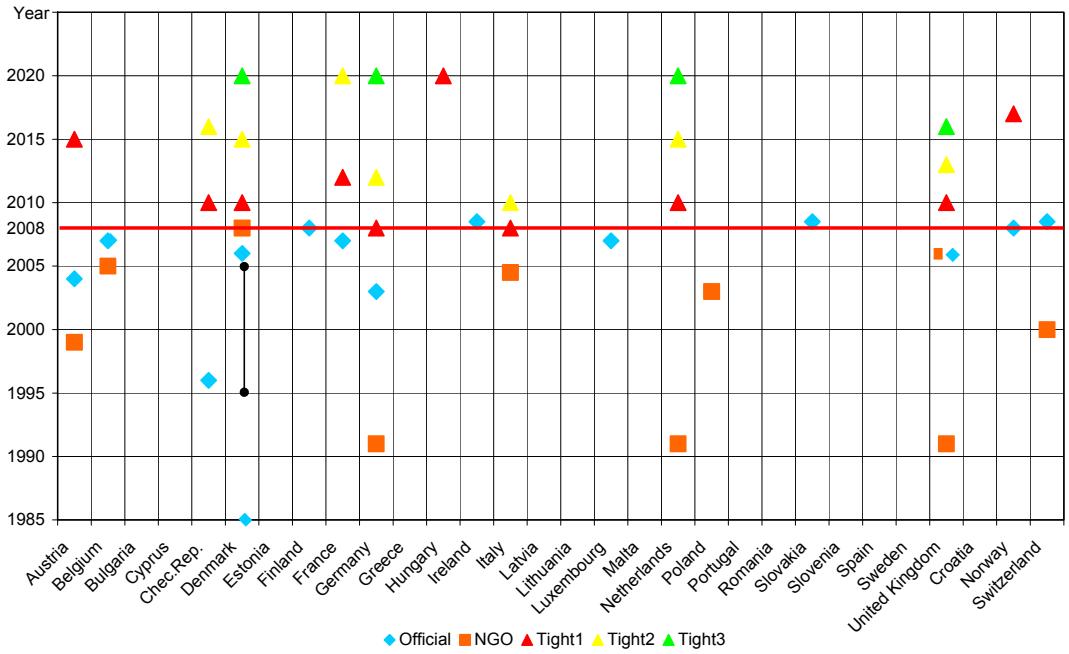


Figure 2. Introduction of a low energy building definition (official and NGO) are shown as blue rhombus and orange squares respectively. Planned tightening of the Building Regulations in the Member States are shown as triangles. The three levels of tightening in the minimum energy performance do not represent the same level of tightening for all countries. The vertical line for Denmark represents a period of time without an official definition of low energy buildings.

The EPBD states that the Member State must evaluate the national requirements for energy performance of new buildings every five years. In many countries this has been a welcome opportunity to tighten the minimum energy performance requirements.

Normally the planned tightening only covers new buildings, but Belgium (Flanders) also has plans for existing buildings.

In the table below, existing legislation regarding very low energy buildings and the planned tightening of the national Building Regulations are listed as stated in the answers to the questionnaire.

Table 3. Current legislation regarding very low energy building in European countries and planned tightening of the national Building Regulations. What targets do the countries have for developing national strategies for very low energy buildings? None of the existing low energy definitions in Europe are mandatory, but most are expected to become mandatory in future tightening of the national Building Regulations requirements. The level of tightening is given compared with the minimum energy performance of new buildings as stated in the national Building Regulations in 2007. Countries in *italics* and wit a "-" means not answered yet.

Country	Current legislation
Austria	**Existing:** The current building legislation is represented by OIB Richtlinie 6, presenting minimum requirements regarding heating energy demand (calculated values, based on the building performance, www.oib.or.at; OIB Richtlinie 6 is implemented in the building regulations of the Austrian provinces). The building legislation does not refer to low energy buildings and passive house buildings. In Austria, the share of social housing is high; social housing subsidies are linked to energy performance values; regarding new buildings the required values are below 60 kWh/m2 and year (average; there are 9 different subsidy schemes used by the Austrian provinces). Social housing subsidies have a great impact on market development for low energy buildings. Working programme of the Austrian Federal Government for the period 2007-2010 (energy check for all households in Austria; new construction: implementation of low energy and passive building standards together with the Austrian provinces; thermal renovation of all buildings dating from the period 1950-1980 until 2020; 2015: social housing subsidies will be available only for passive buildings); klima:aktiv programme (2004 ongoing: awareness creation and market development programme); further development of energy-related standards for social housing subsidies (agreement between the provinces and the federal government according to article 15a federal constitution). **Planned:** 2015: social housing subsidies will be available only for passive buildings.
Belgium (Flanders)	**Existing:** No specific legislation exists. **Planned:** There are no specific plans, except legislation will be developed for lowering of taxes for low energy buildings.
Bulgaria	**Existing:** Low Energy Buildings Regulation does not exist in the Bulgarian Energy and Energy Efficiency Legislative Framework so far. **Planned:** No initiatives are foreseen.
Czech Republic	**Existing:** Decree No. 148/2007 Coll., Energy Performance of Buildings and Czech technical standard ČSN 730540 **Planned:** The effect of low energy and passive buildings is calculated in the framework of energy savings in 2010 and 2016.
Cyprus	No **existing** or **planned** legislation.
Denmark	**Existing:** When meeting the Low Energy Classes 1 or 2, a building is not forced to be connected to the collective energy supply grid. If a new building does not meet the requirements in any of the low energy classes, it must be connected to the local collective energy supply grid (natural gas or district heating) if it exists in the area of the building site. **Planned:** Rules for Low Energy Classes 1 and 2 are already in force as optional possibilities. In 2010 it is planned that low energy Class 2 (25 % lower energy consumption than the minimum energy performance for new buildings stated in the current Building Regulations) will be the new energy performance limit in the Building Regulations. In 2015 it is assumed the low energy Class 1 (50 % lower energy consumption than the minimum energy performance for new buildings stated in the current Building Regulations) will be the minimum requirement of the Building Regulations. It is the government's target that by 2020, all new buildings use 75 % less energy than new buildings constructed according to the current Building Regulations.
Estonia	**Existing:** Estonia does not have any legislation setting the requirements for energy requirements for buildings. Legislation on energy performance of buildings has been developed recently, according to the Building Act (Law) it should be adopted before 01.01.2008. Low Energy Buildings and Passive Buildings have not been considered in any legislation or legislative proposal. **Planned:** There is not any national strategy or target for development of Low Energy Buildings or Passive Buildings. However, there is an initiative to launch the analysis of Low Energy Buildings in Estonia; the actions foreseen within this initiative are to gather the information on developers of Low Energy Buildings (architects, designers, builders, researchers..) and analyse the market and practices of Low Energy Building development in Estonia, propose concept for their development (for new as well as through reconstruction). This initiative will be funded partly by Switzerland; it will be launched in 2008.

