ENPIRE – Guidelines on Ambitions and Legislation

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1 Background and aims of the ENPIRE project

All over Europe local governments are involved in projects to improve the quality of houses in the urban environment. This involves not only the development of new urban areas but increasingly also the restructuring of *existing* urban areas. Although improvement of the overall quality of the dwellings and of social conditions in the neighborhood will be the primary aim of such projects, there are also very good opportunities for improving the energy efficiency of the dwellings. Improvement of energy efficiency will not only contribute to the mitigation of climate change but can also help to stabilize energy costs for inhabitants. However, it is very important that the issue of energy efficiency is already considered at the most early stages of the urban planning processes so that optimal choices can be made with regard to energy infrastructure, energy efficiency measures and renewable energy generation.

Local authorities have a specific and very influential role in promoting and facilitating the process of energy efficiency in urban planning, and are often in the best position to take the lead in CO_2 reduction initiatives. In order to provide the different parties in the planning and decision making process with good information and best practice examples the ENPIRE project was started in January 2008. Within this project general guidelines have been developed and practical experiences documented with regard to energy planning in urban renewal projects (see also www.enpire.eu).

Three different Guideline documents have been prepared by the ENPIRE project, covering the following subjects:

- **Process:** how should the process of energy planning and preparation of an energy vision study be organized in order to achieve good results;
- **Legislation and Ambitions:** which efficiency requirements are required by existing legislation in different countries and in what way can one set a ambition level that exceeds the legal requirements;
- **Embedding Agreements:** in what way can a certain ambition level for energy efficiency or CO_2 reduction be agreed between stakeholders and laid down in a joint agreement.

Apart from these Guideline documents a number of local projects involving urban planning and energy visions studies have been implemented in:

- Albertslund, Denmark
- Ávila, Spain
- Breda, Netherlands
- Casale, Italy
- Dublin, Ireland
- Havířov, Czech Republic

Practical results and lessons from the above projects have been collected in the "**Evaluation Report of Local Projects".**

Finally our key recommendations and lessons are described concisely in a special brochure titled: "**Energy Efficiency in Urban Restructuring Projects: Bridging the Gap between Ambitions and Practice".** All these documents can be downloaded from the ENPIRE website or by contacting the project coordinator (W/E Consultants, email: info@w-e.nl).

2 Objective and Overview of this document

In this document we describe a set of guidelines and recommendations with regard to the first stage of setting the ambitions.

The first chapter is taking a view on the national legislation of each country with a focus on the Dutch regulation.

Chapter 2 provides a brief description of the ambitions in two of the national projects within ENPIRE – the Danish one and Spanish one. Common for the ambitions laid down in all national projects is that they are very diverse due to the fact that the projects take basis in different legislation and issues.

Chapter 3 is a guideline on how the overall ambitions can be set in the first phase of a project. Den entire guideline consists of a process description. The process description contains the most important parts within the process and issues and stakeholders that have to be involved in this. The process description is supported by some brief sections describing different methods on which to decide and estimate an issue from.

3 Legislation

Description of the national legislation that has an influence on the energy consumption for the buildings and a description of the ambitions that will be realistic and accepted by local partners, compared to local climate policy, EPDB and the liberalised energy market and how this is reflected in the local case studies in the EU ENPIRE project.

3.1 The Dutch legislation

In the Netherlands – as in most other countries - there is different legislation for old and new buildings. There is no national legislation which applies to the energy performance of projects with multiple buildings.

New buildings – EPC regulation

New buildings have to meet a certain Energy Performance Coefficient (EPC) in order to obtain a building permit. The EPC is relative score which measures the primary energy consumption of the building in relation to a certain reference energy consumption for the building. The calculation method for the EPC is laid down in a national standard. Different EPC calculation methods and different minimum EPC scores are in place for utility buildings and residential buildings. Under the EPC regulation a builder is free to make his own choices on how he wants to achieve the EPC level. There is no standard set of U-values or other measures that is obligatory.

In the EPC calculation method the energy consumption by users of the building (i.e. for washing cooking, refrigerators) is not considered in the EPC, but hot water consumption and lighting are included with fixed standard values. The reference energy consumption is calculated on the basis of the total floor area and the total loss area of the building under consideration[a].

Because the EPC is calculated on basis of the primary energy consumption there is a relation with CO_2 emission but EPC is not a direct measure of CO_2 emission. Electricity is converted to primary energy with standard conversion efficiency of 39%.

Renewable energy from PV installations or solar hot water boilers may be deducted directly from the building energy consumption.

Collective or district heating systems are accounted with an "equivalent efficiency factor" which depends on the distribution system, the temperature level and the source of the heat (i.e. industrial heat, waste incineration). For a district heating system a specific value for the equivalent efficiency may be used if the underlying calculation has been validated. In this way equivalent efficiencies up to 170% are possible for an efficient CHP system with low distribution losses. One effect of such high equivalent efficiencies of district

[a] The EPC is calculated as EPC= Q_{tot} / (330xA_{user} + 65 x A_{loss}) x 1/C_{EPC} where Q_{tot} is the total primary calculated energy consumption (in MJ); A_{user} and A_{loss} are resp. the user floor area and the energy loss area (in m^2). C_{EPC} is factor which is used to correct for differences with regard to older standards.

heating may be that less insulation measures are applied because they are no longer necessary to attain the EPC value.

The table below gives the present EPC standards and the target values which have been formulated for the period up to 2020. We can observe that it is the intention to build only "energy neutral" residential buildings after 2020. For reference: an EPC of 0.80 corresponds to a primary energy consumption of 70 – 75 kWh/m^2.

	Residential buildings	Utility buildings
Present EPC -2009	0.8	1.0 – 2.6*
Future EPC – 2011	0.6	?
Future EPC – 2015	0.4	?
Future EPC – 2020	0.0	?

* EPC standard varies per utility building type

Figure 1 Energy Performance standards in the Netherlands

One of the criticisms of the EPC legislation is that is only theoretical calculation at the time of building design and that actual energy performance may be less good because of deviations during the construction process. According to one recent survey nearly half of the buildings as they were actually constructed would not meet the EPC standard.

Another controversial issue is the effect on indoor air quality by the use of heat recovery ventilation units in residential energy efficient buildings. In some recent projects which used such HRV units there were a lot of complaints about air quality. Major factors in this seem to be poor quality of the installation work and poor maintenance of the equipment by the users.

Existing buildings – Energy labeling regulation

For existing buildings the energy labeling regulation has been introduced in conformance with EPBD directive. The energy consumption and the corresponding energy label in the A-G range is calculated in a different way than the EPC for new buildings.

An energy label is obligatory in the following situations:

- renovation of a building with a floor area larger than 1000 m^2;
- when a building is rented out the building owner should supply the tenant with an energy label;
- when a building is sold the owner should supply a label to the buyer.

Also the following regulations exist:

- housing corporations should have labelled their entire building stock by January 2009;
- in the near future the maximum rent for rent-controlled buildings will depend on the building's energy label;
- public buildings larger than 1000 m^2 should all have a label by January 2009.

3.2 Resume of all the countries national legislation

Denmark
Building Regulations requiring demands for energy frame values for new buildings. In the Danish building regulations a minimum demand and three other low energy classes which are 2, 1 and 0 equal to 75%, 50% and 25% of the minimum standard are required at the moment. But in 2010 the minimum standard will be low energy class 2 and in 2015 low energy class 1 and in 2020 low energy class 0. As regards renovation there only is a demand for the building component except for larger renovation in which the minimum demand for new buildings is recommend. **Planning law**. In Denmark an important instrument is that municipalities can demand improved energy standards in connection to local plans for all types of buildings.
Netherlands
Building Regulations In the Netherlands there is different legislation for old and new buildings. New buildings have to meet a certain Energy Performance Coefficient (EPC) in order to obtain a building permit. The EPC is relative score which measures the primary energy consumption of the building in relation to a certain energy consumption reference for the building. Under the EPC regulation a builder is free to make his own choices on how to achieve the EPC level. The energy consumption for residents by 2009 is about 70-75 kWh/m^2/year. This will be increased in 2011, 2015 and 2020 where the residential building should be energy neutral.
Czech Republic Spain
Building Regulations. Since January 2009 it has been mandatory to have an energy certification on the following building types: new buildings; renovated buildings (larger than 1.000 m^2, 25% of building shell or energy installation) and public buildings (larger than 1.000 m^2) and other newly built or renovated buildings for rent or sale have to be provided with the Certificate.
Italy
Building Regulations. In order to get a building permit all new buildings need to meet some minimum requirements which is increasing in 3 steps; 2006, 2008 and 2010. The type and level of performance requirements for heating differ according to the function of the building (residential, non-residential). A proof of compliance must be made after completion of the building. Legal responsibility rests with the director of works. Control of the regulation is the responsibility of the municipality in which the building is located. In public buildings, the EPBD requires compulsory installation of solar thermal systems for hot sanitary water.

Spain

Building Regulations. The new requirements established by EPBD have generated some Spanish legal documents, which are: Spanish Action Plan of Saving and Energy Efficiency, Renewable Energy Foster Plan, Building Technical Code, Building Energy Certification, Changes in the Regulations of Thermal Installations in Buildings and Actualization of the Thermal Isolation law.

The Building Technical Code contains a number of different demands that will results in an improved building regarding the energy consumption and indoor climate where the most relevant demands are related to improvement of the insulation level and the obligation to supply solar energy.

France

Building Regulations. The current legislation in France is based on the EU Energy Performance Directive for Buildings (EPBD) and on the Thermal Regulation (i.e. *Réglementation Thermique, RT*) for buildings. The RT applies to new projects in residential and non residential sectors. Its overall objective is to reduce energy consumption in new buildings by 15% in 2010 looking to achieve a further 40% by 2020 within the framework of the National Climate Plan. In order to reach these targets, the RT is favouring the use of renewable energies, materials with high thermal inertia and preventing the use of air conditioning through bio climatic design. The RT has also resulted in the use of labels for new building where there are 4 categories. The 4 categories also take into account the geographic and the energy source (fossils/electric heating).

Ireland

Building Regulations The Irish Government has made a commitment to achieving a 20% reduction in energy demand across the entire economy through energy efficiency measures by 2020. It is estimated that improvements in the energy performance of the residential sector will contribute 53% of the total national reductions required to meet the overall target of 20% reduction in CO2 emissions by 2020. Minimum Energy targets required by National Building Regulations specific to new housing are as follows;

2005 Building regulations reference level
2008 40% improvement on 2005 building regulations
2010 60% reduction on 2005 building regulations
2012 Carbon Neutral homes
2019 Zero Energy, in accordance with the recently revised European Performance of Buildings Directive EPBD

The minimum energy consumption for new building in 2008 is 75 kWh/m^2/year.

