Overview of national approaches for the assessment of innovative systems in the framework of the EPBD

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This report summarises the key facts of the national approaches for the assessment of innovative systems in the framework of the EPBD or, more precisely, in the framework of the national Energy Performance of Building (EPB) regulations.

1 > Introduction

The EPBD [1] is one of European Union's tools to reduce its energy consumption. New and innovative products, systems and technologies may help to achieve this final goal. It is therefore of first importance that EPBD related regulations don't become barriers to innovation.

The EPBD requires that each Member State defines EPB calculation procedures. Member States are free to develop calculations as they want; the EPBD itself only gives a list of parameters that should be included. In some Member States, calculations are based on a simplified monthly steady state approach; in other Member States, calculations are based on dynamic simulations. But independently of the complexity of the calculation procedures, they can not cover all types of building systems or technologies that will be invented in the future – and they probably do not cover all those that are already on the market.

This is a real problem for such technologies, as reported by a manufacturer: *"The fact that our products are not included in the national EPB calculation procedure is a barrier to their market uptake because the architects firstly try to fulfil the EPB requirements. After having paid for this, they don't have money left for products that saves energy, even if these products have good return on investment."*

Consequently, if a Member State does not want its EPB regulations to be a barrier to innovation in the building sector, it should design its EPB regulations in such a way that the assessment of innovative systems (or buildings) is legally and technically possible.

One of the tasks of the IEE SAVE ASIEPI project was to analyse the way this has been made possible in several countries across Europe. This report presents some important characteristics of the national approaches by answering some key questions. It is based on the results of inquiries amongst the project partners, subcontractors, sponsors and contacts. [Some very general recommendations are included in this report, but those will be detailed further in a second report to be published later. The national approaches of 7 Member States is given in the annex.

Definitions

In the context of EPB regulations, *innovative systems (or technologies)* are defined as:

- systems (or technologies) that, in most cases, improve the building's energy performance

AND

- whose performance cannot be assessed by the standard EPB calculation procedure in a particular country.

Similarly, the concept of *innovative buildings* should be used for buildings whose performance cannot be assessed by the standard EPB calculation procedure, not because they are using innovative systems, but because of their novel/unconventional design.

The alternative assessment framework for the assessment of innovative systems or buildings is often called the *Principle of Equivalence*. This comes from The Netherlands, where the *Gelijkwaardigheid Principe* is well established. However, in this report, we will use the terminology "*alternative assessment framework or procedure*".

Additional definitions

Energy need for heating or cooling: heat to be delivered to, or extracted from a conditioned space to maintain the intended temperature conditions during a given period of time (EN ISO 13790 - § 3.4.1)

Energy use for space heating or cooling: energy input to the heating or cooling system to satisfy the energy need for heating or cooling, respectively (EN ISO 13790 – § 3.4.9)

Primary energy: energy that has not been subjected to any conversion or transformation process (for a building, it is the energy used to produce the energy delivered to the building. It is calculated (...) using conversion factors) (EN 15217 - § 3.33)

A quasi-steady-state method is a method that calculates the heat balance over a sufficiently long time (typically one month or a whole season), which enables one to take dynamic effects into account by an empirically determined gain and/or loss utilization factor. (EN ISO 13790 – § 5.3)

A dynamic method is a method that calculates the heat balance with short times steps (typically one hour) taking into account the heat stored in, and released from, the mass of the building. (EN ISO 13790 – § 5.3)

Note: EN ISO 13790 covers three different types of method:
- a fully prescribed monthly quasi-steady-state calculation method;
- a fully prescribed simple hourly dynamic calculation method;
- calculation procedures for detailed dynamic simulation methods.

Additional information

2 > Is it necessary to have a legal framework for the assessment of innovative systems/buildings?

At first glance, if a Member State does not want the EPB regulation to be a barrier to innovation, the answer is clearly "yes", but…

The EPDB has been implemented very differently in all Member States. Large differences can be observed not only with respect to the calculation procedures, but also on the administrative procedures and on the control and compliance issues. Therefore, the answer to the question is not as straightforward as it looks like, as shown by the Belgian, Portuguese/Norwegian and Danish situations.

Software competition is open in CZ, FR, DE, ES, HU, IT, NL, NO and UK, but not in BE, DK, IE and LT.

In **Belgium**, studies have shown that the previous regulation related to building insulation and ventilation was not well applied, mainly due to a lack of controls by the authorities. For that reason, Belgium has chosen to implement the EPBD with a very strong control scheme. As consequence, the way to calculate the building energy performance (EPB) had to be well defined and had not to be open to any discussion between the authorities and the person in charge of the EPB calculations. Belgium has therefore defined a calculation procedure that must be followed to the letter. (Belgium has also chosen to provide official software that must be used to deliver the EP declaration to the authorities.) Consequently, if Belgium does not want its EPB regulation to become a barrier to innovation, it must have a legal framework for the assessment of innovative systems/buildings.

Another specificity of Portugal is that the actual building energy consumption has to be monitored and has to be below the requirements

Conversely, **Portugal** has chosen a very open approach. The designer must calculate the EP of a non-residential building under nominal use conditions, with a detailed hourly simulation. The regulation specifies those nominal use conditions, but for the rest, the designer has much freedom. For instance, he can use any simulation software he wants, as long as this software is "recognised" by the national certification system. Consequently, any innovative systems can be assessed by the designer and no legal framework for assessment of innovative systems/buildings is necessary. **Norway** allows similar flexibility in choice of software, as long as the software meets minimum requirements given in a national standard. The only parameters related to user behaviour are 'fixed' – and only for building regulation calculations, not for energy certificate calculations.

A third situation is the Danish one. As Belgium, **Denmark** has implemented a fully-described approach. But in reality, the system is much more open than in several countries as the designer may change the values of some parameters that are fixed in other countries. Therefore, innovative systems are handled as usual ones. If a building designer considers that the calculation procedure does not match its design, he can ask the authority in charge of the calculation procedure how to make the calculation for its building. Moreover, the calculation procedure can be quite quickly upgraded. Consequently, even without a specific legal framework for the assessment of innovative systems/buildings, the EPB regulation is not considered as a barrier for innovative systems/buildings.

Currently, there are legal frameworks in BE, ES, FI, FR, FR, DE and NL and there is no frameworks in CZ, DK, GR, HU, IT, LT, PO, PT, and UK.

The answer to the question can therefore be "yes" or "no", according to the way the EPBD is implemented but the situations in Portugal and Denmark are quite unique. Indeed, most of Member States have implemented the EPBD in a way that is closer to Belgium than Portugal/Norway, and where no flexibility is possible as in Denmark, and therefore need to have a legal framework for the assessment of innovative systems/buildings.

Even if this is required neither by the EPBD nor by the proposed EPBD Recast, ASIEPI recommends the Member States that do not have such a legal framework to analyse the necessity to define one.

3 > In which cases is the alternative assessment procedure applicable?

The scope of the alternative assessment procedure varies from Member State to Member State.

Only for innovative buildings and/or also for innovative systems?

In most Member States, the building owner or designer of an *innovative building* can apply for an alternative assessment for its building.

Example: two building designers A and B want to apply an innovative system X. In BE, ES, FR, the manufacturer of the system X will apply for an alternative assessment for its system If this alternative assessment is accepted, A and B will be able to make the EP-calculation of their building on basis of the accepted alternative assessment. In DE, NL, the manufacturer of the system X will let make a study and will provide it to the designers A and B. A and B will use that study to apply for an alternative assessment of their own buildings.