Country	Current legislation
Finland	**Existing:** No other legislation than definition of the heat losses of low energy building in the building regulations are undergoing. **Planned:** There are no actual plans.
France	**Existing:** To obtain the "Low Consumption Building" label, a building have to respect on the one hand requirements of the thermal regulation for new buildings and on the other hand a specific requirement on consumption (described in question 1.1 and introduced by decree). Incentive policy (label, financial support, increase in maximal surface to be built, etc.). **Planned:** In a speech by Nicolas Sarkozy, president of the French republic, at the concluding session of the Grenelle de l'environnement on Thursday 25 October 2007 it was proposed that: "*By 2012, all new buildings built in France should comply with the so-called "low-consumption" standards; and by 2020, all new buildings should be energy positive, that is, they should produce more energy than they consume*".
Germany	**Existing:** The energy requirements will be generally amended in 2008 (time schedule: draft ordinance in May 2008) to a 30 % lower (means: more severe) level. In general the strategies are: – enhancing the use of renewable energy using a quota, – reducing the percentage of electric heaters. (both by general requirements assisted by subsidies, as far as the measures are economically not reasonable). **Planned:** The energy requirements will be generally amended in 2008 (time schedule: draft ordinance in May 2008) to a 30 % lower (means: more severe) level. That means that the subsidy requirements mentioned in section "*Incentives for promotion*" will have to be adjusted, because they depend on the current legal level. The government has decided in principle, that the subsidy programs will be continued on a high level, but there is no decision about the way and the conditions yet. Next step of enforced requirements in 2012 will be another 30 % reduction. In 2020 new buildings shall be operated without using any fossil energy supply.
Greece	-
Hungary	**Existing:** There is no existing regulation, but without mentioning the term "passive" the A+ certification category (this is in the regulation) may be interpreted as "passive building". **Planned:** The Hungarian parliament will soon adopt “The Hungarian Climate Change Strategy 2008-2025 (HCCS)”. The main focus of the HCCS is on buildings, as this issue is not addressed elsewhere. The plan is expected to include: – New building codes, compulsory zero emission buildings, for large investments from 2012, for all new building from 2020. – Standards for energy saving possibilities requiring low levels of investments (e.g. phasing out traditional light bulbs). – GIS for measures with high investment costs, possible use of ETS auction revenues. – Energy labeling and focus on public awareness.
Ireland	**Existing:** Irish building regulations 2007 – consultation draft now published[1]. These draft regulations (soon to be finalised) target all new dwellings on which work commences on or after July 1st 2008. The new regulations will lead to new dwellings being “lower-energy” dwellings than those constructed according to the current building regulations[2]. **Planned:** Building regulations are expected to evolve to eventually ensure that all new buildings are of a low-energy standard, i.e. continuous improvements to the building regulations are expected.
Italy (Piedmont)	Nothing **existing** or **planned** specifically for low energy buildings or passive buildings, but a general tightening is planned. **Planned:** The proposed minimum requirements to U-values are originally scheduled for 2009 are now set as requirements for 2008, and a further tightening of around 10 % has been introduced for 2010. There is thus in the current legislation a clear long term goal setting giving specific minimum requirements for 2006, 2008 and 2010. These requirements are minimum requirements and some regional governments have already or are in the drafting phase of introducing their own implementation of EPBD having quicker implementation; e.g. in Lombardia they are already now from 2008 going for the 2010 level.
Latvia	-
Lithuania	-

[1] http://www.environ.ie/en/PublicationsDocuments/FileDownLoad,15343,en.pdf

[2] www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownLoad,1652,en.pdf

Country	Current legislation
Luxembourg	**Existing:** Regulation defining a system of financial support for passive or low energy buildings which defines standards for these buildings. – National Allocation Plan by the Ministry of Environment: – Financial support for private buildings – Increasing energy performance in public buildings – Establishing of energy concepts in public buildings **Planned:** The new regulation concerning Energy Performance in Residential Buildings will probably be effective on 1st January 2008. No actual plans for further tightening.
Malta	-
Netherlands	**Existing:** There is no legislation concerning passive buildings. **Planned:** The intention of the government is to come up with a more severe requirement for energy saving performance than the EPC (energy performance coefficient). At the moment the EPC = 0.8 for dwellings and in 2010: 0.6 and in 2015: 0.4. This method is difficult to compare with the figures of PB. But roughly an EPC of 0.4 is about the energy use of a passive building, but only for heating. But the EPC is not a good method to calculate the energy use of a passive building. – 2010: 25 % reduction compared to current code. – 2015: 50 % reduction compared to current code. The policy plans only mention the Energy Performance Certification EPC, and the plan to build "energy neutral" in 2020 (without definition).
Poland	No **existing** legislation is available. The **plans** and targets for developing low energy strategies have not been specified yet.
Portugal	-
Romania	There are no **existing** legislation on very low energy buildings and no actual **plans** for tightening of the Building Regulations.
Slovakia	**Existing:** There are no legislation on very low energy buildings, there is only the classes A and B at the energy performance of building Code. **Planned:** No actual plans for tightening.
Slovenia	-
Spain	-
Sweden	**Existing:** A number of initiatives are ongoing in Sweden with the purpose of establishing a definition of very low energy buildings. These are: The standardisation SIS tk189 have started a working group to standardise the definition of very low energy buildings and passive buildings. As a background for this a preliminary work from a group of consultants – initiated by the Swedish energy agency - exists. A research project by ByggaBoDialogen (www.boverket.se) gives suggestions for classification of energy performance of buildings. There are three suggestions for classification: energy consumptions per heated area (as being used in the Swedish certification scheme), as power consumption, or based in the type fuel being used in the building. The Swedish building owner association and other organisations have received funding from The National Board of Housing, Building and Planning and the Swedish Energy Agency to study possibilities for the Minergi scheme from Switzerland or similar schemes from Germany or Austria. The Swedish Energy Agency is currently funding the construction and documentation of passive houses and on good examples of energy efficient buildings. The National Board of Housing, Building and Planning and the Energy Agency will jointly look at the possibilities to make a Swedish suggestion for very low energy buildings and passive houses. **Planned:** In cooperation between government and industry there is a proposal for classification of buildings in different aspects, where energy is one of the themes.
United Kingdom (England & Wales)	**Existing:** The Code (CSH) is not currently mandatory but a consultation is taking place on making it so. Also Energy Performance Certification to comply with EPBD. Carbon Reduction Commitment (carbon trading for larger buildings). Carbon Emissions Reduction Commitment (duties on energy utilities to invest in energy efficiency in consumers' homes. **Planned:** The Code is not currently mandatory but a consultation is taking place on making it so. Indicative timetable to become regulatory requirement: 2010 level 3 (25 % better than current regulations); 2013 level 4 (44 % better - similar to PassivHaus); 2016 level 6 (Zero Carbon for all energy – including appliances).
Croatia	-

Country	Current legislation
Norway	**Existing:** The new regulation has limits for total energy demands based on properties similar, as far as possible, to what we understand as low-energy buildings. The energy requirements in the building regulation will be revised every fifth year. At the revision in 2017 it is foreseen that passive house standard will be required. The building industry and the authorities will collaborate in a new "low energy-program" to reach this goal. Important elements here are better education and developing better construction products. **Planned:** The new regulation (August 2009) has limits for total energy demands based on properties similar, as far as possible, to what we understand as low-energy building. The energy requirements in the building regulation will be revised every fifth year. At the revision in 2017 it is foreseen that passive house standard will be required as minimum standard.
Switzerland [1)]	**Existing:** All new and renovated buildings should comply (by law) to the standard SIA 380/1 limiting the energy need for heating. The limit, different for different building types (residential, offices, restaurants, assembly halls, etc.) depends on the form factor. No official legislation of low energy buildings, but subventions is given in several states to buildings labelled with Minergie® or MinergieP®. The official limit in many states is 80 % of the SIA 380/1 limit. **Planned:** A new certification scheme, according to EN 15217 and EN 15603 is being prepared by SIA and should be published in early 2008. Switzerland has made an energy saving programme, called SwissEnergy, which is based on partnerships in the areas of energy efficiency and renewable energy. On the basis of the Energy Act and the CO_2 Act, the SwissEnergy programme management is aiming to reach the following goals by 2010: – Reduction of CO_2 emissions by 10 % compared to the 1990 level. – Limiting the increase in electricity consumption to a maximum of 5 % compared to the 2000 level. – Doubling the proportion of new renewable forms of energy used in electricity and heat production. In this context it is expected that Minergie® and Minergie-P® will gain more ground. Cantonal governments have announced their interest for a certification scheme that includes low energy buildings (category "A"), but no schedule exists. The Swiss government intends to include the savings in buildings to keep the obligation of the Kyoto protocol. Finally, there is a project, adopted in some states, to go towards a 2 kW society, in which the average primary power used is 2 kW per person. This includes that, in a reasonable delay, all buildings be in category A of the certification scheme. The cantonal energy directors will force the house owners to build low energy buildings. The fuel oil consumption in new buildings must be halved compared to existing buildings. Today the fossil fuel consumption in new buildings averages 9 l/m². The reduction to 4.8 l/m² is at the same level as the Minergie® standard. The 2000-watt-gesellschaft has stated that the energy values of Minergie® for new buildings will become minimum standards from 2009. In the next leg the standard for new building may then increase to the value of Minergie-P®; for renovations it will be Minergie®.