Some more detailed descriptions are to find in the appendix.

4 Ambitions

The ambitions within the ENPIRE project have been varied, which appears from the national project descriptions to be found in the enclosures. In this chapter it has been chosen to focus on two of the seven projects – the Danish and Spanish project. The ambitions within the projects are either laid down by a housing association or a municipality or jointly as in the Danish project. The final evaluation of the projects can be found in WP6 Derivable 13 Evaluation Local Projects.

4.1 Denmark – Ambitions, local project in Albertslund

The municipality of Albertslund as a front runner

In the municipality of Albertslund they have agreed that they want to become the Danish climate test site concerning energy efficient renovation of concrete housing areas, since many billions DKK will be invested during the coming years. In order to show that advanced energy solutions which for example live up to a low energy class 1 level or a passive house standard are possible to realise with a positive economy and improved comfort, it is now the plan to establish "example" renovation projects several places in Albertslund.

For instance, it has been decided to implement low energy class 2 as a minimum and establish test houses of for instance low energy class 1 or passive house standard, as a means to identify the extra cost and total economy of these solutions in the 4 demonstration projects mentioned below. One of the projects is the privately owned "Poppelhusene" estate where it has been agreed to realise a passive house renovation standard for a test house and to combine with a active roof solution for the roof called "SOLTAG", where it is possible to obtain a total CO2 neutral building design including both solar thermal collectors and PV modules in the roof (approx 1 kWp PV should be enough for one housing unit). At the same time it is the idea to adjust the district heating design solution so low losses of the distribution network can be obtained when the rest of the 74 dwellings are renovated. To support the realisation of the first test house the municipal district heating company will give a support of 500.000 DKK while VELUX and other building component suppliers will give a supplemental support. Besides "Poppelhusene", the district heating company will also give a similar support for similar demonstration projects in "Hyldespjældet", which is social housing administrated by the BO-VEST housing association and in "Røde Vejrmølle Park" which is also privately owned. These activities will also be coupled with a demonstration project concerning a low energy class 1 standard for 6 housing units in Albertslund South which is also administered by BO-VEST, being part of a large renovation scheme for 552 housing units in the first part and later 1000 -1500 more housing units. For the first houses it has

been decided to reach low energy class 2 as a minimum. This will be the new minimum demand for new buildings in 2010.

4.2 Spain – Ambitions, local project

Within the energy planning process there are critical success factors and real motivations to draw up a new stage related to energy efficiency within the urban planning. There are different potential local drivers, such as local potential for renewable energies, environmental, competitiveness or economical and financial issues, employment, or just to show a "green image".

The main objective of the province of Ávila (City Council of Ávila) in energy matter (represented by APEA – Energy Agency of Ávila) is to promote energy efficiency and energy savings and to foster the renewable energies in the province.

The ultimate aim is the correct management of the local energetic resources and the optimal conditions for the energy supply in rural and urban areas so it will contribute to:

- Quality life of citizens
- Competitiveness of the province
- Conservation of environmental
- Increase the actions of different socio-economic actors

The Energy Agency expects to define a sort of recommendations to be delivered to the future urban areas promoters within the province of Avila. These recommendations will be useful to achieve an energy decrease around the 30% of the energy consumption allowed by the current law.

Moreover, it is expected that the document will be considered as a reference by the municipalities where new urban developments are expected, because it will show them the chances about the energy consumption decrease.

Other stakeholders involved in the project developed in Sanchidrián have different interests and ambitions, which can be summarized as follows:

- City council of Sanchidrián: It is the municipality where the new urbanization is going to be built:
    - It tries to reduce the energy bill of the new equipments (public lighting systems and green areas) because it will be its responsibility once the urbanization will be finished. This reduction can be, for example, around the 50% in the public lighting system, compared with the traditional lighting systems.
    - The municipality has also political interests. Show concern about environmental issues is highly estimated among people.
- Builder – promoter of the new urbanization. This stakeholder is who will build the dwellings and its main argue is the economical profit that will get. Nevertheless, there are other ambitions and reasons that justify the actions carried out within the project:
    - The Builder pursues a better image in the construction and promotion market that will let him to increase the choices of selling dwellings. The construction sector has potential owners more and more interested in energy efficiency issues.

- The company has an interest related with the fact that showing its interest in energy efficiency issues is well estimated by the market.
- Another argue is the advantaged position that the company will acquire regarding with the possible future laws in related with energy efficiency, because a broad fulfilment of the current law ensure a good position in the future law requirements.

Professional associations related with building sector (architects, technical architects, engineering). These associations constitute groups of technicians that are joined. One of the objectives of these associations is the information of its members. The professional associations will use the material generated in ENPIRE to disseminate the results through its members in order to train and get competitiveness among them.

5 Guidelines

The purpose of the guidelines is to provide the municipalities and housing associations with a tool to be able to create realistic ambitions.

The participating countries have a variation in how the national building regulative is made. A part from this there also is a variation in climate conditions, energy infrastructure, building traditions etc. This means that it is not possible to create a set of similar guidelines that include u-value and view of energy source etc. With this in mind the guidelines is made. The guidelines contains of a description of the process on creating the ambitions and then some practical tools on how to evaluate the different energy measures.

The Guidelines in this document are meant to be used in the initiating phase of defining the ambitions. This has an influence on how detailed the sustainable energy measures have to be described. A detailed description can be perceived as a impediment for the entire project as unforeseen problems may arise when scruniting the project. In the Breda project several detailed proposals for solution were chosen. The proposals for solution are described are described in the ENPIRE leaflet

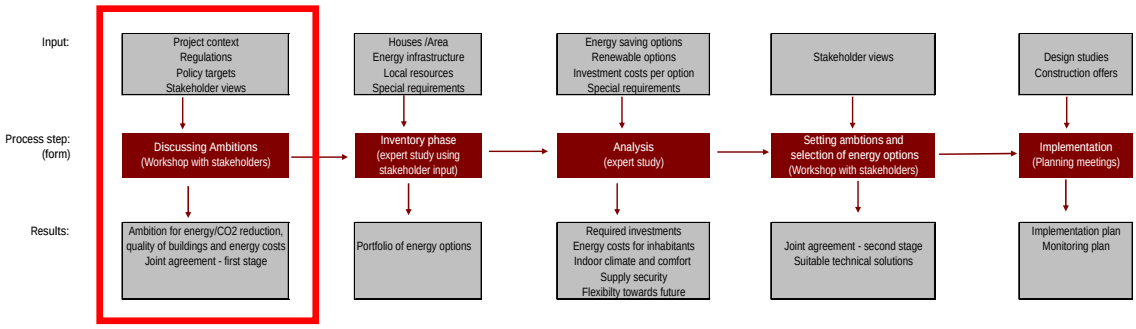


Figure 2 Processschedule on defining the ambitions to the implementation

In Figure 3 is a more detailed description on the process and those considerations each project should get though in the process of setting the ambition that both are realistic and ambitious.

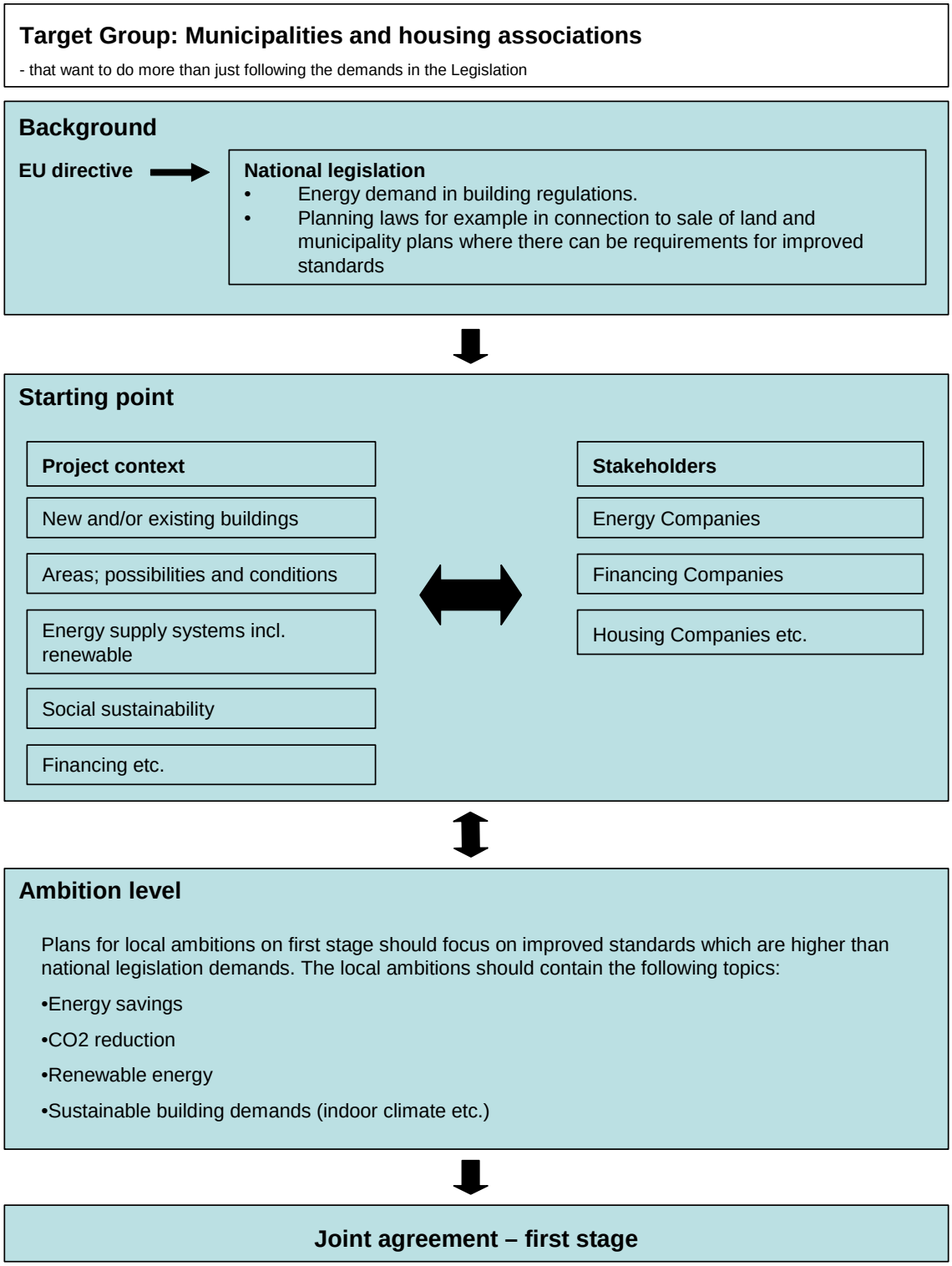


Figure 3 Process schedule for setting the ambitions in the starting phase of the project

Background every project starts from the EU directive and the national legislation.