In some Member States, such as **Belgium**, **France** and **Spain**, the manufacturer of an *innovative system* may directly apply for an alternative assessment for its system. If this is accepted, the alternative assessment will specify in which type of buildings it can be used.

In Member States that do not have such a system, the legal framework states that the building owner or designer may apply for an alternative assessment. So, from a legal point of view, there are no innovative systems, but only innovative buildings. However, in most cases, the same study can be used in several buildings, and *innovative systems* exist de facto.

Only for systems that cannot be assessed, or for systems that cannot be correctly assessed, by the standard EPB calculation procedure?

We have defined innovative systems as systems (…) *whose performance cannot be assessed by the standard EPB calculation method in a particular country*. However, this definition does not cover the variety in scope of the national alternative assessment procedures.

Examples:

- *Heat recovery efficiency in BE: there is no default value; the efficiency has to be measured according to EN 308; there is no need for alternative assessment. Humidity controlled ventilation in FR: there is a default value; better performances can be proved with an "Avis Technique".*
- *Auxiliary energy of the heating system. In BE, this auxiliary energy is given by fixed values; the alternative assessment can not be used to prove better performances. In NL, this auxiliary energy is given by default values; the alternative assessment can used to prove better performances.*
- *Demand controlled ventilation systems in BE: the aspect demand controlled is not included; the alternative assessment can be used.*
- *Lighting in residential buildings in many Member States.*

The following situations may occur for a specific system.

- The standard calculation procedure may specify a fixed/default value for the considered system and specifies on which conditions better values can be used, or does not specify any values but only how to prove the system performance. Usually, this is not through the national alternative assessment procedure but will require e.g. a measurement according to the relevant standard. In some cases however, the way to prove better values falls under the national alternative assessment procedure.
- The standard calculation procedure specifies a fixed/default value for the considered system but does not specify under which conditions better values can be used. In some Member States, the national alternative assessment procedure can be used to prove better values, whereas in other Member States, this is not possible.
- The standard calculation procedure does not integrate the system/technology in question. The system is therefore innovative according to the above mentioned definition and the national alternative assessment procedure (if any) can be used to assess its performances.
- The standard calculation procedure does not integrate this type of energy use. There is no need for alternative assessment.

4 > Is it necessary to have a technical framework for the assessment of innovative systems/buildings?

Belgium intends to have such a technical framework in a long term. Italy intends to have such a technical framework, if a legal framework is set up.
France has a technical framework that is applicable in some cases only (e.g. Avis Technique for ventilation systems).

With *technical framework*, we mean a set of boundary conditions that specify the way to perform the assessment of innovative systems/buildings; this would include, for example building use, pollutant emissions, climate, and all other input values that are necessary to perform the alternative calculation.

Currently, among the Member States that have a legal framework, there is usually no technical framework. Only general requirements might be given, such as the fact that the basic assumptions of the standard calculation procedure may not be changed (e.g. the assumed internal temperature).

To some extent, such a technical framework can also be found in **Portugal**, as the dynamic simulations must be carried out with a validated software and under nominal use conditions, specified by the legislation. Similarly, **Norway**'s national EP calculation standard also acts as a technical framework for assessing buildings with new technologies, using monthly or dynamic simulations as necessary.

The EP assessment is based on monthly steady state calculations in BE, DK, FI, DE, HU, IE, IT, NL, PO, PT*, RO, UK* and on dynamic simulations in FR, HU*, PT*, UK*. (* means "for some cases")*

Obviously, setting up such a technical framework is not an easy task, for several reasons:

- the evaluation of the innovative systems/buildings is often based on dynamic simulations, whereas in several Member States, the standard calculation is based on simplified monthly steady-states calculations. Therefore, there might be no detailed information to fix the many input data that are necessary for the dynamic simulations,
- it might even be difficult to know in advance which assumptions are necessary for systems and building designs that do not exist yet!

However, there are several advantages to have such a technical framework. Some of them are:

- it makes the equivalence studies more reliable, as the results are less depending on the person who makes the study,
- consequently, it reduces the responsibility of the persons in charge of evaluating and accepting the studies,
- and it also reduces the risk of misusing the principle of equivalence and therefore increase the public acceptance of it.

ASIEPI recommends the Member States that do not have such a technical framework to analyse the necessity to define one, at least a minimal one.

5 > What are the main features that the alternative assessment framework should present?

In 2004 already, the European research project RESHYVENT had identified some of the main features that such a framework should have [2]. In the framework of ASIEPI, this question was submitted to industries that produce innovative systems.

From the answers obtained, the main features that the alternative assessment framework should have are:

- Most of all, it should be **available now** and it should be **reliable**.
- Secondly, it should not only pay attention to energy, but also to **indoor climate** (as expressed in EPBD art. 4), and it should allow **optimisation studies**, so that industries could easily see the impact of any change on the calculated EP.
- Thirdly, the **delay** to carry out the study and to make it accepted should not be longer than 6 months and the **costs** should be limited.

In all Member States, the costs are supported by the demander.

The following features should also be considered:

- The technical framework should be **transparent**, in the sense that it should not be too difficult to obtain a good understanding of the philosophy of the assessment approach, of the parameters of influence and of the possibilities for optimisation,
- Consequently, the parameters that are known to influence the performances of the systems to be analysed should be identified and input data should be made available by the authorities; in other words, a technical framework is desirable, as said previously.
- At the European level, a disadvantage for the industry is that the alternative assessment procedures vary from Member State to Member State. This problem has been only partly addressed by the new European Standards that were developed to support the EPBD. This clearly acts as a barrier for the free circulation of goods, but this is inherent to the fact that the EP calculation procedures themselves are national. This barrier could be weakened if there was an agreement at European level on general guidelines about how equivalence studies should be performed (or how the national regulations and EP calculation methods can be made more flexible so as to make such studies redundant).

In Belgium, the equivalence studies for the assessment of innovative systems are under the responsibility of a central body, the Belgian Union for Technical Approvals. However, this option has mainly been chosen to have a common evaluation system for the 3 Regions.

The evaluation take place at national or regional level in BE, ES, FR, IT, and at local level in DK, ES*, FI, DE, NO, NL.*

6 > Who should be allowed to carry out the equivalence studies? Who should evaluate them?

In general, there is no or little limitation of the persons allowed to carry out equivalence studies.

The evaluation of the equivalence studies may take place at national (or regional) level, or at local level. The advantages or disadvantages of those approaches are summarised in the next table.

National/regional level		Local level	
+	It's easier to set up a structure that has the human resources to evaluate such studies, which might be very complex.	-	Local authorities, especially in small municipalities, might not have the technical competence to evaluate equivalence studies.
+	Similar innovative systems are evaluated in a similar way.	-	An innovative system might be accepted in one city and refused in another one.
+	An innovative system must be evaluated once.		
-	Centralisation may create some delays.	+	Decentralisation might reduce some delays.

ASIEPI has shown that there is a clear preference among relevant stakeholders, including industries, to have an evaluation at national or regional level. ASIEPI recommends the Member States to evaluate this option. If there are some barriers to organise it at national or regional level, including some legal barriers that could not be solved, a good compromise could be to have the study accepted at local level, but on basis of acceptance criteria developed at national level and/or with the support of a central body.