1) Energy regulation and thus tightening of the energy requirements is decided canton by canton.

Very low energy buildings in national EEAP

As requested in the Energy Services Directive[1], every Member State must have a National Energy Efficiency Action Plan (NEEAP) and the existence of very low energy buildings in this document is indicative for the awareness of this type of buildings and the need to reduce energy consumption in buildings.

Table 3. Information about very low energy buildings in the NEEAPs of the European countries.

Country	Very low energy buildings in the national NEEAPs
Austria	The national EEAP considers the energy efficiency of buildings in 3 chapters: (1) Measures relating to private households, (2) Measures relating to the public service sector, (3) Measures relating to the private service sector; these chapters refer to national instruments such as klima:aktiv.
Belgium (Flanders)	No information.

[1] http://ec.europa.eu/energy/demand/legislation/end_use_en.htm

Country	Very low energy buildings in the national NEEAPs
Bulgaria	-
Czech Republic	The effect of low energy and passive buildings is calculated in the framework of energy savings in 2010 and 2016.
Cyprus	
Denmark	Quotation from 'En visionær dansk energipolitik' (A visionary Danish energy policy) 2025: "There is a need to develop better components and solutions that can reduce the additional costs connected with constructing low energy buildings and performing low energy retrofit. Apart from a reduction in the energy consumption, focus must be on improvements of the indoor climate."
Estonia	The NEEAP does not separate Low Energy Buildings or Passive Buildings from the rest of the building stock.
Finland	In the NEEAP there is following text: According to the new government programme, low energy building will be promoted for example by revising the building regulations. The timetable and level of tightening of the requirements are not yet decided.
France	The NEEAP will be written based on the outcome of the Grenelle de l'Environnement. According to the present outcome of the Grenelle, new residential buildings should follow the BBC label by 2012. By 2020, new residential buildings should be passive or positive energy buildings. For renovation, the Grenelle de l'Environnement is likely to adopt a BBC label of 80 kWh/m^2.per year for heating, cooling, ventilation, hot water and lighting, starting in 2009.
Germany	Recent decisions of the Federal Government (August 2007)[1] : – next step of enforced requirements in 2012 shall be another 30 % reduction, – in 2020 new buildings shall be operated without using any fossil energy supply.
Greece	-
Hungary	Nothing special about very low energy buildings.
Ireland	From Energy White Paper 2007[2]: "Responses emphasised the need to improve existing support measures to take account of increased energy costs, as well as the need for expanded support schemes for improving housing insulation and more comprehensive schemes for housing improvements in all areas of energy performance."
Italy (Piedmont)	Nothing special about very low energy buildings.
Latvia	-
Lithuania	-
Luxembourg	NEEAP is being elaborated for the time being.
Malta	No information.
Netherlands	No information.
Poland	The NEEAP does not mention the term Low Energy Building or Passive Building. The plan envisages the information campaign on rational energy consumption in residential dwellings as well as using the *Thermomodernisation Fund* to support energy efficient measures in residential sector. The plan foresees the implementation of building energy certification scheme according to the EPBD.
Portugal	-
Romania	Nothing special about very low energy buildings.
Slovakia	NEEAP is under development.
Slovenia	-
Spain	-
Sweden	NEEAP is under development. Classification of low energy buildings is proposed.
United Kingdom (England & Wales)	Revisions to Building Regulations (England and Wales) have been introduced to improve energy efficiency standards so a new home built in 2007 is 40 % more energy efficient than one built in 2002. Improvements to Building Regulations with aim of delivering zero-carbon homes by 2016. Code for Sustainable Homes supports this. Carbon Emissions Reduction Commitment to be strengthened for 2008 to 2011 and maintained at least until 2020. In the Scottish Building Regulations energy standards have been revised so a new home is at least 40 % more energy efficient than one built in 2002, which together with new planning guidance for on-site low and zero-carbon equipment will reduce CO_2 emissions for many developments by at least 55 %.

… continues.

[1] www.bmwi.de/BMWi/Redaktion/PDF/E/eckpunkt-fuer-ein-integriertesenergie-undklimaprogramm,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

[2] www.dcmnr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf

Country	Very low energy buildings in the national NEEAPs
	A requirement has been introduced in Wales that all new buildings, including housing, funded or built on land disposed of by the Assembly Government meet the Ecohomes Excellent environmental standard. Further there has, in Wales, been set an aspirational target that all new buildings will be zero-carbon from 2011.
Croatia	-
Norway	No information.
Switzerland	Plans often quote the Minergie and Minergie P labels.

Comparison of energy requirements in some MS

Comparison of the minimum energy performance is not immediately possible, as the assumptions and basis are different from country to country. For instance energy performance can be calculated by heated floor area, habitable area, or gross floor area and this can easily result in deviations of 10 - 20 %. Further it differs what energy consuming processes are included in the different calculations of the energy performance.

Anyhow, we have tried to set up a table for those countries with a fixed limitation on energy consumption.

Table 4. Definition of very low energy buildings in selected MS.