Starting point The main issues here are the context of the project and the stakeholders, both issues which can be individually in the projects, and leads to that the following text only has to be read as advisory.

Project context as mentioned above this will vary from project to project. But however there are some specific issues which repeatable appear such as:

New and/or existing buildings

The EU-directive make requirements to the energy consumption of new built whereas the requirements to energy measures for renovation can be omitted, if they are not profitable. This makes it difficult to realize energy measures, contributing to reduce the energy consumption of the existing buildings as these are often connected to an extra cost. In the Czech Republic it is assumed that the Directive would only capture 10% of the technical potential – the exclusion of existing buildings below 1000m from the renovation requirements was the major reason for this. The situation in the new Member States is almost identical with the EU 15 likely to deliver only 9% of the technical potential by 2010.

The following chapters are about these issues whereas the last section has its focus on the renovation situation. Chapter 5.1 Being in compliance with the EU EPBD directive by help of low energy classes and energy point systems, Chapter 5.2Passive house designs and low energy classes in Denmark and Chapter 5.3 Important solutions for low energy retrofit of the future.

Areas; possibilities and conditions

Obvious issues to focus on;

Urban building coefficients, which physically characterize the buildings in the project. Examples are the Floor area and the Shape factor, i.e. maximum height in relation to the building surface.

Site layout - the distribution and orientation of buildings and of spaces within the buildings should be such that one achieves the lowest energy.

Ect.

Energy supply systems incl. renewable

District solutions - this level addresses options which are only possible or most attractive on a larger scale, like district heating, combined heat and power generation, geothermal heat, heat and cold storage in the underground. While some of these options are only attractive in new construction areas one can also consider improved efficiency or "greening" of an existing district heating system or even a change from individual to central heating/cooling systems. If this is considered it is important to remember that the choice of a certain energy-solution should take into considaration the local energy infrastructure. and its potential for using renewable sources. For example a distribution network for natural gas may not be available or suitable for transportation of energy from renewable sources like biogas, whereas a heat distribution grid can transport heat from any heat source.

Financing is very important for renovation as for newbuilt. Projects that consider and involve economic considerations I the early initiating phase will be well positioned. Considerations must be made within profitable solutions and alternative financing solutions.

Chapter 5.7Example on how to organise energy efficient renovation in co-operation with local energy saving companies and Chapter 5.8Calculations of total economy (capital and operation costs) by help of the new developed BYG-SOL tool deal with these issues.

Sustainability The idea of sustainability is broad defining and has the weakness of not being clearly defined leading to the definition at random and then looses importance. But in a initiating phase it is advantageous and can open the idea generated process. It is important to remember to make a clear definition of what sustainability means to the individual project.

A whole consideration of a project can be made in various ways. The three chapters; 5.5 General approach concerning the use of a Green Quality Building Process, 5.6Green diploma and 5.4 EPL give each their suggestion of how this can be performed. EPL, which is a toll elaborated in The Netherlands is in the ENPIRE project estimated to be particularly interesting because EPL combines the energy consumption of the individual building with its surroundings. This means that the same building can obtain a different estimation, depending of where in the country it is located.

Stakeholders the stakeholders are described closer in the report "FINAL GUIDELINES ON THE PROCESS". Stakeholders in many projects are a diversified party and in some cases with very different interests. But common to them all is that they are acting as catalysts within the project, in which they have the opportunity of contributing negatively in delaying the process or positively by making some energy measures a success. It is important for all projects to control all stakeholders for several reasons – such as the importance of finding/deciding/selecting stakeholder with interests, conflicting and solve these conflicts before they become an obstacle, slowing down the realization of the project. Besides it can be of decisive importance to find and activate stakeholder that necessarily would not have found the project by themselves.

Ambition level Basically the ambitions have to go beyond the level required in the EU-directive and by the national legislation. But it is important to be realistic and not set the ambitions too high so that they will not be met. It is recommended that the locale ambitions include the following subjects: Energy savings, CO2 reduction, renewable energy and sustainable building demands (fx indoor climate etc.)

Joint agreement – first stage

5.1 Being in compliance with the EU EPBD directive by help of low energy classes and energy point systems

When it comes to defining minimum and best practice standards there are two different possible approaches:

- Focus on the performance of individual components and the building shell as a whole
- Focus on the performance of the whole dwelling, including installations as an energy frame value. This approach is at the moment used in Denmark, as well as in the Netherlands and Austria for instance.

When you are considering the idea of introducing minimum and best practise standards for eco efficient renovation it is at the same time very relevant to look at the prospects of actual influencing the market so well defined eco efficient renovation standards will actually be introduced in practise. Here focus can be set on, how improved energy standards have been introduced primarily in Austria in the new building area in a very successful way. In Austria the work on these issues and the building regulations as a whole are handled by the local regions and experience from the Salzburg region in Austria for instance shows how a simple energy point system, affecting the financing of building projects, has had a tremendous influence on the improvement of the energy quality of especially new housing projects.

The results of this initiative speak for themselves:

Since 1993, when the system was introduced, the specific heating load has decreased from 63 W/m^2 to 25 W/m^2. The heat loss value of the building shell has decreased 65%. At the same time the use of solar heating for DHW has increased to be used in 60% of all new houses while biomass heating has reached 72%.

In Denmark, as an example, use of solar heating for DHW is used in less than 1% of new buildings, so this can be considered as a remarkable achievement.

When you look at the way the energy point system is defined, then you actually discover a mix between individual component and overall building performance criteria. But the strong approach is how the financing of the building or renovation project is affected in this way, so it is carried out with no costs for the region. Only existing funding systems have been adapted to new demands concerning energy efficiency, which means that builders, as for instance, housing associations get an improved financing, provided they support an improved energy standard. If they choose to omit this, it will get a poorer financing, compared to previous times.

5.2 Passive house designs and low energy classes in Denmark

The German passive house standard is a very strong tool with respect to limiting the energy use for room heating to 15 kWh/m²/year, so it is possible to cover the heating demand by help of the fresh air you anyway need to supply in connection to the necessary balanced heat recovery ventilation system (with 10 W/m²).

In the same way the new Danish low energy classes 2 and 1 are also strong tools to ensure an all over low energy quality of buildings with respect to primary energy use, because you here utilise an energy frame value which includes energy use for heating and

domestic hot water. To this you add electricity use for operation which you first multiply with a factor of 2.5 to take into account the extra environmental burden when using electricity compared to heat.

In Figure 4 there is an illustration of low energy class 2 compared to minimum demands and former demands (before 2006).

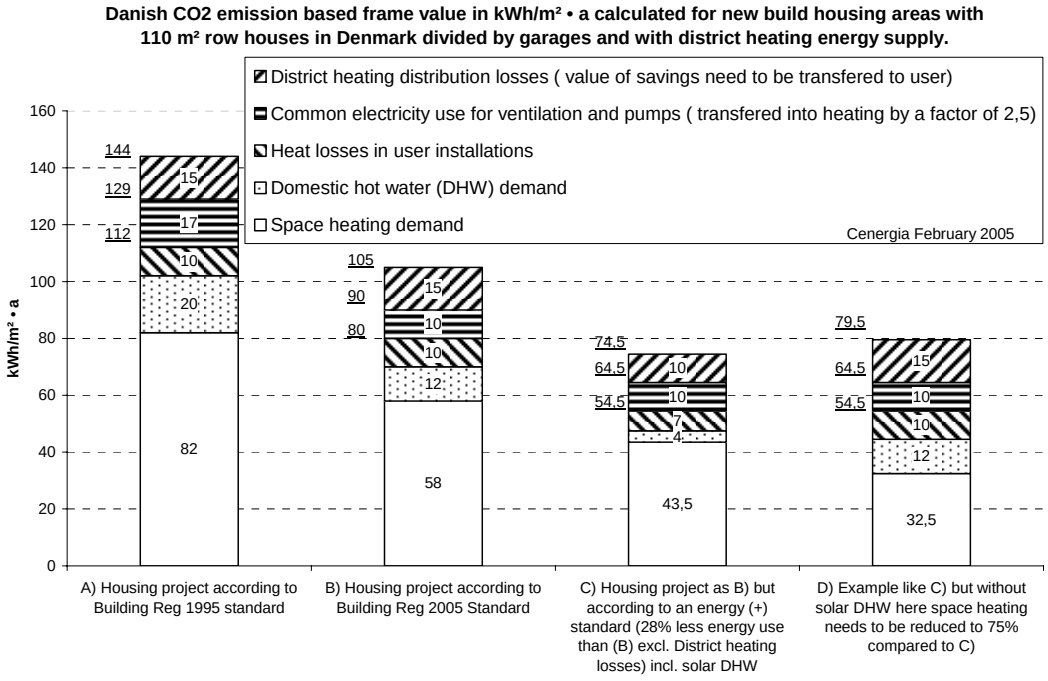


Figure 4 New build standard in Denmark compared to the old standard and low energy class 2 (energy+)

Low energy class 1 buildings are 50 % better than buildings according to the minimum demands in the building regulations. And since the passive house standard with 5 kWh/m²/year for room heating is around 40 % better than the level you will expect in connection to low energy class 1 buildings, then it should be clear that the low energy class you should reach for passive houses should be better than low energy class 1.

Here you can e.g. choose a level which is 33 % better than low energy class 1, e.g. as a low energy class 1+ level. Then you will have the same improvement which exists when you go from low energy class 2 to low energy class 1.

	kWh/m²/year
Minimum demands in building regulations:	84
Low energy class 1 is then:	42
Low energy class 1+ is then:	28

Room heating level for passive houses:	15
Energy use for DHW including solar DHW heating:	6
Reminder to cover electricity use for operation of ventilation and pumps. (28-15-6):	7

This is equal to 450 kWh of electricity per year. With 0.25 kWp PV-modules (1.5 – 2.5m²) you can increase this to 640 kWh per year.