7 > Are there other interesting aspects in the national approaches?

BE: www.energiesparen.be/epb/gelijkwaardigheid
FR: www.rt-batiment.fr

In **Belgium**, **France** and **Spain**, the accepted equivalence studies for innovative systems are **published** on an official website, whereas in other Member States, they are not made public by the authorities.

In **Spain**, the energy certificate of an innovative building will include two scales: one with and one without the innovation. This can make the certificate a little bit more complex, but might increase its acceptance by various stakeholders.

8 > Conclusions

- As for the requirements, the calculation procedures, the software, the control and compliance issues, Member States that have implemented alternative assessment procedures have implemented them in very different ways. These can be a source of inspiration for Member States that do not yet have such a framework. In any case, adaptation to the national EPB regulation will be necessary.
- The main advantage to have an alternative assessment framework is that all products/systems get a chance to be taken into account – at least all products/systems that use energy for a purpose that is considered in the EPB regulation. This removes (some of) the barriers for innovation that can be created by EPB regulations.
- However, in some of the Member States where an alternative assessment framework exists, it has been used to overestimate the saving potential of some systems. This is particularly true in the Member States where anyone can perform the study and where the evaluation takes place at local level. To overcome this, some of the following options, or a combination of some of them, should be considered:
    1. A centralised body could perform the studies, but this might increase the delay to carry out the studies, as well as the costs.
    2. A centralised body could evaluate the studies…
    3. …or, at least, clear national acceptance criteria could be defined.
    4. A technical framework for the assessment of innovative systems/buildings could be defined.
- An agreement at European level on general guidelines about how equivalence studies should be performed could help the Member States and could facilitate the free circulation of products.

9 > References

1. EPBD (2002). Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings, Official Journal of the European Communities, 04.01.2003.
2. Energy Performance of Buildings - Assessment of innovative technologies, SAVE ENPER-TEBUC project (01/04/2001 - 30/09/2003).
3. P. Wouters, N. Heijmans, X. Loncour, Outline for a general framework for the assessment of innovative ventilation systems, RESHYVENT project, 2004.
4. IEE SAVE ASIEPI project, *http://www.asiepi.eu*.
5. ASIEPI WP6 - The EPBD as support for market uptake for innovative systems - "State-Of-The-Art" analysis - Questionnaire to ASIEPI partners, available on *www.asiepi.eu*.

Annex 1 > Belgium

A1.1 > General framework

In the Flemish Region, the official software is the EPB-software.
In the Region of Brussels-Capital, the official software is currently the EPB-software Brussels, but another application is being developed for both the Walloon Region and the Region of Brussels-Capital.

It is important to note that the EPBD implementation is under the responsibility of the 3 Regions. The 3 regulations are similar but slightly different; the calculations procedure are however (almost) identical.

The building energy performance is expressed the so-called E-level, which is a ratio between the primary energy and a reference value for the primary energy.

The E-level must be calculated according to a fully prescribed monthly quasi-steady-state calculation method published in the regional law (Ministerial Orders).

As the calculation procedures are included in 3 regional laws, they are not expected to change very often.

There is only official software applications. These must be used to send the EPB declaration to the authorities.

The building energy performance must be reported when the building is erected (dossier as-built).

The control scheme is quite strong. Controls are made by the authorities on basis of the submitted EPB declarations and of in site visits. If the requirements are not fulfilled, administrative penalties are automatically sent.

A1.2 > Alternative assessment

Ministerial Order of 10-04-2007 regarding the assessment of equivalence of innovative construction concepts or technologies in the framework of the energy performance regulation ("Ministerieel besluit betreffende de vaststelling van de gelijkwaardigheid van innoverende bouwconcepten en technologieën in het kader van de energieprestatieregelgeving")

http://www.energiesparen.be/epb/gelijkwaardigheid

At the time this report was written, only one procedure was in force in the Flemish Region.

This procedure is known as the "*assessment of equivalence*". This procedure can only be used for innovative systems (there is no procedure for systems that perform better than the default or fixed value included in the calculation standards). The procedure can not be used for innovative buildings, for which another procedure is in preparation.

The study can only be done by one organisation, the Belgian Union for Technical Approval (UBAtc). The UBAtc appoints a group of experts to make the study; a larger group evaluates it. Once the study is approved, according to UBAtc rules, a document called ATG-E is delivered to the manufacturer, who will provide it to the Region. The Region decides how to take the innovative system into account in the official EPB-software. This decision is published on a website. The system can be used in any building (within the scope specified) without further administrative work.

In the Flemish Region, the alternative assessment method can not be used for what concerns the certification of existing buildings that are sold or rented.

Annex 2 > Denmark

A2.1 > General framework

The building energy performance is expressed as the primary energy need.

SBi-Direction 213: Energy demand in building

The primary energy need must be calculated according to a fully prescribed monthly quasi-steady-state calculation method published in a publication of the Danish Building Research Institute SBi. However, the procedure is much more open than in other countries, in the sense that the designer may modify some parameters that are fixed in other countries.

The calculation method can be updated if necessary. From April 2006 to February 2009, 4 versions were released.

The official software is Be06 and is included in SBi-Direction 213.

There is one official software application; alternative applications are allowed as long as they give the same results and use the same calculation engine core as in the official one.

The proof of compliance with the energy requirements must be made twice; once to get a building permit and one after the completion of the building in order to obtain a permit to use the building. The control of compliancy is the responsibility of the local authority.

A2.2 > Alternative assessment

There is no specific legal framework for alternative assessment. This is due to the fact that the legal framework, the procedure and the software are quite open, as stated above. Innovative systems/buildings are therefore handled as usual systems/buildings.

For what concerns innovative systems, the calculation procedure can be updated gradually and quite quickly to be able to take into account the effects of innovative systems.

For what concerns innovative buildings, the building owner the building owner will be responsible for assessing the energy performance of innovative systems typically made by consulting engineers often in dialogue with SBi and the local building authorities will accept or reject the assessment. It is up to the building developer to provide satisfactory documentation (e.g. energy calculations) when applying for dispensation. There is no formal format for such applications.

The alternative assessment is usually integrated in the software by changing a specific input data.

As the certification of existing building that are sold or rented is based on the same methodology, the alternative assessment methods could also be used in this context.

Annex 3 > Finland

A3.1 > General framework

At the present time, there are no requirements on the total building energy use. The regulation specifies the maximum building heat losses (building envelope, ventilation, infiltration) and requires calculating the energy use containing the space heating, hot water heating, space cooling and electricity. Currently, the requirements do not contain the primary energy calculation. Overall requirements are expected in 2012.

Guideline D5 "Calculation of power and energy needs for heating of buildings" is included in the Building Code since 1985.

For small residential buildings (less than 6 apartments), the energy use concerning the Energy Performance number must be calculated according to a fully prescribed monthly quasi-steady-state calculation method published in the Building Code and known as Guideline D5.

For other types of buildings, the procedure to calculate the Energy Performance number is open: the energy performance may be calculated according to Guideline D5, but EN standards and other calculation methods can also be used.

A modification of the Guideline D5 has to follow the legislative process of a decree and would typically take 1 year. Last major changes took place in 2002 and 2007.

There is no official software implementation of the Guideline D5, but a few commercial software applications are on the market.

The building permit application must include the building energy performance. The application is checked by the municipality. The building should be built according to this design; in case of changes, the building energy performance should be recalculated.