Country	Energy requirements for very low energy buildings
Austria	Usually low energy buildings are buildings with annual heating energy consumption (calculated demand) below 60-40 kWh/m^2 gross area (higher numbers for single family houses). Usually, passive buildings are defined according to passive house standard. Passive house standard, 15 kWh/m^2, where the area refers to net area in Austria in general. The indicator 15 kWh/m^2 however refers to the useful area (Wohnnutzfläche) in Styria and to heated area (Energiebezugsfläche) in Tirol.
Denmark	The current Building Regulations define two low energy classes. Low Energy Class 2 and Low Energy Class 1 are defined as having a calculated energy performance which is 25 and 50 % lower respectively than the maximum requirement for new buildings. The minimum requirement for residential buildings is given by: 70 + 2200/A kWh/m² per year (A is the heated gross floor area). For other buildings the minimum requirements is given by: 95 + 2200/A kWh/m² per year. The minimum requirement for non-residential buildings includes electricity for building integrated lighting.
France	The “arrêté ministeriel” of 8 May 2007 defines regulatory requirements for energetic performance of buildings. This arrêté defines five levels: HPE, HPE EnR, THPE, THPE EnR, and BBC, the "Low Consumption Building". Base for the BBC label: For new dwellings: the annual requirement for heating, cooling, ventilation, hot water and lighting must be lower than about 50 kWh/m² (in primary energy) (40 kWh/m² to 65 kWh/m², depending on climatic area and altitude). For other new buildings: the annual requirement for heating, cooling, ventilation, hot water and lighting must be at least 50 % lower than what is required by the current building regulation for new buildings. For renovation, the Grenelle de l’Environnement is likely to adopt a BBC label of 80 kWh/m^2 per year for heating, cooling, ventilation, hot water, and lighting, starting in 2009.
Germany	The minimum energy performance of a new residential building in Germany is defied in the EnEV as: $50{,}94 + 75{,}29 * \frac{A}{V_e} + \frac{2600}{100 + A_N}$ kWh/m^2 where A is the external surface of the thermal envelope, V_e is the volume enclosed by the thermal envelope, and A_N is the habitable area. A weight factor on electricity consumption of 2.7 is being used. Official definitions concerning the public subsidies for (residential) Low Energy Buildings are subject of the programs run by the (state-owned) Kreditanstalt für Wiederaufbau, Frankfurt (KfW). These programs are mainly fed by public sources. The current requirements are 60 % (KfW60) (the primary energy demand is limited by 60 kWh/(m²a), and the quality of the building envelope is 30 % better than the EnEV level) or KfW40(the primary energy demand is limited by 40 kWh/(m²a), and the quality of the building envelope is 45 % better than the EnEV level). In addition, there is also a subsidy program for "Passiv-Häuser", which is defined in accordance with the Passiv-Haus-Institute as "KfW-40-buildings with an annual heat demand lower than 15 kWh/m²".

Country	Energy requirements for very low energy buildings
United Kingdom(England & Wales)	Indicative timetable to become regulatory requirement: 2010 level 3 (25 % better than current regulations); 2013 level 4 (44 % better - similar to PassivHaus); 2016 level 6 (Zero Carbon for all energy – including appliances).
Switzerland	Some Canton's in Switzerland include references to "Minergie®" in their legislation for new buildings: Minergie (42 kWh/m^2) – (as from 01.01.2009 less than 38 kWh/m^2). Energy consumption includes heating, hot water and ventilation. Additionally, appliances must meet certain requirements.

Calculation methods or other specific requirements

In Member States where an official definition of low energy buildings exists, there is a tendency that the calculation method used for proving low energy performance is the same as the one used for the normal application for obtaining a building permit. Even though the calculation methods are all in accordance with the definitions in the EPBD and thus the relevant CEN standards, there are national deviations that make a cross-country comparison of the calculated energy performance difficult. Some of the discrepancies between the calculation methods used across Europe are listed below:

– use of internal or external dimension of the heated floor area,
– variation in internal loads,
– different ways of handling the summer comfort issue,
– inclusion of unheated spaces in the calculations,
– energy flows that are included in the primary energy consumption[1],
– different conversion factors for different energy carriers,
– external climate conditions.

Thus this study does not try to make this kind of comparison, but sticks to the statements given by the national representatives.

Moreover, a number of NGO definitions of low energy buildings do exist and most of them have their own calculation method to prove compliance with the low energy building definition in question and additional requirements that this kind of buildings must meet. Figure 3 shows a comparison of the Danish, the Swiss, French and German definitions and thus calculation methods.

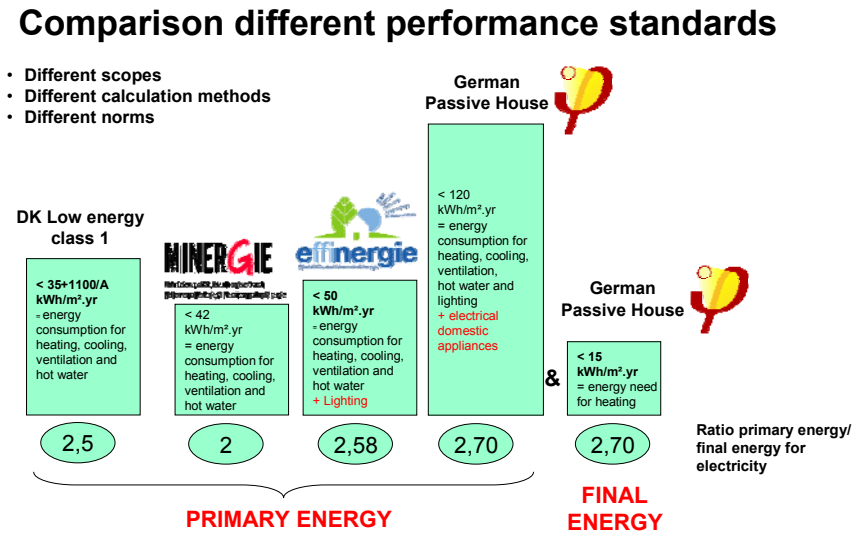


Figure 3. Comparison of the Danish low energy class 1, the Swiss energy calculation method (Minergie), French energy calculation methods (Effiinergie), with the two energy frames as defined in the Passive House standard (total energy consumption and heating consumption per year). Source: Pascal Eveillard, Effinergie presentation « Enjeux et référentiel », March 2007.

[1] Energy used for lightning in a 150 m² house with traditional technology is approx. 1000 kWh/y (approx. 6 kWh/m²) while the energy used for appliances is approx. 3000 kWh/y, (approx. 20 kWh/m²).The Danish Electricity Saving Trust has estimated that with energy efficient equipment and optimized conditions lightning can be reduced to 500 kWh/y (3 kWh/m²) and to 1500 kWh/y (10 kWh/m²) for appliances.

Primary energy calculation method

Most of the official calculation methods deal with the calculation of the primary energy consumption of buildings. However, what processes and how the corresponding energy demand is converted into primary energy differ from country to country. In some cases the primary energy consumption is converted into CO_2 emission.

The definition and consequently the calculation of primary energy consumption is strongly dependant on the chosen boundary for calculation. Figure 4 indicates several possible boundaries in accordance with the methodology in the EPBD, and the supporting standards for the EPBD.

The most generic primary energy calculation resides at the point of extraction of energy directly from the source, before any conversion losses.

Most countries however have chosen a boundary for the calculations that lies somewhere between the point of extraction and the entry of energy into the building. Conversion losses within the building are thus part of the primary energy calculation. This boundary is not perfectly clear, as electricity consumption is weighted by a factor (varying from country to country) that takes into account the conversion losses at the power plant.

The next boundary level is the thermal envelope of the building, but this only gives the energy demand, not the energy consumption.