Cenergia has developed a new tool, "BYG-SOL" or "Solar Energy in the Energy Frame Value" in connection to a research project by the same name supported by the Danish Energy Agency. Here you can make energy calculations according to the new Danish energy rules, and the EU Directive for Energy Performance of Buildings in a very simple way which is described in the chapter 5.8 Calculations of total economy (capital and operation costs) by help of the new developed BYG-SOL tool.

5.3 Important solutions for low energy retrofit of the future

One of the extensive challenges is to have the existing building mass updated. Characteristic for all the participating countries within the ENPIRE project is that no visionary requirements to the existing building mass in the national building regulations are claimed, which makes the process of updating the existing building mass heavy, as regards reduction of energy consumption

- New financing mechanism for large scale renovation
- Use of solar heating systems with a high contribution for both heating and DHW, by combining with boost heat pumps
- User of super low energy windows with low frame losses
- Use of prefabricated facade insulation components
- Use of industrialised renovation
- Use of low cost low noise building integrated heat recovery ventilation systems for quick installation
- Use of passive house standards for retrofit
- Use of overall building designs with daylight use and low electricity use
- Use of active roofs which are designed for building integrated solar energy
- Use of building integrated PV and intelligent PV systems e.g. like PV operated ventilation system in combination with natural ventilation e.g. for offices or public buildings
- Low cost roof integration of PV and solar thermal systems
- Solar thermal collector systems directly supplying solar heat into the district heating network
- Biomass gasification CHP system based on wood chips and bio oil from waste
- Development of Community Energy Management System
- Intelligent low temperature district heating concepts

5.4 EPL

Municipalities have to implement the legislation on the Energy Performance standard (EPC) for single buildings when they issue a building permit for new buildings.

In the Netherlands when the municipalities develop larger projects with new or existing buildings municipalities often make use of tool called the Energy Performance of a Location (EPL) to set a certain ambition level.

EPL-based requirements may be included in local regulations for the community.

The Energy Performance of a Location (EPL) is a Dutch instrument to realise fossil fuel and CO_2-emission reductions in building projects that comprises several buildings. EPL is used next to the EPC, the Dutch energy standard for single buildings (energy performance coefficient of a building). While the EPC is obligatory for obtaining a building permit, the EPL on the other hand is not always required.

The EPL is a relative indicator of the CO_2-emissions which are due to the energy use of buildings in a location. It is calculated by dividing the project specific CO2 emission by a certain reference CO_2-emission for the location. EPL includes the energy use for heating, cooling, hot water, lighting, ventilation and household purposes in buildings and also a (fixed) value for the energy use for public lighting and water management of the public areas.

The EPL-scores scale from 0 to 10, where 10 implies a CO_2-neutral energy supply of the location. For new locations with buildings that meet the current (2009) Dutch energy efficiency regulations for buildings, the EPL score will be approximately 6.6. Better scores of the EPL can be realised by reducing the energy consumption in a location or by producing renewable energy. The method contains some restrictions for compensation of CO_2 emissions. When new renewable energy capacity is realised, it has to be within the boundaries of the location. CO_2 emissions cannot be compensated outside the location. So, the method stimulates renewable energy use at the location itself.

EPL has been developed to stimulate energy efficient buildings and sustainable energy supply in a location. The municipality can translate their ambitions for CO_2 emission reduction to an EPL score. The Community of Breda for example, requests an EPL of 7.2 for new building projects and restructuring areas, which implies a 15% CO_2 reduction compared to the present building standards. This ambition can be monitored during development of the project and can be used to check if the ambition is realised.

Since 1998 the EPL scores of locations with new building projects and restructuring areas in the Netherlands have been monitored. The last EPL Monitor (2006) shows that in locations with EPL ambitions, the EPL is considerably higher than in locations without EPL ambitions. The higher EPL scores correspond to CO_2 reduction of 20% on average.

5.5 General approach concerning the use of a Green Quality Building Process

This is illustrated by the following Green Quality Building Process Figure 5:

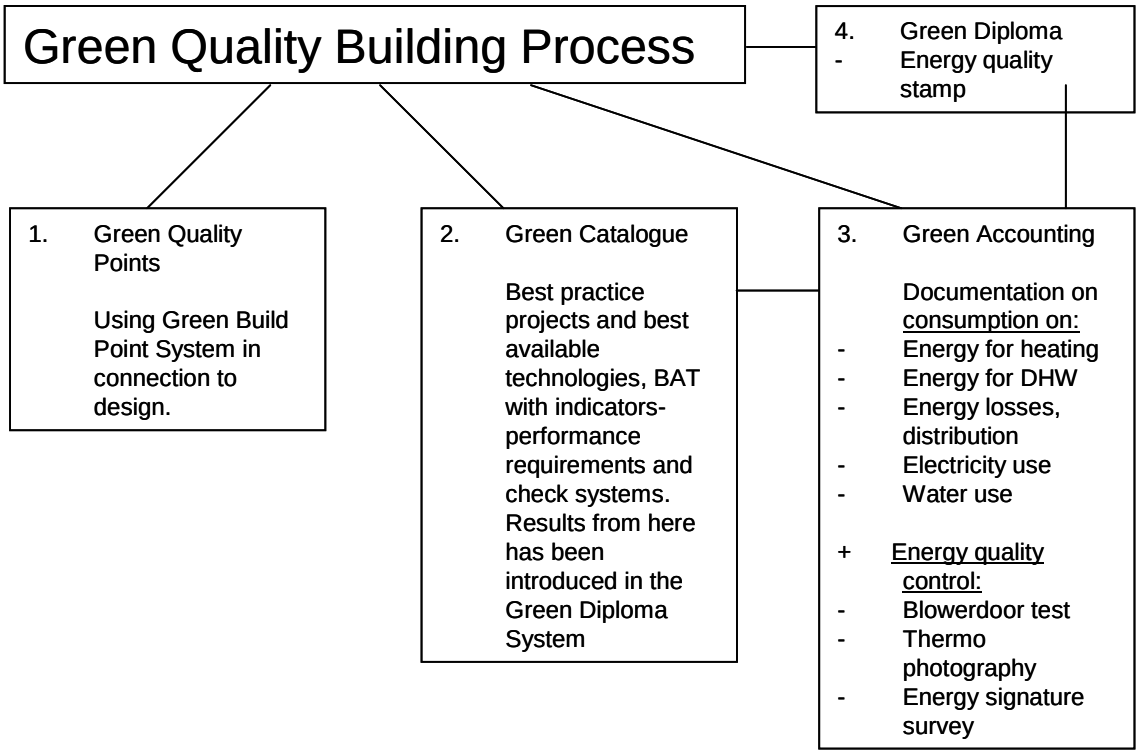


Figure 5

Above is an illustration of the Green Quality Building Process. This can also be explained in the following way.

First you check the general quality of your aimed at sustainable and energy efficient renovation project by filling in your Green Build Point System (1), to see if your approach is acceptable. Then you can use the Green Diploma System (4) as an energy (and environmental) quality stamp you aim to reach. The Green Catalogue (2) (www.greencatalogue.com) provides information on indicators and performance requirements, and this can be used as basis of Green Accounting (3).

In the Green Quality Building Process you can aim at a low energy design in one out of 3 improved levels, which you compare to the national minimum quality of housing renovations projects. The 3 levels are suggested as:

National demands in connection to a "New build level" or a slightly improvement of this (which is the minimum standard to obtain the Green Diploma), Low Energy Class 2 level (which is 25% better than the national minimum demands for new build and which secures a Low Energy Green Diploma) or the Energy Plus level which can either be defined as a Low Energy Class 1 level (which is 50% better than the new build standard) or a Passive House Standard securing an Energy Plus Standard.

In all cases you need to identify indicators, performance requirements and check systems for a number of best available technologies, like insulation, windows, ventilation systems etc.

5.6 Green diploma

A secretariat for the Green Diploma has been established in Denmark by the national association of housing associations (BL) the Energy Service Organisation in Denmark. For a European approach, a possibility could be to present performance requirements for building projects and best practice technologies related to:

a. Standard renovation in the countries

b. Green Diploma level 1 - which could be equal to the minimum demands for new buildings in the countries, perhaps with some modifications

c. Green Diploma level 2 – which could be equal to an improved low ener-gy standard, possibly equal to the expected minimum demands for new buildings in year 2010 when the EU-EPBD demands will be revised

d. Green Diploma level 3 – which could be equal to the best possible Energy Plus Standard, (e.g. Passive House Renovation), or equal to the expected minimum demands for new buildings in year 2015 when the EU-EPBD demands should be revised again.

Besides it is very important to include a focus on check systems which can be used to confirm that the performance requirements are being met in practice. Examples are here i.e. use of Energy Signature registration by help of radio controlled meters, use of blowerdoor tests and thermo photography and use of electricity meters for pumps and fans.

A barrier here is the fact that it only in Denmark where a low energy class system has been introduced aiming at being introduced as minimum demands for new build in the years, 2010, 2015 and 2020 ending up with a 75% energy saving compared to today.

It can be concluded that there can be great use of a certification system like Green Diploma, but it will at the same time be more useful if it is possible to secure improved financing solutions for low energy renovation projects so you can show a good economy of the users based on the energy savings.

5.7 Example on how to organise energy efficient renovation in co-operation with local energy saving companies

The idea is to obtain loans with low interest rates, based on a municipal warranty like the one which is practised in Denmark for district heating systems.

In Figure 6 is illustrated how you can help to organise energy efficient renovation of social housing projects based on a Danish context. The main results of this are that instead of financing energy savings and solar energy systems by a normal bank loan, where the interest rate can easily be 7.5-8% by the end of 2008, instead you can obtain a municipal guaranteed loan at a interest rate of app. 4%. This can actually secure up to a low energy class 1 level in concrete housing renovation according to calculations. This is 50% better than the present standard of new build.