Even if foreseen by law, there is usually no control after building construction, for what concerns the building's energy performance.

A3.2 > Alternative assessment

The Building Code specifies that "Guidelines are not binding and it is possible to apply solutions other than those given in guidelines, provided that such solutions meet the requirements set for construction work." ("Ohjeet eivät ole velvoittavia, vaan muitakin kuin niissä esitettyjä ratkaisuja voidaan käyttää, jos ne täyttävät rakentamiselle asetetut vaatimukset.")

There is a procedure is known as "*separate clarification*" and is foreseen in the Building code. This option can be used for both innovative systems and innovative buildings. This option can also be used to prove a better performances that the default or fixed value included in the calculation procedure.

The study is performed by a "neutral" consultant and evaluated by the municipality. There is no technical framework that specifies how to make an alternative assessment.

The alternative assessments are not published.

Annex 4 > France

A4.1 > General framework

The calculation procedures are known as Th-C-E and are included in the Ministerial Order of 24-05-2006 related to the thermal characteristics of new buildings and new parts of buildings.

The first thermal regulation has been introduced in 1974.

The building energy performance is expressed through the primary energy.

The primary energy must be calculated according to a fully prescribed simple hourly dynamic calculation method published in the law and commonly known as Th-CE 2005.

The regulation has been introduced in 2000 and modified in 2005. The future regulation will come in force on 2012.

There are several certified commercial software applications using a kernel produced by CSTB.

The building permit don't require including the predicted primary energy use. The energy certificate is issued when the building is erected (dossier 'as-built').

The compliance with the energy regulation can be checked by the Technical Studies Centre (CETE) of the Ministry of Equipment on basis of the submitted EPB declarations and of in site visits. Since 2008, the controls become stricter.

A4.2 > Alternative assessment

The alternative assessment is foreseen in Title V, § 81-82 of the Order of 24-05-2006.

The EPB regulation includes an alternative assessment and complementary procedures:

1. The alternative procedure is known as "Title V" and is foreseen in the EPB regulation. This procedure can be used for both innovative systems and innovative buildings. A study must be sent to the Ministry for Ecology Sustainable Development and Spatial Planning. The content of the study is specified in the regulation. The Ministry selects a group of expert to evaluate it. Once approved, the Title V is published if it concerns an innovative system applied to all buildings, and can be used without further administrative work.

   Usually, the result of the alternative assessment will be immediately introduced in the calculation software, by changing some values.

2. The complementary one is know as "*Avis Technique*" and can be applied to prove a technical value of the product and used instead of the default included in the standard calculation procedures. A study must be written following a directive document and sent to CSTB. On basis of additional experimental and numerical evaluations, the study is evaluated by a group of experts. Once approved, the Avis Technique is published and can be used without further administrative work.

The certification of existing buildings that are sold or rented can be based on operational rating or can be calculated with another method than the one for new buildings. Alternative assessment methods can not be used for what concerns the certification of existing buildings that are sold or rented. However, the legislation explicitly foresees the use of "Title V" for existing buildings that are renovated.

Annex 5 > Germany

A5.1 > General framework

The current procedures are included in two standards:
DIN V 4108-6 and DIN V 4701-10 for residential buildings and
DIN V 18599 for non-residential buildings.
From autumn 2009, all buildings can be calculated with the same standard (DIN V 18599).

The building energy performance is expressed as the primary energy.

The primary energy must be calculated according to a fully prescribed monthly quasi-steady-state calculation method published in national standards. Standards are reviewed and partly revised (extended for new systems and technologies) about every second year.

There are no official softwares, but there are several commercial softwares, some for residential building calculations, others for non-residential building calculations, few for both. Most of the software products for non-residential building calculations use a common kernel. The software products are not certified by the authorities, but some comparative studies on the tools have been made.

The application for the building permit must include the calculated primary energy of the building. The application is checked by the municipality. The building should be built according to this design; in case of changes, the building energy performance has to be recalculated and the energy performance certificate is issued.

There is no control required after building construction, for what concerns the building's energy performance. Due to the signature of the building owner on the application of the building permit he/she is responsible that the building is realised as designed and certified.

A5.2 > Alternative assessment

Energieeinsparverordnung EnEv - §23 Anderweitige Bewertung für Baustoffe, Bauteile und Anlagen

It is important to note that the German standard calculation procedures include many systems that are not included in other national calculation procedures. There are therefore less systems that must be considered as "innovative systems" according to the definition mentioned on page 2 than in many other Member States.

The EPB regulations include the possibility to use "*alternative assessment methods for building material, building components and building systems*". Two methods are available:

1. The first method applies to systems that perform better than the default or fixed value included in the calculation standards. In this case, measurements in national or international labs followed by an assessment for the national adaption at the German admission office (DIBT) are required. Then, the system performances are published in the German Federal Gazette, and they can be used instead of the default value, without further administrative work.
2. The second method applies to systems or technologies whose performances can not be assessed with the standard procedure (e.g. solar wall for preheating of supply air). An alternative calculation method (e.g. simulation program) has to be used to assess the performance of the specific system. The improved performance can then be applied in the standard calculation procedure. For the example of the solar wall a heat recover rate representing the the solar preheating effect can be used. The evaluation of the alternative calculation is made by the municipality.

The two alternative assessment methods can also be used for what concerns the certification of existing buildings that are sold or rented, as the certification is based on the same calculation procedure.

Annex 6 > The Netherlands

A6.1 > General framework

This prescriptive approach prescribes several sets of energy saving measures. If you apply one of those sets, the EP-level of the house must not be calculated as it is set by default on 0.8, which is the current maximum EP-level allowed to receive a building permit.

The calculation methods are included in:
NEN 5128:2004 for residential buildings and
NEN 2916:2004 for non-residential buildings.

Every few years, the Dutch Standardisation Committee decides if it is necessary to update the standard. Small changes can be made via a so called "change document" in which only the change are described. This is relatively easy, but when it covers more than correcting errors, the official procedure needs to be followed. This includes a public inquiry and formal legislative changes. This will easily take half a year to a year. A formal change of the standard itself is an even bigger operation.

A list of software is available on: www.senternovem.nl/epn/regelgeving/normen_en_rekenprogrammas.asp

The building energy performance is expressed by the so-called EPC level, which is a ratio between the primary energy use and a reference value for the primary energy use. In 2009, a simplified prescriptive approach has been introduced for residential buildings, but all buildings using that simplified approach get the same EPC.

The EPC must be calculated according to a fully prescribed monthly quasi-steady-state calculation method published in national standards.

Since the publication of the first EP standard in 1995, the standard for residential buildings changed in 1998, 2001 and 2004. The next update will be published in 2010.

The Dutch standardisation committee releases the official software. But it is not mandatory to use that software; there is also commercial software available. There is no accreditation for the software.

The building permit must include the building EPC. The EP calculation is checked by the municipality. The building should be built according to this design. In case of changes, the performance should be recalculated, or at least the building should be build conform the performance level on which the building permit was given. In practice this is often not done.

A6.2 > Alternative assessment

The "principle of equivalence" is applicable to all requirements of the building code.

There is a procedure known as the "principle of equivalence" and is foreseen in the Building code. This option can be used for both innovative systems and innovative buildings, as defined on page 2. This option can also be used to prove a better performance than the default or fixed value included in the calculation procedure.