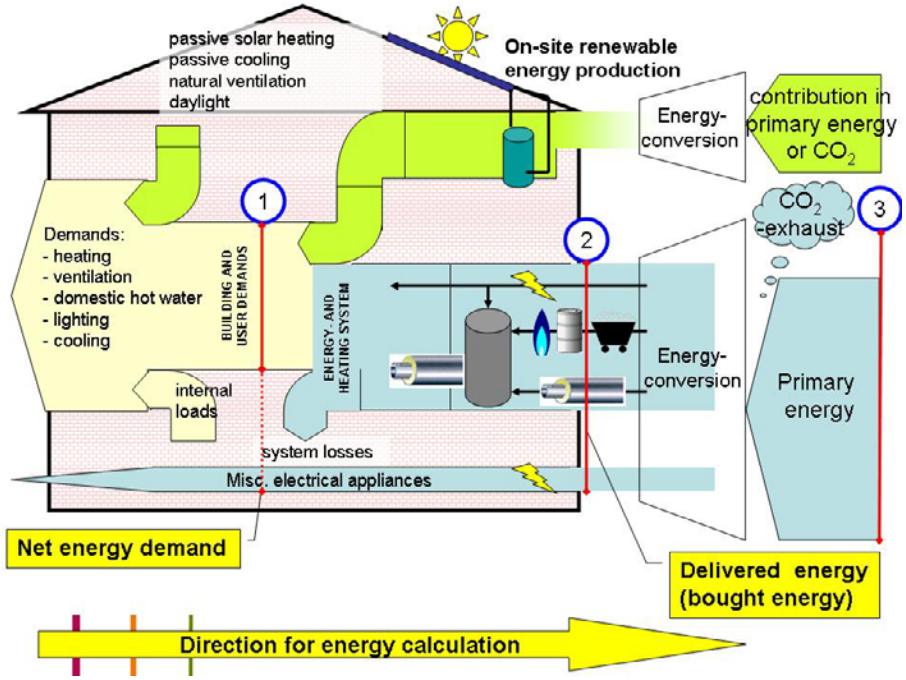


Figure 4. Illustration of the path from energy demand in a building to primary energy consumption. In many cases the primary energy consumption for a building is defined at the building boundary, i.e. leaving out the losses in the global production and extraction of energy. The only energy flow that is always included all the way to the power plant is the conversion of electricity consumption to primary energy. (source: prCEN/TR 15615:2007(E) and Thor Lexow.

Indoor climate and summer comfort

EPBD Article 1 states that: "The objective of this Directive is to promote the improvement of the energy performance of buildings within the Community, taking into account outdoor climatic conditions and indoor climatic requirements, and local conditions and cost-effectiveness". Further, Paragraph 13 states: "Recent years have seen a rise in the number of air-conditioning systems in southern European countries. This creates considerable problems at peak load times, increasing the cost of electricity and disrupting the energy balance in those countries. Priority should be given to strategies which enhance the thermal performance of buildings during the summer period".

The summer-comfort and indoor-climate issue is dealt with in different ways in different countries. In some cases this is a matter of requirements to the ventilation system of the building, and in other cases this is calculated as an excess temperature penalty, which is part of the global energy performance for a new building. The figure below gives an overview of the current situation and the following table contains the detailed answers from the questionnaire.

Generally, indoor climate and summer comfort in low energy buildings are handled by official procedures in the same way as other types of buildings.

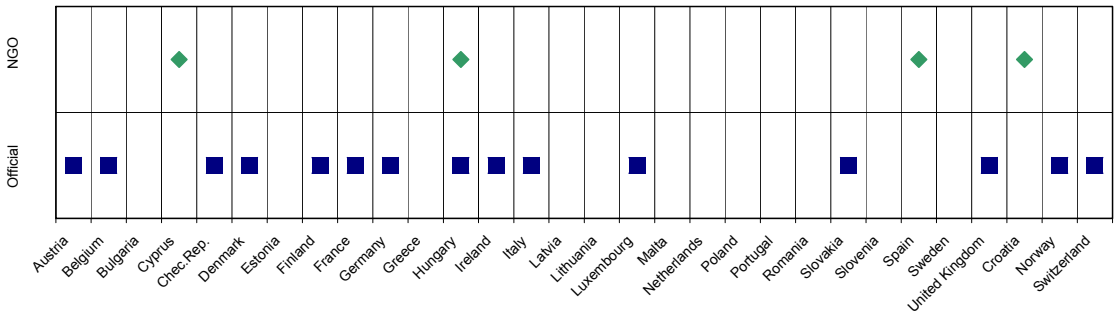


Figure 5. Summer comfort and indoor climate issue is handled in the calculation method of the European countries.

Table 5. The table summarises how summer comfort and indoor climate issue in very low energy buildings are handled in the energy calculation methods of the European countries.

Country	Official	NGO
Austria	Yes: in the klima:aktiv building standard.	Yes: in the TQ Building Certification, IBO Building Pass.
Belgium (Flanders)	It is already in the requirements for new buildings; requirements for the indoor climate and summer comfort are not more stringent in low or very low energy buildings. Although, low and very low energy buildings will have more difficulties to reach these requirements.	No (according to present knowledge, it has not been checked with passiefhuis-platform).
Bulgaria	No information.	No information.
Czech Republic	Yes, the requirements are defined for all types of buildings.	-
Cyprus		
Denmark	As penalty for overheating in the building is part of the overall energy performance calculation for new buildings, it is taken into account as fictive energy consumption. It is recommended to keep the excess temperature penalty as low as possible, but there are no fixed values to stay below.	*BOLIG+* uses the same calculation method and tool as in the Building Regulations. It is emphasised in the BOLIG+ definition that the overheating penalty must be kept as low as possible and even zero if possible. The *Passiv Haus* definition does not contain requirements to the indoor climate, but the tool has a calculation of

Country	Official	NGO
		hours above certain limits and thus offers a possibility of evaluating the indoor climate. *Swan labelled* house uses the same requirements as in the Building Regulations.
Estonia	No information.	No information.
Finland	Yes, they are the same as for all the other new buildings.	-
France	Yes, these requirements are already taken into account in the regulation for new buildings.	-
Germany	Yes, essential ventilation and summer comfort are public requirements for all buildings, the calculation tools take that into account.	-
Greece	-	-
Hungary	Yes, the requirements are the same in any buildings of similar use.	-
Ireland	-	No, as the definition is an NGO, there are no specific energy requirements, just a description.
Italy (Piedmont)	-	Nothing specific for the low energy buildings or passive buildings. Indoor climate prescription is the same as for all other buildings.
Latvia		
Lithuania		
Luxembourg	Yes - details see chapter 1.2 of annex in draft regulation.	-
Malta		
Netherlands	-	No definition, so no requirements.
Poland	General requirements for indoor comfort exist in polish standards for new buildings. There are no special requirements for passive or low energy buildings.	The requirements according to Passivhaus Institut set the maximum indoor temperature in summer at 26 °C.
Portugal		
Romania	No.	-
Slovakia	Yes, the same as the general requirements.	-
Slovenia		
Spain		
Sweden	-	Not ready.
United Kingdom (England&Wales)	Yes.	Yes.
Croatia		
Norway	Yes, general indoor requirements shall be fulfilled at the same time as the energy requirements are fulfilled.	-
Switzerland	Yes, same as for other buildings.	Minergie: specific requirements for ventilation. SIA: specific requirements for summer comfort according to SIA 180: a building should be designed to be comfortable in Summer without cooling, as long as there are not too large internal heat loads.

Energy certification for low energy buildings

In the questionnaire it was asked, whether a special certification scheme exists for very low energy buildings. Many of the answers made it clear that energy certification of low energy buildings is generally handled in the official energy certification schemes set up in the individual countries. Accordingly, some of the countries that have answered "No" might actually mean "*No, we do not have a special certification scheme for low energy buildings, but we use the same scheme as for normal buildings*". Answers on the existence of a special, official certification scheme for low energy buildings should therefore be considered with scientism. It is thus primarily the NGO-defined low energy buildings that have their own certification scheme that does not necessarily match the official certification schemes.