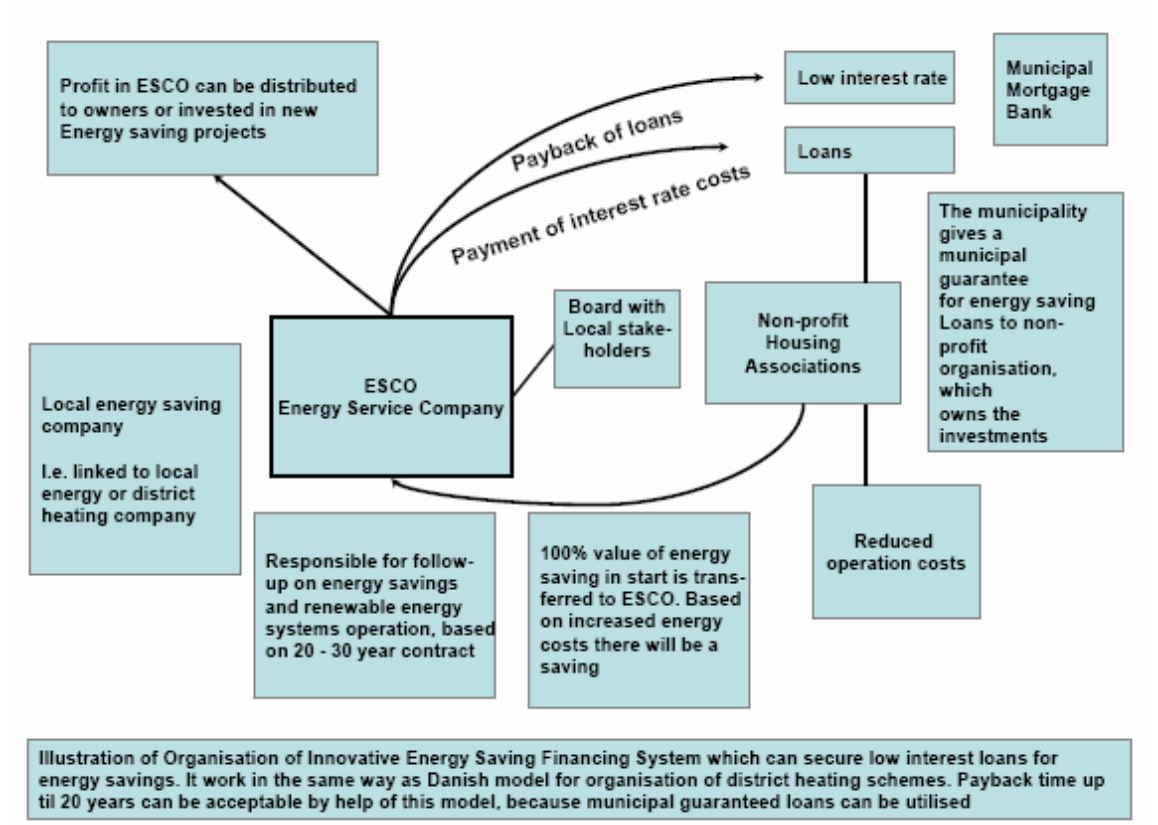


Figure 6

5.8 Calculations of total economy (capital and operation costs) by help of the new developed BYG-SOL tool

Cenergia has developed a new tool, "Solar Energy in the Energy Frame Value" in connection to a research project by the same name, supported by the Danish Energy Agency. Here you can make energy calculations according to the new Danish energy rules and the EU Directive for Energy Performance of Building in a very simple way.

By help of the "BYG-SOL" tool it is possible very quickly to identify which energy saving package is the most efficient and most economic for retrofit as well as new build housing projects, because there is also a build in a data base for extra costs of energy saving measures, data which you can also change if you want to.

The tool can be downloaded from Cenergia's website and from www.solarcitycopenhagen.dk in Danish and it is being translated to English at present time.

Appendix

Appendix 1 Danish Legislation

In Denmark new energy rules, based in the EU Energy Performance Directive for Buildings EPDB have been introduced in the building regulative.

This means that we since 2006 have to live up to an energy standard which is better than before and that two projected low energy standards, low energy class 2 which is 25% better than normal standard and low energy class 1 which is 50% better, has been introduced. At the same time it has been agreed in the government and parliament that low energy class 2 will be the new minimum demand in year 2010 and low energy class 1 will be the new minimum demand in 2015 while the minimum demand in 2020 concerning low energy class 0 will be equal to 50% of low energy class 1.

Energy frame for new building: housing, hotels etc.	
low energy class 1	(35+1100/A) kWh/m^2 per year
low energy class 2	(50+1600/A) kWh/m^2 per year
Minimum demand	(70+2200/A) kWh/m^2 per year
(A is the heated floor area)	
Energy frame for new building: offices, schools, institutions etc.	
low energy class 1	(50+1100/A) kWh/m^2 per year
low energy class 2	(70+1600/A) kWh/m^2 per year
Minimum demand	(95+2200/A) kWh/m^2 per year
(A is the heated floor area)	

Besides the energy frame there also is a minimum demand fore the building components.

In cases of renovation that is over 25 % of the area of the climate shield the Danish building regulations has a demand that the building also should be energy renovated.

This demand is dropped when the possible energy improvement is not profitable. A energy improvement is considered profitable when

$$\frac{\text{the savings x lifetime}}{\text{the investment}} > 1.33$$

The energy calculations concerning minimum demands and low energy classes in Denmark is referring to an energy frame value which consists of energy use for heating and hot water to which is added electricity use for operation which is multiplied by a factor 2.5 to take into account the higher CO2 emission and costs of electricity. Local renewable energy systems like solar thermal systems or PV systems can have their contribution included in the energy frame value, so you deduct the influence of these.

This is only the case for renewable energy systems included in the building. It has at the same time been agreed that where there can be regulations that secure that e.g. district heating should be used in certain areas, then this is at the moment not the case for buildings performing better than according to low energy class 2.

This has lead to a situation where several planning areas which demand low energy class 2 or 1 will not use district heating, but instead relay on for instance heat pumps.

This is in Denmark seen as a problem, because the majority of district heating is actually very sustainable since it is based on waste incineration or use of combined heat and power and is covering 60% of all heating demands in Denmark at the present.

To be able to give priority to use of district heating in new planning areas it can be suggested to use an extra energy frame value for city areas which improve the building energy frame value by e.g. dividing by a factor of 1.2 you utilise district heating of a certain quality while it does something similar for communal renewable energy systems.

In this way a municipality can make an energy quality demand not only for buildings, but also for buildings including energy supply systems and use of renewables. If the municipality e.g. demand low energy class 1 building then it can combine this with a demand for the city area which is higher, like e.g. 50% of low energy class 1.

This will give a freedom for the developers and energy companies to come up with a useful solution. Here one possibility could be that the energy company owned renewable energy systems which was placed on the buildings and contributed to meet the demands and the energy frame value for the city area.

Appendix 2 Czech Legislation

The most important energy related legal document is the Energy Management Act 406/2000 Coll.

The requirements of the European Directive 2002/91/EC (EPBD) were transposed into the Czech legislation in 2006 through the amendment of the Energy Management Act. Consequently implementing legislation was elaborated. Those were following decrees:

Decree No 148/2007 Coll., on energy performance of buildings

which stipulates the calculation method for the energy performance of buildings, the requirements on buildings with respect to their energy performance and defines the content of energy performance certificates.

Further to the Amendment of Energy Management Act 406/2006 Col. the energy certification is obligatory since January 1st 2009 in the following cases

- new buildings;
- renovated buildings (larger than 1.000 m^2, 25% of building shell or energy installation)
- public buildings (larger than 1.000 m^2) shall place the certificate in a prominent place clearly visible to the public before 1st January 2009;
- other buildings for rent or sale shall be provided with the Certificate only when newly built or renovated

Certificates may be delivered only by Energy Auditors and Members of Czech Association of Building Engineers.

Further important decrees in the field of energy are:

Decree No 193/2007 Coll,
which lays out details for the effectiveness of use of energy for the distribution of heat energy and internal distribution of heat energy and cooling. This decree designates the requirements for the efficiency of use of energy in newly established equipment for the distribution of heat energy and for the internal distribution of heat energy and now for distribution of cooling. It applies only to distributions of heat for the heating of residential buildings, not for the distributions of technological heat in industrial processes. (tal på kravene)

Decree No 194/2007 Coll.

which designates the rules for heating and supply of hot water, measurement indicators of consumption of heat energy for heating and for the preparation of hot water and requirements for equipping internal heat equipment of buildings with instruments regulating the delivery of heat energy to end consumers

Decree No 195/2007 Coll.

which defines the rules for the regional development policy in terms of energy.

Setting up of minimum energy performance standards

- All new and existing buildings (>1000m2) should comply with these standards
- Energy performance certificates to be presented when buildings are constructed, sold or rented out
- Requirement for a regular inspection of boilers and air conditioning systems above minimum sizes

The EPBD Implementation scheme for the Czech Republic is shown below in Figure 7.

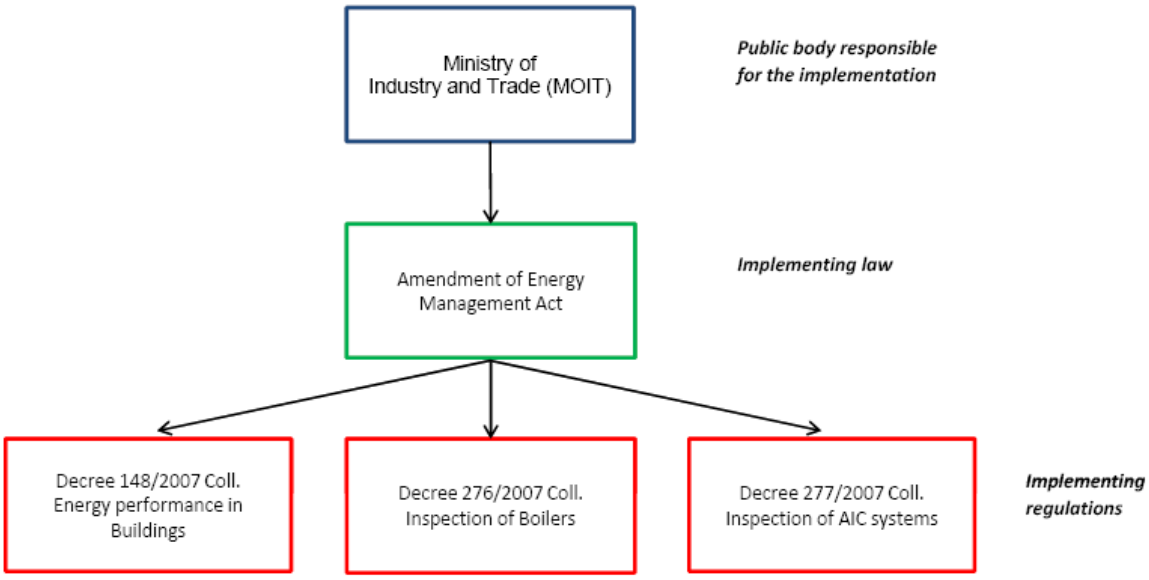


Figure 7 EPBD Implementation scheme

In principle, the EPBD provides a strong framework to stimulate energy-efficiency improvements. According to the investigation for the EU 15, it was found however that the Directive would only capture 10% of the technical potential – the exclusion of existing buildings below 1000m from the renovation requirements was the major reason for this. The situation in the new Member States is almost identical with the EU 15 likely to deliver only 9% of the technical potential by 2010

Two measures are needed to capture more of the potential in the new Member States:

- The extension of EPBD to renovation of all buildings - this would lead to capturing 25% of the technical potential by 2010 and almost 50% by 2015
- Access to funding to overcome the initial investment costs associated with energy-efficiency measures. This is a big concern in the Czech Republic, as well as in other new Member States. Without proper funding mechanisms this historic opportunity to improve considerably the technical condition of the housing stock and to lower the operational costs by reducing the consumption of energy would be probably missed.