The study can be performed by anyone, often it will be performed by a consultant. The study is evaluated by the municipality. There is no technical framework that specifies how to make an alternative assessment.

Depending on the situation, the result of the alternative assessment can not directly be introduced in the available software. In that case, the one who makes the alternative assessment needs to make some additional hand calculations to calculate the final EP value.

The alternative assessments are not published automatically.

The alternative assessment methods can not be used for what concerns the certification of existing buildings that are sold or rented.

Annex 7 > Norway

A7.1 > General framework

The building regulations (revised 2007) give quantitative requirements for kWh/m²yr *net energy demand*, not primary energy. In addition, at least 40% of the delivered energy must be from renewables or district heating, except for small houses or cases where this rule increases LCC. Requirements for indoor climate shall of course also be satisfied (Class II in EN 15251), but this need not be documented for a building permit. EP calculations are not necessary for simple buildings that fullfill a checklist of 11 criteria (prescribed minimum U-values, 70% heat recovery, airtightness, SFP etc.). The energy labelling scheme has not yet been implemented.

The EP calculation method is described in national standard NS 3031:2007. This describes fixed parameters (mostly related to user habits, such as internal loads and set-point temperature), and gives guidance on values for other 'non-fixed' variables. The dynamic hourly method is used for buildings with cooling, but the quasi-steady monthly method may otherwise optionally be used. There is no national software, but commercial software is available. Any software can be used that is validated in accordance with the EN standard on software validation. Validation need not be certified/accredited by a 3rd party.

To gain a building permit, EP documentation must be submitted to the local municipality. There is no statutory control of actual energy consumption after the construction is completed.

A7.2 > Alternative assessment

Norway views its EP calculation standard as relatively flexible, and thus not *unwittingly* a barrier to innovative systems/buildings. The two main reasons being (a) choice of software, and (b) few 'fixed' parameters. The calculation standard is probably sufficient as a technical framework for evaluation of non-standard/novel technologies, such that the need for a legal framework for alternative assessment has been avoided.

There are three points to note here:

- As a general rule, documentation of the performance of building subcomponents (e.g. window U-value, heat recovery efficiency) should be submitted together with the EP calculation, irrespective of whether the subcomponents are high or low performance. This documentation requirement is not at all rigorously vetted by the municipality; it can for example be a short reference to a specific product name or a construction detail in document. The onus is on the building designer/contractor to collate accurate documentation, in order to avoid possible future litigation by the owner. If such documentation is not available from the manufacturer, then the building designer will have to use an appropriate method (e.g. EN standard) to calculate and document its performance (e.g. heat pump seasonal COP) and apply this input data in the validated EPC software.
- The fixed parameters (internal equipment, lighting, domestic hot water, people, and set-point temperatures) may act as barriers, especially to very low energy buildings. However, the lighting load can actually be reduced (to a lower minimum) if a lighting calculations are documented according to EN standard. Furthermore, it will actually be possible to deviate from other fixed parameters too in the near future when a new standard for low-energy and passive houses is published.
- Since the building regulations give strict limits on *net energy demand*,

this might act as a barrier to market penetration of energy delivery systems (e.g. heat pumps). This has been done on purpose by the building authorities, to promote investment in passive energy-efficiency measures (e.g. insulation), which are generally robust and last as long as the building. There is therefore no 'alternative assessment' method to circumvent this potential problem. However, the builder can try to apply to the building authorities for dispensation in individual cases, providing sufficient documentation of low primary energy consumption. The authorities are generally obliged to reject such applications, unless there are very good reasons, such as safety considerations.

The current requirements cover:
- *Maximum U values*
- *Solar factor for windows...*
- *Minimum efficiency for thermal and for lighting installations*
- *Minimum natural lighting, solar contribution to domestic hot water, photovoltaic.*

HE-1 Energy Saving

The official software tools are LIDER to calculate the energy needs and CALENER to calculate primary energy use and CO_2 emissions in order to issue the certificate.

Example of Subsidies for dwellings:
3600 € for Class A
2800 € for Class B
2000 € for Class C

Annex 8 > Spain

A8.1 > General framework

At the present time, there are no overall requirements on the building primary energy use or Co2 emissions but those are expected in the near future. The requirements at present are referred to individual aspects such as heating and cooling energy needs, efficiency of thermal installations etc. However, the primary energy use and the Co2 emissions must be calculated in order to produce the energy certificate

The energy performance for certification purposes can be calculated according to a fully prescribed hourly dynamic calculation method (CALENER).

The method can be updated thanks to "*additional capabilities*", as explained in § X.2.

There are official software applications; alternative applications are allowed but none were developed so far.

The building permit demand must include the building energy performance. The building permit demand is checked by the municipality. If subsidies are requested due to a good energy class a specific inspection by the regional authorities (energy agencies) is foreseeable. The building should be built according to this design; in case of changes, the building energy performance should be recalculated.

The control is under the responsibility of the 19 regions. Even if foreseen by law, there is usually no control after building construction, for what concerns the compliance with the building energy regulations.

A8.2 > Alternative assessment

There are two procedures known as "*additional capabilities*", one for innovative systems, one for innovative buildings.

For innovative systems, a methodology has to be developed and to get approved. This approval is done at national level by an advisory commission for energy certification but includes a public inquiry; the approval of the relevant union of manufacturers is essential. The procedure can also be used for systems that perform better than the fixed value included in the standard calculation procedures.

For innovative buildings, there is no need of approved documents. Anyone can make an alternative assessment. The evaluation is made by the municipality although the regional government can ask for an external control in some circumstances.

The integration of the additional capability within the software can take various forms: it can be by changing a default value or by adding a specific calculation kernel to the software.

The building will get two certificates, one without the innovative systems, one with the innovative systems, but the subsidies may be obtain on basis of the certificate that includes the innovative systems.

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WP6

The EPBD as support for market uptake for **innovative systems**

"State-Of-The-Art" analysis

Questionnaire to ASIEPI partners

Public version 2.1 (01-04-2009)

Table of contents

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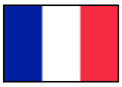 France: Hicham Lahmidi, Centre Scientifique et Technique du Bâtiment

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Important remark

The information contained in this report is based on the information known by the authors at the time they delivered the information. The authors delivered the information at different time.

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The information contained in this report is based on the information known by the authors at the time they delivered the information. It must also be noticed that, in some countries, the legal framework is still under development and therefore is evolving quite quickly. While this document is believed to contain correct information, the authors makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information disclosed.

1 Introduction

One of the WP of the ASIEPI project is dedicated to the assessment of the so-called innovative systems. It is of first importance to have in mind what is an innovative system or innovative technology, in the context of WP6. **In the context of energy performance regulations, and in particular in the context of ASIEPI WP6, innovative systems/technologies are defined as:**

- systems/technologies that, in most cases, improve the building's energy performance

AND

- whose performance cannot be assessed by the standard EPB calculation method in a particular country:

The first task within WP6 is to make an overview of the current situation regarding the assessment of innovative systems across the EU. This task is described in the contract as follows.