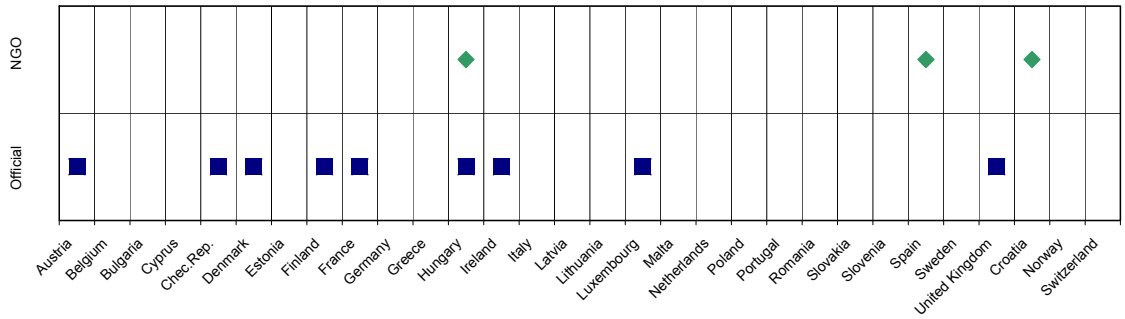


Figure 6. Energy labelling of low energy buildings in Europe is primarily handled in the normal energy certification schemes of the individual countries. Answers on the existence of a special, official certification scheme for low energy buildings should therefore be considered with scepticism as the answers have been ambiguous.

The official answers from the respondents do however not match completely the knowledge of the authors who are aware of the Passiv Hause schemes as a NGO schemes in Germany and Austria, the Effinergie® scheme in France, and the Minergie® scheme in Switzerland.

Incentives for promotion

The incentives to promote low energy buildings vary across the European countries. The incentives range from no direct promotion and only marginal indirect incentives to direct financial support at various levels. The most popular direct supports for low energy buildings are:

– Loans with low interest rate to finance low energy buildings. This is done either by means of official subsidies or via private investment organisations.
– Lower taxes or stamp duty for low energy buildings are another mean to promote these kinds of buildings.

To supplement the direct incentives a number of indirect incentives exist in the European countries. Examples of these are:

– simplified heating billing requirements,
– no obligation to take public heat supply,
– CO_2 taxes,
– certification or labelling of low energy buildings.

Table 6. Direct and indirect incentives to promote very low energy or passive buildings. Countries in *italics* indicate that no questionnaire has been returned.

Country	Direct	Indirect
Austria	The klima:aktiv programme provides direct incentives for building refurbishment (free energy advice) for residential and non-residential buildings. In the residential sector, social housing subsidies are linked with the building energy performance; at least low energy standard is mandatory. In the province of Vorarlberg it is planned to limit social housing subsidies to passive house buildings (new buildings).	Housing companies, providers of prefabricated buildings, building owners in the non-residential sector receive the award "klima:aktiv house" (low energy standard) and "klima:aktiv passive house" for buildings which achieve the required amount of scores. The award can be used for marketing.
Belgium (Flanders)	– subsidy for low energy buildings (at the moment E70 and E75 , will probably be changed if there is a political agreement about definition) and for passive houses according to the NGO definition (will probably be changed if there is agreement about official definition) – tax refund for passive houses.	None.
Bulgaria	None.	None.
Czech Republic	Legislative, State programme for support of energy savings.	None.
Cyprus	None.	None.
Denmark	Single family houses meeting the low energy class requirements do not need to be connected to the public energy grid and the installation and charge to be connected to the grid can thus be deducted in the construction and running cost of the building.	Electricity produced from building integrated photo voltaic (PV) systems is subject to net settlement (the electric meter runs backwards when the building delivers electricity to the grid). In certain regions (by utility supply company) there is subsidy for installation of building integrated photo voltaic systems on detached houses or for installing heat pumps.
Estonia	None.	None.
Finland	None.	None.

Country	Direct	Indirect
France	Many incentives planned in the Grenelle de l'Environnement both for residential and non residential: green loans, loans without interest for residential, tax ex-emption for non residential.	Financial support for the purchase of high-performance equipments and components, right to build a bigger building (increase in maximal surface to be built), etc.
Germany	Subsidies are given via reduced interest rates for residential buildings and schools meeting certain energy performance requirements. Official definitions concerning the public subsidies for (residential) Low Energy Buildings are subject of the programs run by the (state-owned) Kreditanstalt für Wiederaufbau, Frankfurt (KfW). These programs are mainly fed by public sources.	In future, the Passive Building will be excluded from the duty of heating cost billing procedures, which means cheaper and less complicated tenancy.
Greece	-	-
Hungary	The tender of the new official district put emphasis on low energy consumption and environmentally friendly design - the first sign that some attention will be paid by the government.	Only the prestige of the designers and builders.
Ireland	A revised and revamped House of Tomorrow scheme administered by Sustainable Energy Ireland is an incentive which is expected to be re-launched in due course. It focuses on developments of low-energy houses incorporating renewable technologies. There are specific requirements for components as part of meeting the criteria for the house of tomorrow scheme.	It is anticipated that the national Building Energy Rating scheme will making energy performance of buildings visible to consumers and will provide an indirect incentive to for low energy buildings.
Italy (Piedmont)	Nothing, for new buildings. Annual fee reduction (IRPEF) for people restructuring existing buildings. This kind of incentives is not only for passive buildings but for all kind of restructuration focused on reducing significantly the energy demand of buildings. There are tables regarding the maximum transmittance of each single component more over than of the total energy demand. This kind of incentives however are not specifically related to passive buildings so the transmittance limit and primary energy demand limit are not particularly low.	None.
Latvia	-	-
Lithuania	-	-
Luxembourg	Financial support (investment subsidies) by the Ministry of Environment and by several municipalities in residential and non-residential buildings. The investment subsidy will only be granted if the conditions of a low energy or passive buildings as defined in the draft Regulation on energy Performance in Residential buildings are fulfilled.	None.
Malta	-	-
Netherlands	Gov: None. Subsidy schemes are in development, but it seems that they will be related to the EPBD label (A-G). It is proposed that improvement of label grades will give subsidy for existing buildings.	NGO: Subsidies ; there is a active group, which promotes the PB: passiefbouwen.nl

Country	Direct	Indirect
Poland	The *Thermomodernisation Fund* exists for supporting energy efficient modernisation of buildings in Poland. According to the law, the investor can obtain 20 % reduction of loan used to conduct the modernisation. Only multifamily, existing, residential buildings reaching at least 10 % reduction of energy consumption is subject to this law. The incentive is also granted if renewable energy or high efficiency CHP is to be installed. The incentives do not set the specific requirements for the components. The building to obtain the incentives needs to meet the requirements of energy consumption reduction and of minimum U-values set in the energy audit.	-
Portugal	-	-
Romania	None.	Research grants - part of National Research Program 2007 – 2013. New benchmarks for certification and thermal energy recovery systems correlated with environment energy efficient use.
Slovakia	In preparation.	None.
Slovenia	-	-
Spain	-	-
Sweden	-	Energy classification of buildings.
United Kingdom (England&Wales)	See Table 7 for further information. Grants for accredited low and zero-carbon technologies.	None.
Croatia	-	-
Norway	In addition to regulatory requirements, there are economic incentives and the future marking-system (certification). A relation between these instruments and definitions is strongly wanted. The energy certification will probably be used as criteria for economic support.	None.
Switzerland	Cantonal governments give subsidies to Minergie and MinergieP buildings Some banks give loans at reduced rates for these buildings It is generally acknowledged that low-E buildings have a better market value than the others. Minergie P asks that all electric appliances are in class A, and asks also for a reinforced thermal insulation (e.g. U<0.15 W/m²K in walls, and < 1 W/m²K for glazing).	A CO_2 tax will be introduced in January 2008. As from 1 January 2008 fossil fuels will be taxed in Switzerland, if the reduction target set for the household is reached it will be possible to get a tax refund from the Government.