Appendix 3 Italian Legislation

In Italy, before the Energy Performance for Buildings Directive (EPBD: 2002/91/CE), was acting the Law n. 10 of 09/01/1991 "Rules for the implementation of the national energy plan in the field of rational use of energy, energy saving and development of renewable energy". This law, since 1991, was evidencing the building energy certification, valid for 5 years, in every building transaction or rental.

Now, the implementation of the EPBD is the responsibility of the Ministry of Economic Development, in collaboration with the Ministry of Environment and the Ministry of Infrastructures. On 19 August 2005, the Council of Ministers approved a first Legislative Decree, representing a general framework for the transposition of all EPBD articles, except article 9. On 29 December 2006, the Council of Ministers has adopted a new Legislative Decree regarding modifications and extensions. The official texts are available on the Ministry of Economic Development website:

www.sviluppoeconomico.gov.it.

The setting of technical guidelines, rules and general inspections is done at regional level whilst the actual inspections are coordinated at local level.

Energy performance requirements

The basis for the calculation methodology is the 'Energy Performance Building Regulation' (EPBR). It is based on the CEN standards and applies to both new and existing buildings. The procedures are available from the Italian Standard Organisation. (www.uni.com)

New buildings

On 29 December 2006, the Government revised the minimum requirements of all new buildings. Requirements are phased in according to the date of the building permit request:

- First stage: building permit requests after 1 January 2006
- Second stage: building permit requests after 1 January 2008
- Third stage: building permit requests after 1 January 2010

The type and level of performance requirements for heating differ according to the function of the building (residential, non-residential). A proof of compliance must be made after completion of the building. Legal responsibility rests with the director of works. Control of the regulation is the responsibility of the municipality where the building is located.

In public buildings, the EPBR requires compulsory installation of solar thermal systems for hot sanitary water.

Existing buildings

For existing buildings, the Government adopted the EP minimum requirements also for renovated buildings through a gradual approach:

• Integral application to the whole building in case of total renovation and/or demolition and reconstruction of existing buildings having a useful surface of more than 1000m^2.

• Integral application, but limited to the new part of the building if this part exceeds 20% of the original volume.

• Application limited to single parameters, performance levels and prescriptions when the intervention on an existing building regards mainly renovation of heating systems.

Certification of Energy Performance of Buildings

The certification of new buildings started 30 days after publication of the new Decree on 1 February 2007. The certification will gradually become mandatory for all new buildings, when property is transferred or when rented, in three steps:

• July 2007 for buildings above 1000m^2

• July 2008 for buildings below 1000m^2 (excluding single flats)

• July 2009 for all flats

Moreover, since 1 January 2007, a certificate is required in order to have access to any type of public incentive for improving energy performance like:

• A 55% fiscal deduction over a period of three years for building efficiency measures

• Interventions for public building energy renovation

• The new premium rate program for photovoltaic systems

For new buildings exceeding 1000m^2, the compulsory display of the certificate is required. The same obligation is extended to existing public buildings, when an energy service contract of any type is signed, starting as of 1 July 2007.

Appendix 4 Spanish Legislation

In Spain, the legislation with some influence in the energy consumption for buildings comes from the EPBD and the obligations introduced by this Directive.

The new requirements established by EPBD have generated some Spanish legal documents, which are:

- Spanish Action Plan of Saving and Energy Efficiency
- Renewable Energy Foster Plan
- Building Technical Code
- Building Energy Certification
- Changes in the Regulations of Thermal Installations in Buildings
- Actualization of the Thermal Isolation law

The Spanish Action Plan for Saving and Energy Efficiency and the Renewable Energy Foster Plan fix the main rules and targets to achieve regarding to the substitution of conventional energy for renewable sources and the amount of energy efficiency that has to be achieved.

The building Technical Code is the reference regulation to the building sector, because it's the code that fixes the rules that have to be obeyed by constructors. There are several topics developed in the Code: Building Safety; Building Functionality etc. but the part which is most important for us treats Living conditions, where many aspects are included. These aspects are:

- Energy demand limitation. The Code, within this part, forces buildings to improve the isolation level in order to reduce the energy demand. The isolation level has increased significantly with this law, but there are other aspects regulated within this part, as condensations.
- Thermal installations yield. This code part has regulated the minimum yield that thermal installations have to work with. It also fixes some regulations for ventilation systems.
- Lighting systems energy efficiency. Some rules to lighting systems have been fixed. To do that, a new concept in Spain has been introduced: The Energy Efficiency Value, which classifies the lighting installations according to the energy efficiency and the amount of life that the system generated. There is also an obligation to install equipment to control and regulate the lighting system.
- Solar thermal contribution. Despite of some cities had solar thermal contribution obligation before, this is the first law that forces to install solar thermal at national level. The obligation of supply with solar energy changes according to the zone of the building, because the climate conditions vary within the country.
- Solar photovoltaic contribution. This part forces some kinds of buildings (like supermarkets, stores etc.) to generate electricity from photovoltaic sources.

In this sense, not only new buildings have to carry out these obligations, but also old buildings that are going to be refurbished, so this regulation is important enough because it will generate energy efficiency improvements in many buildings.

Another important novelty introduced by the application of EPBD in the Spanish law is the energy certification introduction. It forces builders to give the building users the building energy label, something very common in some products (appliances, equipments etc.) but not used in buildings until now. To give this energy certification, the Spanish government has created two different software which allow the energy certification estimation.

This certification gives the building a value according to its energy behaviour and also gives some data as the energy consumption per square meter and the CO_2 emissions per square meter.

Besides these new laws, there are also some changes and actualizations in regulations related to energy efficiency. The first one is related to thermal installations and some changes were introduced by EPBD. These changes were about the layout of equipments, the isolation level that heat pipes have to respect; the documents that a project has to generate.

The last modification introduced by the Directive is about the building isolation level, because before EPBD, buildings had to carry out with a isolation level that is now fixed by the technical code, so there are some laws that are been cancelled or modified.

Appendix 5 French Legislation

With 40% of the national energy consumption, 660 TWh, and almost 20% of CO_2 emissions, the building sector is the biggest energy consumer in France. Looking to improve the energy performance of buildings, the Thermal Regulation 2005 (i.e. *Réglementation Thermique, RT*) applies to new projects in residential and non residential sectors. Its overall objective is to reduce energy consumption in new buildings by 15% in 2010 looking to achieve a further 40% by 2020 within the framework of the National Climate Plan. In order to reach these targets, the RT is favouring the use of renewable energies, materials with high thermal inertia and preventing the use of air conditioning through bioclimatic design.

The current legislation in France is based on the EU Energy Performance Directive for Buildings (EPBD) and on the Thermal Regulation for buildings. The current version is the Thermal Regulation 2005. The RT is meant to be revised every 5 years to integrate the latest objectives in terms of energy performance and integration of renewable energies in new buildings. Due to recent evolutions, the future version of the RT is planed for 2012.

It is worth mentioning that, following the presidential elections of 2007, the recent national consultation on how to improve the integration of the Environment in the French economy, called *Grenelle de l'Environnement*, has led to a significant strengthening of the RT and the emergence of new opportunities to reach a low consumption building sector in new and existing constructions.

RT 2005 specifications:

The RT 2005 is making a point in inviting stakeholders to consider all the opportunities offered to improve the global energy performance of buildings by reference to a legally specified technical framework.

The three conditions that have to be respected for new buildings are:

- Energy demand management: limiting energy consumptions by comparison to a Reference Primary Energy Consumption ratio
- Summer comfort: achieving an Internal Conventional Temperature minor to a Reference Internal Conventional Temperature
- Minimum requirements: ensure the implementation of minimum requirements for the elements considered while calculating the Energy Balance of the building.

The RT 2005 has brought the following improvements:

- Use of labels in new projects :
    - *HPE* – High Energy Performance : primary energy consumption in kWh/m² are inferior by 10% to the reference energy consumption ratio (Cref)
    - *THPE* – Very High Energy Performance : primary energy consumption in kWh/m² are inferior by 20% to the reference energy consumption ratio (Cref)
    - *HPE* and *THPE Energies Renouvelables* – High and Very High Energy Performance with Renewable Energies: if the HPE and THPE are equipped with renewable energy sources for heating or domestic hot-water production.

- *BBC* – Low Consumption Buildings: for buildings with a consumption level between 30 to 50 kWh of primary energy/m²/year. This level of performance is being identified through the trademark *Effinergie*, standing for energy efficiency.

Reference consumption levels for a building in line with the RT 2005 to fulfil its needs in terms of heating, air conditioning, ventilation and the production of domestic hot-water is of 130 kWh pe/m²/year (250 kWh/m²/year in case of electric heating). The national average in existing buildings being around 400 kWh pe/m²/year.

Maximal Primary Energy consumption reference levels according to the geographic settlement:

Climatic area	**Fossils**	**Electric heating (including heat pumps)**
H1	130 kWh pe / m² / y	250 kWh pe / m² / y
H2	110 kWh pe / m² / y	190 kWh pe / m² / y
H3	80 kWh pe / m² / y	130 kWh pe / m² / y

Inputs of the *Grenelle de l'Environnement*:

From what has been discussed so far by both the Parliament and the Assembly in the bills presented over the last two years, *le Grenelle* is proposing:

- A Building Sector National Plan: to deal in priority with the energy issue in existing and new buildings. The Plan is proposing several measures to stimulate investment in the building sector:
  - Zero interest rate loan for private owners
  - Increased advantages on tax credits on insulation and renewable energy equipments
- To support the improvement of the energy performance of social housing buildings through additional financial support and access to the FEDER funds
- Exemplary actions taken in national administration buildings
- In general: the *Grenelle* is strengthening all available regulation and reporting procedures in order to raise the overall energy performance of the building sector in France.