Task 1: Overview of the current situation regarding innovative systems across EU

This first step is to make a "State-Of-The-Art analysis" of the current situation in the different Member States participating in the project (as partners or as subcontractors). Attention will also be given to knowledge exchange between MS who have experience with handling of innovations in the national EPB regulations, like France, Netherlands, Sweden and Norway, although the lessons learned from this subtask are interesting for all member states. The following points will be analysed:

- What is the legal framework in each MS (if any)?
- What kind of systems are considered as innovative (according the above definition) in each MS?
- Who is allowed to make the performance assessment? Are there assessment and specific quality control schemes? Is there a role for organisations involved in technical approval systems? What problems concerning performance assessment are found in practice? Can solutions be found in other countries? To what extent can results obtained in one country be relevant for other countries?
- Financial aspects, e.g. who is paying the study?
- How does it work in practice (good and bad experiences from industry)? How many studies have been carried out so far? What are the conditions for a successful implementation? Why do some barriers occur in one country and not in another, what lessons can MS learn from each other?
- What is the impact of the procedure on the market for innovative systems?

A good example to illustrate the sense of these questions is the barrier in the Netherlands formed by problems with the verification of the performance assessment of innovations: it results in non-innovative products being rewarded as innovative ones, fewer recognition of innovative products because assessments our doubted and overall less public support of the Energy Performance procedure as a whole.

To collect the relevant information, WP6 will first analyse available reports (as e.g. ENPER-TEBUC Task 2 report (2001-2004) - but as the MS are actively working on the implementation of EPBD, these reports are probably already outdated) and secondly launch an inquiry to the national contacts points and to the associates.

WP6 has many links with other WPs, in particular WP2, WP3 and WP7. WP6 will carry this task in close collaboration with other WPs.

Description of task 1 of WP6 in the EC-contract

To achieve this goal, a survey was launched amongst the ASIEPI participant. This report contains the questionnaire as well as the answers from each ASIEPI participant.

2 Questions

Question 1 Describe how the energy performance of a building is calculated (when no innovative system is used).

In some countries, as in Belgium, the energy performance calculation can be qualified as "closed", in the sense that the person in charge of the calculations has no freedom on the way to perform them: a standard methodology for the calculations is fully described in an official procedure while calculations must be performed with a specific software.

In other countries, as in Norway or Spain, the energy performance calculation can be qualified as more "open", in the sense that the person in charge of the calculations has much more freedom on how to perform them: several software might be available, possibly approved by the authorities, or it is possible to follow prescriptive requirements instead of making an energy calculation.

This might have an impact on the assessment of innovative systems. Therefore, a small description of the standard method(s) and procedure(s), including (but not limited to) the software(s) used, would help to better understand the general context and later, to understand how innovative systems are handled. The information can be useful for WP2 and WP3 too.

Belgium is a federal state, composed of three Regions: the Flemish Region, the Walloon Region and the Brussels-Capital Region. In Belgium, implementing the EPBD is a responsibility of the Regions.

In the Flemish Region, the energy performance of a building is (±) expressed by a ratio between the calculated energy consumption of the building and the amount of energy that this building is allowed to use. This is the so-called E-level. The full calculation procedure of the E-level is given in a Ministerial Decree.

The person in charge of the E-level calculation has to use **a specific software** called (*EPB-software*) freely provided by the Flemish Region.

The calculation is based on **monthly average values** (no dynamic simulations).

Consequently, every system/technology that is not covered by the E-level calculation procedure is potentially an innovative system, according to the definition mentioned above.

The calculation method is included in a Ministerial Order and is therefore published in the Belgian Law Gazette or Official Journal.

There is no alternative prescriptive approach. The regulation is not expected to be changed very easily. Since its first publication in 2005, there was no update yet. The official software was however updated 2 or 3 times.

The calculation procedure is similar in the two other Regions, but there are some differences.

In the Czech Republic, §6a of the Energy Management Act 406/2006 Coll. specify the legal framework (Zákon 406/2006 Sb. o hospodaření energií) for EPBD. Decree 148/2007 Coll. about energy performance of buildings specifies minimal requirements and calculation procedure (Vyhláška 148/2007 Sb. o energetické náročnosti budov).

The requirements will come into force in 2009. One methodology is used for all regions and all building types. Energy performance calculation is expressed by **total annual delivered energy consumption**, including heating, cooling, DHW preparing, mechanical ventilation, lighting and auxiliary energy needed for building operation.

There is simplified multizone calculation, loaded by **typical day for each month in hour time step**. Climate data are used data for 4 climate zones according to the national standards, used for building physics calculation. Zone operation profiles include occupation, lighting, indoor environment requirements and auxiliary energy. Zone operation profiles are standardized for typical zones as offices, schools, dwellings, etc.

Building energy systems, as heating, cooling, hot tap water preparation, ventilation are included as zone assigned systems, while energy sources (e.g. boilers, co-generation unit, solar collectors etc.) are in the model assigned to the energy delivery systems.

Result of energy performance calculation for assessed building is **annual delivered energy consumption counted over gross floor area (**kWh/m^{2}a) and classified according to the levels to the energy classes. **Class "C"** is minimal energy requirement for all new and renovated buildings.

Building Type	A	B	C	D	E	F	G
Single-family Houses	< 51	51 - 97	**98 - 142**	143 - 191	192 - 240	241 - 286	> 286
Apartment Blocks	< 43	43 - 82	**83 - 120**	121 - 162	163 - 205	206 - 245	> 245
Hotels & Restaurants	< 102	102 - 200	**201 - 294**	295 - 389	390 - 488	489 - 590	> 590
Offices	< 62	62 - 123	**124 - 179**	180 - 236	237 - 293	294 - 345	> 345
Hospitals	< 109	109 - 210	**211 - 310**	311 - 415	416 - 520	521 - 625	> 625
Education Buildings	< 47	47 - 89	**90 - 130**	131 - 174	175 - 220	221 - 265	> 265
Sports Facilities	< 53	53 - 102	**103 - 145**	146 - 194	195 - 245	246 - 297	> 297
Wholesale & Retail Trade Services Buildings	< 67	67 - 121	**122-183**	184 - 241	242 - 300	301 - 362	> 362

There is an official approved software, which is based on Excel sheet (free of charge) and 2 commercial softwares available. The methodology is published as a Decree with references to the National Standards.

In Denmark, the energy performance of new buildings is calculated using a simplified calculation program (Be06) which is based on **monthly average values** (no dynamic simulations). This program is the official national calculation tool, however users are allowed to use different programs if they can be validated to obtain the same results as the national calculation tool. No such programs exist at the moment.

The calculation method is "closed", and the user has no freedom to change how the calculations are performed.

The heating demand is calculated according to prEN ISO 13790:2005. Solar shading, the length of the heating season, the usable part of heat loss from installations and heat recovery in ventilation systems along with any post-heating of ventilation air is taken into account when determining the heating demand.

The method produces a result that is the primary energy for the building (kWh/m^2 gross area pr. year), including the energy use for heating, domestic hot water and ventilation along with any electricity uses for building operation, i.e. fans for ventilation system, boiler, pumps etc. For non-residential buildings, electricity use for lighting is also included in the calculation. All electricity uses are multiplied by a factor 2.5, to take into account the differences in CO_2-emmissions associated with the production of heat and electricity.

The result of the calculation is compared to the energy demands specified in the Danish Building Regulations, where the minimum demands are as follows:

Residential buildings: $70 + \frac{2200}{A}$ kWh/m^2 gross area pr. year

Non-residential buildings: $95 + \frac{2200}{A}$ kWh/m^2 gross area pr. year

where A is the total gross area of the building.