Policy instruments in United Kingdom (England & Wales)

The table below was included in the answers from England & Wales, giving an overview of existing policy instruments relating to low-carbon buildings. This information was considered interesting and clear and as such repeated here.

Policy instruments can be divided into classes according to the economic status of the measures they are trying to influence (and whether this is known). In the table below “cost-effective to society” includes the external costs and benefits that are not reflected in the market price. The examples in the table mainly reflect building-related activities, but the principles apply generally. Sometimes a product or technology can straddle classes if it is

cost-effective in some circumstances but not in others. Equally, some policy tools influence more than one area.

Table 7. Examples of existing policy instruments relating to low-carbon buildings in United Kingdom (England & Wales).

Classes of Policy Options		
Economic status of measure		
Cost effective to society and to most users	**Cost effective to society but not attractive to most users**	**Not currently cost-effective to society or users**
Typical policy instruments		
Remove market barriers and accelerate deployment: – provide information – provide loan capital – support development of market infrastructure	Regulatory requirements Fiscal measures: – tax breaks or penalties – subsidies Understand and address public acceptability issues	Support development (if potential benefits seem likely to justify this) – Evaluation of potential impact – R&D support – Demonstration programmes
Current, recent or planned policy measures mainly relating to UK buildings		
– Carbon Trust activities – Energy Saving Trust activities – Aspects of Low Carbon Buildings Programme – Building Energy Performance Certification (building energy labels) – Appliance energy labels – Reduced VAT rates – Energy Efficiency Commitment – European emissions trading scheme	– Building Regulations – Enhanced Capital Allowances – Aspects of Low Carbon Buildings Programme – Reduced VAT rates – Abolition of stamp duty on zero carbon buildings – Possible European minimum performance requirements for equipment – Planning requirements to use renewable energy – Renewables obligation	– PV demonstration programme – Planning requirements to use renewable energy – Hydrogen, fuel cell and carbon abatements demonstration programme – "Towards a sustainable energy economy" research programme – Low carbon technology programme – UK Energy Research Centre projects

Source: Building Research Establishment, BRE (2007).

A detailed survey of the instruments to promote best practices in building energy efficiency policies and programmes is published in *Better Buildings Through Energy Efficiency: A Roadmap for Europe*[1].

[1] http://www.eurima.org/downloads/EU_Roadmap_building_report_020307.pdf

Recommendations

One of the prescribed actions on buildings in the EU Action Plan on Energy Efficiency [COM(2006)545] is for the Commission to develop a strategy for very low-energy or passive houses (before 2009) towards a more wide-spread deployment of these building types by 2015.

In order to generate a picture of the current national approach in this area EuroACE has initiated a survey. The scope was to create an overview of current and planned strategies in the European countries regarding the implementation of requirements towards very low-energy buildings (on passive level or similar) in their national legislation.

The survey shows that many European countries already have taken national actions towards implementing requirements at the level of very low-energy buildings within a time frame of 5-12 years but only a few European Member States (MS) have plans for strengthening the requirements to the existing buildings which is even more important if Europe wants to achieve a major reduction in the overall energy used for conditioning buildings.

The current recast of the EPBD [Directive 2002/91/EC] is an excellent opportunity which must not be missed for the European Commission to follow up on the ambition in the EU Action Plan by introducing a request to MS to: define very low-energy buildings at national level, to draw up a national strategy towards this level of energy performance, and to put focus on upgrading energy performance of the existing building stock.

The study also shows that countries which have a definition have different scopes, different calculation methods and different elements included in the definition. With this in mind the conclusion from this study is that we might not need a common definition as long as a national definition will ensure a proper design following the concept illustrated below. This could be done by including minimum requirements to the different elements in the design like the envelope and active component.

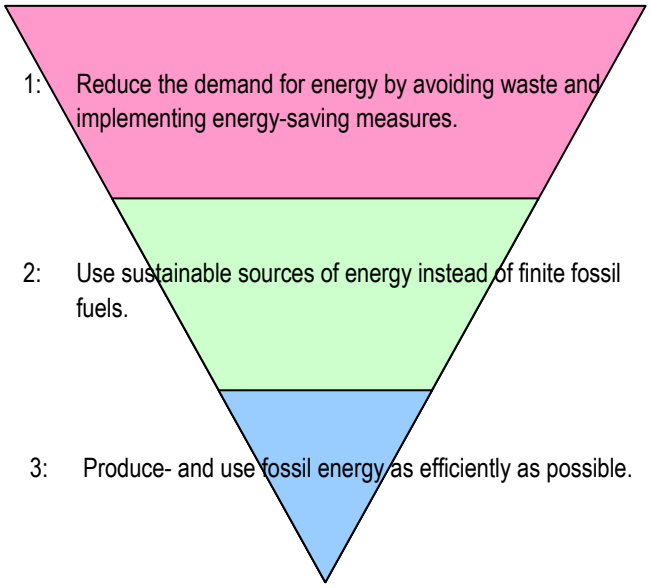


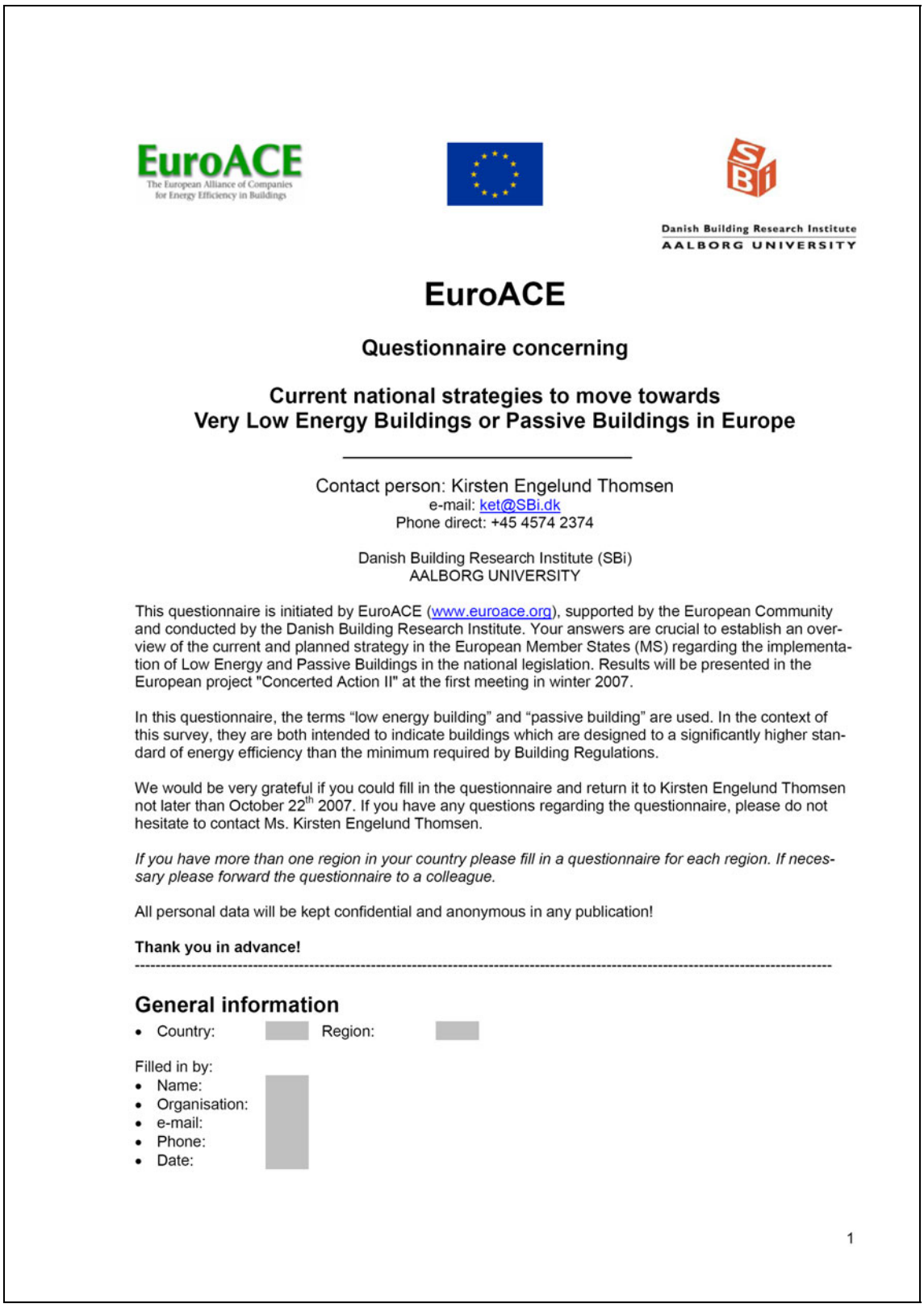
Figure 7. The Trias Energetica concept: the most sustainable energy is saved energy.