Appendix 6 Irish Legislation

National Objectives

The Irish Government has committed to achieving energy efficiency savings of 9% by 2016 in accordance with the requirements of the Energy End-Use Efficiency and Energy Services Directive (ESD).

The Irish Government has also made a further commitment to achieving a 20% reduction in energy demand across the whole of the economy through energy efficiency measures by 2020 in accordance with the European Union's *Action Plan for Energy Efficiency- Realising the Potential in October 2006*,

Recognising that Government must lead by example, it has also committed to achieving a 33% reduction in public sector energy use by 2020

National Bodies

Regulation Body: Department of Communications, Energy and National Resources
DCENR National Energy Agency: Sustainable Energy Ireland

Legislation

National Energy Efficiency Action Plan 2007-2020 - Published May 2009

This Government policy document sets out Government plans and actions to achieve its target of 20% energy efficiency savings across the economy by 2020

Government White Paper, Delivering a Sustainable Future For Ireland - 2007 – 2020

This document sets out the Irish Government's energy policy frame work, designed to to steer Ireland to a new and sustainable energy future; reduce greenhouse gas emissions and energy costs and improve security of energy supply, sustainable transport, affordable energy, competitiveness and environmental sustainability.

National Climate Change Strategy 2007-2012

This document outlines the measures Ireland is taking to meet it's commitment under the the Kyoto agreement, i.e. to limit the growth of CO2 emissionst to 13% above the 1990 levels in the 2008- 2012 period.

Bio Energy Plan for Ireland

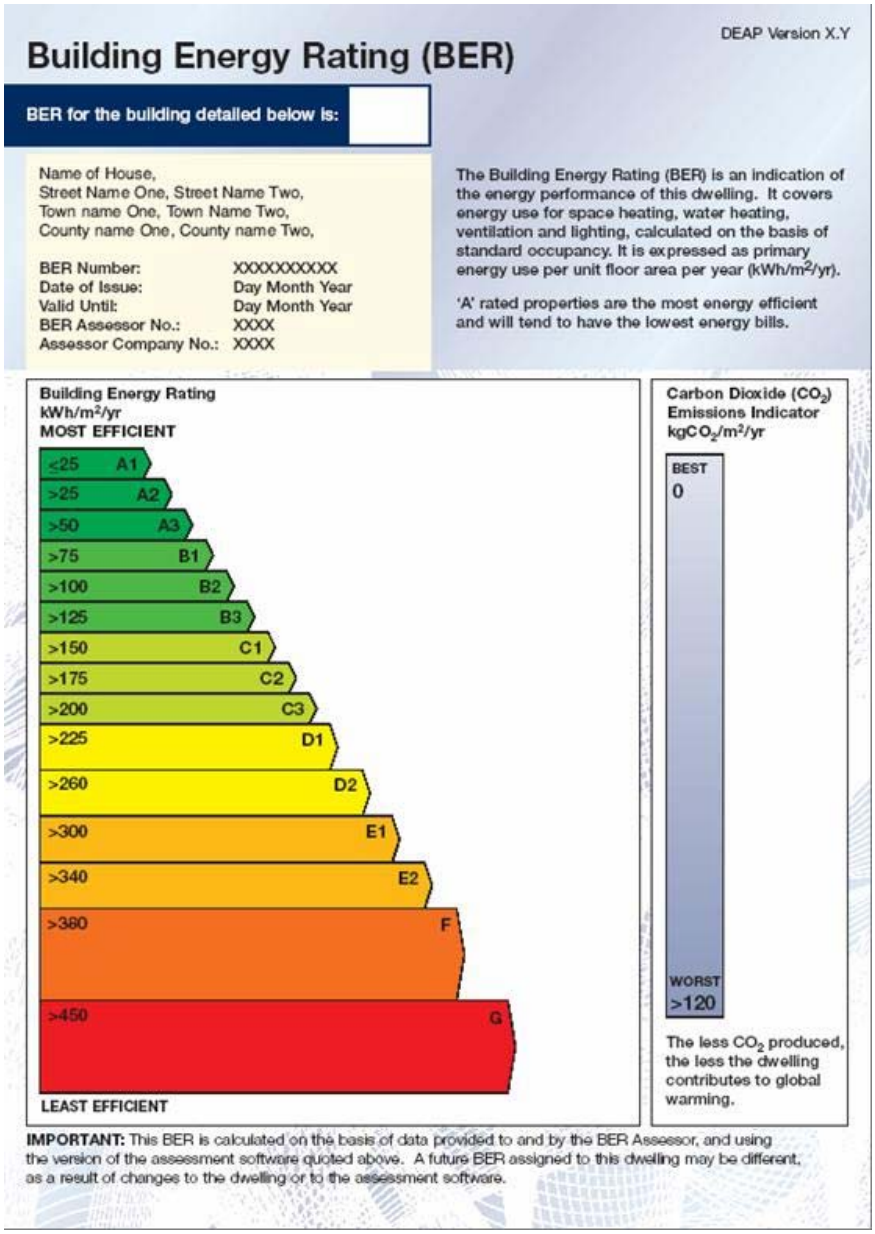
National Development Plan 2007 – 2013 Transforming Ireland – A Better Quality of Life for All

This is the Government's investment programme for Ireland covering all sectors.

European Communities Energy Performance of Buildings Directive (EPBD)

Adopted for dwellings January 2008

The official method for carrying out a BER for a dwelling is the Dwelling Energy Assessment Procedure (DEAP). The procedure takes account of the energy required for space heating, ventilation, water heating and lighting, less savings from energy generation technologies. For standardised occupancy, it calculates annual values of delivered energy consumption, primary energy consumption, carbon dioxide emissions and costs, both totals and per square metre of total floor area of the dwelling. The dwelling is then given a rating on a scale of A1 (best) to G (worst). Below is a typical Building Energy Rating Certificate



Under the DEAP methodology, a new dwelling which meets the minimum standards as set out in Technical Guidance Document L to the Building Regulations Part L, 2008 (applicable from July 2008, with up to one year transitional exemption) is likely to score the following ratings: apartment =3 and house = B1.
In order to achieve higher ratings developers will be required to design dwellings which go above the minimum standards and which include energy efficient features such as condensing boilers, passive solar design, energy efficient glazing, increased insulation levels, renewable energy technologies, etc.

European Communities (Energy Performance of Buildings) Regulations 2006
Gives regulatory effect to requirements of the EPBD in Ireland

Planning and Development Act 2000
National Legislation controlling development

Building Control Act 2007

National Building Regulations dealing with issues such as building standards, workmanship, conservation of fuel and energy and access for people with disabilities.Technical Guidance on the implementation and compliance with regulations is provided in the form of a series of document including Part L 'Conservation of Heat and Power' 2007. This document provides, among other things, guidance on the following:

- Low U Value Construction;
- Limitation of thermal bridging;
- Acheivement of high standards of air tightness; Together with
- mandatory minimum requirements for efficiency of heating systems
- mandatory requirements for the use of renewable energy systems equivalent to 10KWhr/m2/Year

Current measures to reduce emissions from new housing are geared towards increasing energy efficiency at the level of the individual residence, the focus is on construction standards and energy technology.

Sustainable Energy Act (2002)

As part of its National Development Plan the Government adopted the Sustainable Energy Act (2002) and created Sustainable Energy Ireland as the nation's energy regulator with the objectives of promoting environmentally and economically sustainable energy production.

Urban Development Plan and Design Guidelines(Planning Regulations)

County Development Plans set out each Local Authority's policies and objectives for the development of the County over a six year period (currently 2005-2011). The Plans seeks to develop and improve in a sustainable manner the environmental, social, economic and cultural assets of each County. They include guidelines on low energy building design and minimum energy performance targets.

Some objectives within the Development Plan require Studies or Reports to be carried out during the lifetime of the Plan to further inform the decision making process. Changes can be made to the content of the Development Plan during its six year lifetime, through a statutory process known as a Variation to the Development Plan.

It is notable that the development plan requires the preparation of Local area plans for certain key Urban Areas. The preparation of these plans requires open consultation and offers opportunities for the public and their local elected representatives to agree on various planning requirements specific to those areas. This open process also provides an essential and important means for the implementation of the Council's sustainable development and land use objectives for the county facilitates the provision of the necessary social and physical infrastructure.

Government Guidance documents

Sustainable Residential Development In Urban Areas – Guidelines for Planning Authorities - Draft

Quality Housing For Sustainable Communities 2007 - Best Practice guidelines for energy efficient Social Housing Published by Department Of Environment Health and Local Government

Delivering Sustainable Communities

Government policy statement placing an emphasis on sustainable residential developmentincluding energy efficient housing development layouts, and sustainable urban and rural settlement patterns that can help to minimise transport-related energy consumption.

Urban Design Manual – A Best Practice Guide Published by Department Of Environment Health and Local Government

It is estimated that improvements in the energy performance of the residential sector will contribute 53% of the total national reductions required to meet the overall target of 20% reduction in CO2 emissions by 2020. Minimum Energy targets required by National Building Regulations specific to new housing are as follows:

2005	Building regulations reference level
2008	40% improvement on 2005 building regulations
2010	60% reduction on 2005 building regulations
2012	Carbon Neutral homes
2019	Zero Energy, in accordance with the recently revised European Performance of Buildings Directive EPBD

Local authorities have also begun to introduce mandatory minimum energy performance standards for new dwellings within their own Urban Areas for example Dublin City Council have recently amended the development plan to require a target of A3 for any developments of > 10 dwellings or buildings > 1000 sqm. (all planning applications must now include a statement from a competent and qualified person certifying that the proposed development conforms with the energy rating outlined above).

With regard to Local Authority housing, the Department of Environment have set a target for an A2 rating for all new dwellings and B2 for retrofit of existing stock.