The law only refers to the calculation program and manual (not a specific version number of the program or manual). This means that new additions to the calculation program and manual along with changes to existing parts can be implemented directly without any changes in the law. New versions of the program and manual are released regularly, however usually there are only minor changes to the existing procedure, whereas larger changes would typically occur when implementing new innovative systems. From April 2006 to September 2008, 4 versions of the program were released.

In Finland:

Calculation procedures

Since 1985 Finland's National Building Code has included Guideline D5 "Calculation of power and energy needs for heating of buildings", which can be used for calculations for all building types. The calculation method has been refined because of the implementation of the EPBD. The D5 calculation method has been developed by the Ministry of the Environment and was published as a decree in the National Building Code in June 2007. The D5 calculation method has to be used for calculating the energy consumption when issuing energy certificates for small residential buildings (less than 6 apartments). When applying for the building permit, EN standards and other calculation methods can also be used. The updating of the calculation method has to go through the normal legislative process of a decree, which takes normally a one year calendar time.

The calculation in the Finnish Guideline D5 “Calculation of power and energy needs for heating of buildings Guidelines” is based on **monthly average values** (no dynamic simulations). The method does not straightforward support any innovative systems (for example contain tabulated default values or formulas for a certain innovative system).

There is a national way called “separate clarification” in the Finnish Building Code, which means the procedure, where neutral consultant makes a calculation of the presented systems effect to the energy efficiency. This procedure can be used for any new and innovative structural or system component of the building. The Finnish calculation procedure is therefore open.

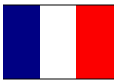
Requirements for new buildings

Finland has set minimum requirements in the National Building Code for thermal insulation and ventilation of new buildings since 1976. The requirements have been changed several times in order to improve energy efficiency in buildings. The latest changes were made in 2002, and these quite strict requirements came into force for building permits requested after 1 October 2003.

The new requirements were published in the National Building Code by the Ministry of Environment in June 2007 and came into force after 1 January 2008.

The energy requirements are the same for all buildings and include:

- Maximum U-values
- Requirement on average insulation level
- Requirement on heat losses of the building (building envelope, ventilation and air-tightness)
- Requirement on calculation of the energy demand of the building per m² of floor area
- The applicant for the building permit has to ensure that the construction will fulfil the requirements. The building permit will be approved by the local building supervision authority.



In France, the energy performance calculation for new building is based on **hourly simulation**. It is expressed by the primary energy consumption per m² of surface and per hour. To perform calculation following the procedure named Th-CE, the person on charge must use a software certified by CSTB.

Concerning the requirements, there are two main conditions. The first one concerns the primary energy consumption (Cep). The project consumption must be lower than the reference (Cep réf). The second, concerns the temperature reached in summer (Tic). It must be lower than the reference value (Tic réf).

In addition, a set of specific requirements for U-value of walls, floor, roof, windows, doors and thermal bridges must be satisfied.

In Germany, the energy performance of a building is expressed in the primary energy demand related to the net floor area (non-residential buildings) resp. the useful floor area (0,32*V_{gross}, residential buildings) in kWh/m²a. The transmission transfer coefficient related to the heat transfer surface area is the second indicator. The German energy decree contains maximum levels for the primary energy demand for residential buildings and the transmission transfer coefficient for all buildings. The maximum primary energy demand for non-residential buildings is defined by reference building technologies, that have to be used to calculate a (maximum=) reference primary energy consumption for a building with the same geometry and use.

The calculation method is ‘closed’, meaning that the method is described explicitly in national standards (DIN V 18599 for non-residential buildings and DIN V 4108-6 and DIN V 4701-10 for residential buildings) that need to be followed ‘to the point’ (besides, of course, the possibly of equivalence).

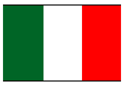
There is no official software tool which has be used to perform the calculation, but there are several commercial software tools available. In case of the non-residential buildings most of them are based on a calculation kernel that was developed at Fraunhofer-IBP. However if you want to make your own spreadsheet to do the calculation this would be allowed. Of course only as long as the software/excel calculates exactly according to the formulas of the standard.

The calculation is based on **monthly average values** (no dynamic simulation).

The new calculation standard for non-residential buildings (which will soon become also valid for residential buildings) can calculate many systems that might be considered as being innovative and can not be calculated in other countries’ calculation standards/methods (e.g. double skin facades, combined heat and power, earth coupled heat pump, etc.) However since the ASIEPI project defines only systems/technologies that are not covered by the national

EPC calculation procedure as an innovative system, there are few systems that will meet this definition. For those systems the principle of equivalence can be used to prove that their performance is better than the default. If a system that is included by a default value in the calculation standard but has proven (by measurements in national labs followed by an assessment at the national admission office (DIBT)) to be more efficient than the default the product specification given by the national admission office and published in the German Federal Gazette can be used instead of the default value.

In Greece, the implementation of the EPBD is expected to start beginning of 2009. Currently Special Decrees and Joint Ministerial Decisions are being set up to define the energy performance requirements and calculations procedures. It is expected that the calculation will be based on **mean monthly values** and the energy performance will be expressed in terms of maximum energy demand per m², although nothing is known yet about the software to be used.



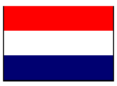
In Italy, the energy performance of a building is expressed in the primary energy demand for heating related to the net floor area in kWh/m² per year or kWh/m^3 for not residential buildings.

The Italian energy decree defines the maximum primary energy consumption for residential and non residential buildings as a function of the climatic zone and the building geometry. Alternatively, the decree defines the maximum transmittance for different components of the building envelope as a function of the climatic zone, as well as the lowest acceptable seasonal efficiency of the heating system.

The calculation method is 'closed', meaning that the method is described explicitly in the national standard (UNI EN 13790), based on **monthly average values** (no dynamic simulations), that needs to be followed 'to the letter' for new buildings. UNI TS 11300 is a national standard, to be officially published in 2008, defining some admitted simplification when some of the input data required by UNI EN 13790 are missing. Every system/technology that is not covered by the calculation procedure is potentially an innovative system, according to the definition mentioned above.

There is no official software tool which has be used to perform the calculation, but there are several software tools available the most popular are DOCET (developed by ENEA and ITC-CNR), BESTClass (Developed by Sacert), Casa Clima (developed by Casa Clima Agency), with different field of application.

Alternative methods of calculation (dynamic simulation) can be accepted if the reason for adopting that calculation method is motivated by the designers in their report and if results are close (within 5%) and conservative in comparison to what stated by methods officially approved.



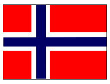
In the Netherlands, the energy performance of a building is expressed in the so called EPC. The EPC is a formula containing the totally primary energy use of the building and the maximum primary energy allowed. The formula is written in such a way that when the energy performance requirement is tightened the EPC needs to be smaller than before (the denominator of the formula is not exactly the maximum energy use). The calculation is a monthly method.

The calculation method is ‘closed’, meaning that the method is described explicitly in a national standard that needs to be followed ‘to the letter’ (besides the possibility of equivalence of course). The Dutch Building Code gives the EP requirement level and refers to the national standard

There is an official software tool which can be used to perform the calculation, but there are also commercial software tools available which are allowed. Even if you want to make your own spreadsheet to do the calculation this is allowed. Of course only as long as the software/excel calculates exactly according to the formulas of the standard. If you do not use the official software or a known commercial software it is possible that the municipality who checks the calculation doesn’t trust the calculation and asks you to prove the quality of the software. As far as I know no one uses other software than the official software or known commercial software.