References and country information

The references below are mainly taken from the answers to the questionnaires and supplemented with background information to the report.

- www.euroace.org
- Action Plan for Energy Efficiency: Realising the Potential (2006). Located 06122007 at http://ec.europa.eu/energy/action_plan_energy_efficiency/index_en.htm
- EU service directive: http://ec.europa.eu/energy/demand/legislation/end_use_en.htm
- **Austria:**
  www.klima:aktiv.at
  www.argetg.at
  ww.ibo.at
  www.oib.or.at
- **Denmark:**
  www.ebst.dk,
  www.ens.dk,
  www.sbi.dk,
  www.boligplus.org
  http://www.elsparefonden.org/about-elsparefonden
- **France:**
  www.effinergie.org
- www.isolonslaterre.org
- **Germany:**
  Nationaler Energieeffizienz- Aktionsplan (EEAP) der Bundesrepublik Deutschland:
  http://www.bmwi.de/BMWi/Redaktion/PDF/Publikationen/nationaler-enerieeffizienzplan,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf
  Passivhäuser: PHPP: www.passiv.de
- **Ireland:**
  www.sei.ie/index.asp?locID=1177&docID=-1
  www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownLoad,1652,en.pdf
  www.environ.ie/en/PublicationsDocuments/FileDownLoad,15343,en.pdf
  www.dcmnr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf
  www.sei.ie/index.asp?locID=1177&docID=-1
  www.sei.ie/index.asp?locID=315&docID=-1
- **Switzerland:**
  www.minergie.ch

Annex 1 – Questionnaire



EuroACE
The European Alliance of Companies for Energy Efficiency in Buildings

Danish Building Research Institute
AALBORG UNIVERSITY

EuroACE

Questionnaire concerning

Current national strategies to move towards Very Low Energy Buildings or Passive Buildings in Europe

Contact person: Kirsten Engelund Thomsen
e-mail: ket@SBi.dk
Phone direct: +45 4574 2374

Danish Building Research Institute (SBi)
AALBORG UNIVERSITY

This questionnaire is initiated by EuroACE (www.euroace.org), supported by the European Community and conducted by the Danish Building Research Institute. Your answers are crucial to establish an overview of the current and planned strategy in the European Member States (MS) regarding the implementation of Low Energy and Passive Buildings in the national legislation. Results will be presented in the European project "Concerted Action II" at the first meeting in winter 2007.

In this questionnaire, the terms "low energy building" and "passive building" are used. In the context of this survey, they are both intended to indicate buildings which are designed to a significantly higher standard of energy efficiency than the minimum required by Building Regulations.

We would be very grateful if you could fill in the questionnaire and return it to Kirsten Engelund Thomsen not later than October 22th 2007. If you have any questions regarding the questionnaire, please do not hesitate to contact Ms. Kirsten Engelund Thomsen.

If you have more than one region in your country please fill in a questionnaire for each region. If necessary please forward the questionnaire to a colleague.

All personal data will be kept confidential and anonymous in any publication!

Thank you in advance!

General information

- Country: Region:

Filled in by:
- Name:
- Organisation:
- e-mail:
- Phone:
- Date:

1

1. Definition of a Low Energy Building or a Passive Building

1.1 Does your country have a definition (governmental or non-governmental (NGO)) of a Low Energy Building or a Passive Building that is significantly better than the minimum requirements?

If YES, please describe the definition(s) and the status. In which documentation is it defined (Building Regulations, etc)?

Governmental:

Status of the definition:

Existing: ☐ Planned: ☐

NGO:

If the answer is NO, please also continue with the remaining part of the questionnaire and answer as many questions as possible.

EXAMPLES:
In Germany a definition of a Passive Building is: "A building designed to the standards set out by the Passiv Haus Institut, Darmstadt (www.passiv.de). Specifically an annual heating requirement which is less than 15 kWh/m² and a maximum total annual primary energy requirement of 120 kWh/m²".

In Denmark a definition of a Low Energy building class 1 is: "A building designed to achieve energy consumption at least 50 % lower than what required by the MS's current Building Regulations for new buildings".

1.2 Does the Low Energy Building or Passive Building definition in your country apply to both new and existing or only to new housing?

Governmental:

NGO:

1.3 Does the Low Energy Building or Passive Building definition apply to both residential and non-residential, or only residential buildings?

Governmental:

NGO:

1.4 When was the definition of a Low Energy Building or Passive Building introduced in your country?

Governmental:

NGO:

2. Political

2.1 Describe the current legislation regarding Low Energy Buildings or Passive Buildings.

Describe:

What is the timetable (including intermediate target) for this development?

2.2 What policy and targets for developing national strategies for Low Energy Buildings or Passive Buildings does your country have?

Describe:

2.3 What does your national Energy Efficient Action Plan (EEAP) say about Low Energy Buildings or Passive Buildings?

Describe:

3. Technical

3.1 Are there any special calculation methods or other specific requirements relevant to Low Energy Buildings or Passive Buildings in your country?
Governmental:
NGO:

3.2 Does your national calculation method(s) for Low Energy Buildings or Passive Buildings set requirements for the primary energy as in the EPBD (taking into account energy used for heating, cooling, lighting, hot water, use of passive systems for heating and cooling, etc.)?
Governmental:
NGO:

3.3 Are there requirements for the indoor climate and summer comfort in your definition of Low Energy Buildings or Passive Buildings?
Governmental:
NGO:

3.4 Do you have a national energy certification (labelling) scheme specifically for Low Energy Buildings or Passive Buildings and if yes, what are the requirements to obtain a certificate and who can issue the certification?
Governmental:
NGO:

4. Incentives

4.1 What incentives (policy, financial, or otherwise) do you have, to support Low Energy Buildings or Passive Buildings in your country and their current status?
Direct incentives:
Indirect incentives:

Status of incentives:
Existing: ☐ Planned: ☐ NGO: ☐

4.2 Do the incentives set specific requirements for components or certification?
Describe:

5. Other remarks

Comments:

The report highlights the current status on implementation of very low energy building definitions in national European Building Regulations. The aim of the survey is to uncover the current status in the European nations regarding very low energy and passive buildings. In the context of this survey, both types indicate buildings that are designed to provide a significantly higher standard of energy efficiency than the minimum required by national Building Regulations.

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