The following recent Government statement outlines the Department of Environment's approach to reducing CO2 emissions in Local Authority Housing:

Michael Finneran (Minister of State with special responsibility for Housing and Local Services, Department of Environment, Heritage and Local Government; Roscommon-South Leitrim, Fianna Fail)

> *My Department is committed to the improvement of the insulation and general energy efficiency of local authority houses and to that end has developed a comprehensive national programme for the "greening" of the social housing stock. This programme includes a range of energy efficiency initiatives for which some €50 million has been set aside in 2009. The range of energy efficiency improvement initiatives includes a programme of Towards Carbon Neutral demonstration projects, focussed on the construction of dwellings to a minimum BER standard of A2, as well as a number of demonstration projects for the retrofitting of insulation and other energy efficiency measures in the existing stock of local authority housing to achieve minimum B2 standards. It is our intention that the experience gained from these projects will inform our approach to both new construction and remedial works schemes in the future to ensure a viable and energy efficient stock of local authority housing into the future. Under the national*

programme, some €20 million will be provided in 2009 for an ambitious programme to improve the energy rating of dwellings due to be re-let during the year to a BER rating of C1, as well as to address energy deficits in apartment complexes. In addition, €14 million has been set aside within the range of initiatives to complete the National Central Heating Programme, which will deliver the installation of central heating and associated thermal insulation improvements in some 2,100 units in 2009. Finally, local authorities may also use their internal capital receipts, subject to approval by my Department of an annual improvement works programme under which they may direct resources to projects which are deemed most meritorious of funding in their authority, including the installation of insulation, the replacement of windows and doors, and other measures to improve energy efficiency in their stock.

Appendix 7 Holland - Ambitions, local project

In Breda the stakeholders found more common benefits than energy savings only, such as better value, higher comfort, respond to environmental issues, the solution of social issues, lower energy cost, no increase of housing costs, a better healthy indoor climate and so on. Because of these common benefits the stakeholders set an ambition together in a covenant and worked well together.

The starting-point is the current Dutch legislation (EPC 0.8) and the predicted development of the EPC (2011: EPC 0.60; 2015: EPC 0.40). For now the municipality of Breda wants more than current legislation. For all new dwellings in the municipality they demand an EPL of 7.2, aiming at EPL 7.4. The new climate policy of Breda speaks of a minimum EPL of 7.2. This matches an EPC of 0.6 and is foreseen for 2011. The stakeholders agreed on this for (re)new(ed) build in a covenant in 2005. The emission reduction compared to 2005 is 45% CO_2, when considering heating, cooling, ventilation and lighting.

For existing dwellings there is no legislation. In Breda the stakeholders agreed in a covenant on energy measurements that have a payback time within the lifetime of the energy measure.

The Housing association WonenBreburg has a long term agreement with the national government (Covenant, October 2008), with the housing associations umbrella organization Aedes and with the tenants organization Woonbond to realize a CO_2-neutral stock of social housing in 2044. They aim to build only CO_2-neutral new buildings from 2015 onwards. Based on this nation-wide agreement also an energy agreement has been drawn up with the municipality of Breda.

The final target for the new dwellings in the local project of Breda is an EPL of 7,4 that will be very likely be realized with heat pumps, low temperature heating and extra insulation. The definitive decision on the techniques has not been taken yet, because the theoretical assumptions for costs and benefits have not yet been confirmed in real offers.

Tools

The most important tools were the calculation methods for calculating the energy performance of buildings and of locations (EPL). Both methods were used to record the demands.

The Toolkit sustainable new buildings was used to generate ideas about usable concepts.

The guidelines of ENPIRE were used to check for ideas to enhance the process and the embedding of agreements.

Indoor climate and comfort

The current dwellings had a bad thermal comfort and problems with ventilation. For all stakeholders, the improvement of the indoor climate, the comfort and the quality of the indoor air all were very important aspects.

Current dwellings with serious comfort problems and poor living quality are demolished and new dwellings were built.

Appendix 8 Czech Republic – Ambitions, local project

The buildings in Havířov are heated with district heating. This is in conformity with the Energy Development Plan for the area. The district heating system is being continuously modernised. In many places the existing 4-pipe system has been replaced with a 2 pipe-system. The massive use of solar energy, wind and other RES is not an issue in Havířov at the present time because of economical reasons and the rules given by Energy Development Plan.

In case of MRA Havirov, which is Municipal Real Estate Agency founded for management and maintenance of the municipal housing stock and is 100% owned by the Municipality of Havirov, by the end of each year MRA agrees with the owner (municipality) on the amount (according to the city budget, its incomes and expenditures) that MRA can spend for the maintenance of the housing stock in upcoming year. MRA prepares plan of repairs according to priorities and technical state of object.

Maintenance of the housing stock is financed from collected rentals. Complex renovations of houses are financed from collected rentals, loans and possibly with subsidies. MRA have 85% appts with regulated rentals (low fixed rents). The legislation did not enable to increase regulated rentals in the past years. The regulated rentals did not create sufficient financial sources for technical renewal of buildings. Available financial sources were invested priority in repairs of emergency conditions of buildings (such as structural defects, panel defects). However the owner invested all rentals back in the housing stock and several tens millions from own resources, the technical state is not satisfactory.

Appendix 9 Italy - Ambitions, local project

In the Piedmont Region is in force the Law n. 13 of the 28/05/2007 "Provisions relating to Energy Performance", which applies to new and existing buildings with surface > 1000 m^2, renovation of buildings with surface <1000 m^2 with new expansions, installation or upgrading of heating plants, in the event of sale or rental. It excludes: cultural heritage buildings, very small residential buildings (<50 m^2), industrial or agricultural buildings used for production processes. The building energy certification, with a validity of 10 years, is compulsory for every new or renovation building.

In such a context, the municipality of Casale is preparing the amendment of the Municipal Building Regulation, with the incorporation of rules aimed at the limitation of energy consumption and ecological measures, commonly named "Environmental & Energy Attachment", which gives a score to the building eco-sustainability for the purpose of the environmental quality certification.

With regard to the U values of the building structures, reference is made to the national law, Legislative Decree n. 192, coordinated with the Legislative Decree n. 311. For example, the thermal transmittance of walls, depending from the climatic zone of North Italy (where Casale is located), is the following:

1/01/2006 0,46 W/m^2K

1/01/2008 0,37 W/m^2K

1/01/2010 0,34 W/m^2K

The Casale project adopted U values levels below 0,30 W/m^2K with an improvement of 20% compared with the 2008 levels.

The financing possibilities for renovation and improved energy efficiency of the Casale case-study are incorporated in the last Italian finance law (the law n. 203 of the 22/12/2008), which implies the VAT and tax reduction for building renovations up to 55%. as well as in the upcoming Regional Operational Program (POR), with particular reference to the financial tools solid biomass plants for heating and electricity production, for PV, and for the implementation of district heating plants.

Lastly, the local prices of energy are quite high, varying from 0,16 €/kW for electricity, to 0,80 €/m3 for gas. A good reason to develop alternative energy strategies for the local urban planning.

Appendix 10 France - Ambitions, local project in Le Grand Chalon

Due to the political calendar over 2007 and 2008, forecasted projects in Le Grand Chalon have not benefited from the latest inputs from the strengthening of the national regulation regarding energy performance in buildings.

However, it is worth mentioning that the area of le Grand Chalon is already hosting a high energy performance demonstration project (Saint-Jean-des-Jardins district) that has been implemented as a pilot project.

On the basis of the experience of setting this project up, le Grand Chalon is now intending to increase the number of new energy efficient projects. So far, only a few projects are under development and, along with the study of the reference energy consumption level allowed, are considering the use of local sustainable energy sources, such as fuel wood or solar heating.

As building activities under the direct responsibility of le Grand Chalon do not represent a high volume of projects and take a long time to set up with local and national partners (social housing association, national authority in charge of the improvement of the building sector etc), the local authority is counting on territorial approaches (i.e. Climate Change Action Plan, Agenda 21 etc) to engage a significant evolution in the building sector. That is where the ENPIRE Project is expected to help to raise awareness on energy and climate change issues among local stakeholders.

As a conclusion, Le Grand Chalon did not wait for national regulation to evolve to begin to help refurbishment projects. Within the framework of the National Program for the Improvement of Dwellings, Le Grand Chalon has supported about 200 refurbishment operations on the territory in the last 4 years and is integrating an energy efficient vision in the study of urban planning. Efforts still have to be maid in order to reach high ambitions in terms of energy efficiency and renewable energies integrated to urban planning. This will only be achieved through the voluntary and strong engagement of local elected representatives.

Appendix 11 Ireland - Ambitions, local project

Project Ambition – Dublin Case Study
The stated energy ambition for the project is as follows:

> *"Within the project we have the ambition to achieve a reduction in CO2 emission of at least 25% compared to the Irish Building Regulations (2008). An energy vision study will be conducted to identify available options to achieve this ambition level. On the basis of the study results a decision will be made which improvements can be implemented, given budget and planning limitations."*

This ambition was agreed with the lead developer, NABCo, with two aims in mind:

Firstly there was an immediate need to upgrade the tender design prepared under 2005 regulations to comply with the more challenging 2008 revision of the Building Regulations, which was introduced just before the project started on site. This requires a 40% improvement on 2005 regulations.

Secondly there was a desire to investigate cost effective ways in which the energy performance of the new homes could be further improved for the benefit of low income tenants in this and other NABCo developments across the country and of course to meet the urgent obligation to address the problems of climate change in accordance with National and European Policy. It was agreed that, while difficult, a further 25% improvement on 2007 regulations would be achievable and would exceed the requirements of further revised building regulations due to be introduced in 2010. This target was based on advice from University College Dublin's Building Research Group.

The stated ambition will therefore, by neccessity be acheived in two stages as follows:

Energy Ambition - Stage 01
Compliance with Part L of the Building Regulations 2008. This will require a reduction of 40% in energy demand and 37% reduction carbon dioxide emissions associated with heating, domestic hot water and lighting compared to the 2005 regulations.

Achievement of the Stage 1 ambition is guaranteed since this is a legal requirement.

Energy Ambition - Stage 02

A further improvement of 25% compared to current Irish Building Regulations

Achievement of the Stage 2 ambition the agreement cannot be guarantee due to budget and practical constraints.

Technical Summary

Standards and Ambitions	**Energy Label** **BER Rating**	**Primary Energy Consumption**	**Estimated CO_2 emissions per dwelling:**
Estimated current Energy Performance (2005 Regulations)	Apartment: B3 House: C1	125-150 KWh/ m^2/ year 150-175 KWh/ m^2/ year	30 kg CO_2 / m^2/ year
Stage 1 Ambition Compliance with current 2008 Building Regulations	Apartment: A3 House: B1	50- 75 KWh/ m^2a/ year 75- 100KWh/ m^2a/ year	19kg CO_2 / m^2a/ year
Stage 2 Ambition 25% improvement on 2008 Building Regulations	Apartment: A2 House: A3	37.5 - 56.25 KWh/m^2a/ year 56.25 - 75 KWh/m^2a/ year	14.25 kg CO_2 / m^2/ year