The calculation is based on **monthly average values** (no dynamic simulations).

Consequently, every system/technology that is not covered by the EPC calculation procedure is potentially an innovative system, according to the definition mentioned above. In addition systems which are taken into account by means of a default value, but which perform better than this value can use the principle of equivalence to prove that their performance is better than the default.



Norway revised its building code in 2007. The new code will be fully enforced from 2009.

(1) **Requirements related to net energy consumption** (i.e. excluding energy supply systems). Here, the code gives two alternatives for checking energy performance:

- *Simple prescriptive requirements*: The building must comply with a set of 11 explicit energy conservation measures. These include: wall U-value (0.18 W/m²K), roof (0.13 W/m²K), windows & doors (1.2 W/m²K), max. area of windows & doors is 20% of heated floor area, airtightness n_{50}=1.5 /h (2.5 for small houses), ventilation heat recovery annual efficiency 70%, fan power SFP, automatic external solar shading, etc. If all the measures listed are in place, the energy requirements are fulfilled and it is therefore not necessary to do any calculations. The benefit of this first approach (simple prescriptive) is that it does not involve any calculations, and gives is immediately understandable for laymen. For buildings with more innovative energy conservation measures, one must use the more advanced performance calculations, below.
- *Advanced performance-based requirements*: The requirement is expressed as (kWh/m²)/yr maximum **net energy demand** (and not in primary energy, as in many MS)[7]. There are 13 building categories. For multifunctional buildings, one checks the different arts of the building separately. Calculations are according to the national standard NS 3031:2007 [1]. Some of the input parameters are fixed; see below.
- The two alternative approaches described above are compatible, i.e. if one does an advanced energy calculation of a building with the simple prescribed qualities, it will result in the same energy consumption as the advanced energy performance requirements [(kWh/m²)/yr].
- One aim of the new building code is to prevent misuse whereby, instead of ensuring an energy-efficient building envelope, the designer makes overly optimistic assumptions about technical building services, assumed building operation and occupant behaviour,

which may change over the lifetime of the building. This problem has been mitigated by placing limits on minimum U-value and airtightness. In addition, NS 3031:2007 has a number of prescribed input parameters including internal heat gains (lighting, equipment, people), hot water use, operation hours, set-point temperatures for heating & cooling, totalized thermal bridges, and minimum air flow rates. This means that some innovative systems get no credit, especially ones that limit internal heat gains. The only exception to this is advanced lighting control, so long as the effective lighting energy consumption is calculated according to EN 15193.

(2) **Requirements related to delivered/primary energy supply**:

- A significant part (≥40%) of a building's energy demand shall be supplied by alternative energy carriers than electricity or fossil fuels [7]. District heating is considered an alternative source. There are two exceptions to this rule: (a) small or low-energy buildings with energy demand <17000 kWh/yr, or (b) if calculations show that alternative energy will lead to higher annuated costs during the lifetime of the building.
- NS 3031 contains an *informative* appendix with typical values of system efficiencies for a common systems (e.g. different kinds of boilers, heat pumps, solar thermal systems, etc.). The efficiency of other systems can be calculated according to EN 15316 [6], or supplied by the manufacturer.

Calculation method:

The calculation method is NS 3031:2007. It explains how to calculate both net and primary energy consumption. A standard climate year is used for the whole country. This standard says that one may use ISO 13790:2008 [2] (either simple monthly or dynamic hourly method) or any other advanced energy simulation software that has been validated according to EN 15256 [4]. Therefore this is an "open" approach, where a few software tools are already available. The flexibility of choice in software means that it is possible to calculate many energy technologies that may be problematic in other countries. The indoor environment of the calculated building should be dimensioned to comply with Category II in EN 15251 [5]. As a general rule, the indoor temperature should not exceed 26°C for more than 50 hours during the summer season; however, this can be exceeded if thermal adaptation is possible (within reasonable limits given in EN 15251). It is envisaged that NS 3031 will be revised as necessary in future in line with future changes of the building regulations, maybe 5-year intervals.

In conclusion: Some technologies that are innovative in some other countries (as defined in the introduction to this report) are not so in Norway, because we have freedom of choice of simulation software. See also question 3.

References:

[1] Norwegian Standard NS 3031:2007, *Calculation of energy performance of buildings - Method and data*

[2] International Standard ISO 13790:2008, *Energy performance of buildings - Calculation of energy use for space heating and cooling*

[3] Standard EN 15193, *Energy performance of buildings - Energy requirements for lighting*

[4] Standard EN 15265, *Energy performance of buildings - Calculation of energy needs for space heating and cooling using dynamic methods - General criteria and validation procedures*

[5] Standard EN 15251, *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting*

and acoustics

[6] Standard EN 15316, *Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies*

[7] Norwegian Technical Building Regulations (*Forskrift om krav til byggverk og produkter til byggverk, TEK*), revised 2007, Chapter 8 (Energy use), http://www.lovdata.no/for/sf/kr/tr-19970122-0033-015.html#8-21

 In Poland, currently the thermal insulation requirements for buildings are regulated by the ordinance of the Minister of Infrastructure on technical criteria to be met by built structures and their localisation (2002).

There are four buildings types:

- Residential buildings (includes both single family houses and multi-residential buildings),
- Collective residential buildings (as hotels, hostels, resorts etc…),
- Public buildings (as offices, hospitals, museums, cinemas, sport utility etc…),
- Industrial and Storage buildings.

In case of a multi-family building or a collective residential building, the energy conservation requirements are fulfilled, if the value of the E factor, representing the computational demand for heat consumed by the building during the heating season is smaller than the upper limit value E_0. The methodology for calculations of indicator E_0 has been standardised. Polish Standard PN-99/B-02025 is developed on the base of European pre-standard prEN 832 and is based **monthly balance method**.

For a residential single-family houses the energy conservation requirements are fulfilled, if:

- the E factor value is smaller than the upper limit value E_0, or
- the external walls meet the requirements of thermal insulation and other energy-saving requirements, specified in the annex of the resolution.

For a public utility building the energy conservation requirements are fulfilled, if the external walls meet the requirements of thermal insulation and other prescriptive energy-saving requirements, specified in the annex to the resolution

The required values E_0 (net energy) of the building seasonal heat demand factor depend on the building shape ratio A/V, and for residential and collective residence buildings amount to:

- $E_0 = 29$ kW·h/(m^3·a) for A/V ≤ 0.20,

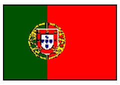
- $E_0 = 26.6 + 12$ A/V kW·h/(m^3·a), for 0.20 < A/V < 0.90,

- $E_0 = 37.4$ kW·h/(m^3·a), for A/V ≥ 0.90,

where:

A – is the total surface area of all outer walls (including windows and balcony doors), roofs and floor-roofs, floors on ground, floors above unheated basements, floors above passages, which separate the building's heated section from ambient air, as measured along outer boundaries;

V – is the cubic capacity of the building's heated section, computed according to the relevant Polish Standard, which sets out the procedures to compute the building's cubic capacity.

 In **Portugal**, there is a different situation regarding residential and non-residential buildings.

Residential buildings must be assessed by a rather tight simulation model, based on **average seasonal performance** (spreadsheet calculation, very simple and easy). Buildings must show that they are below maximum allowed energy consumption for 4 items: heating, cooling, hot water and primary energy (i.e, including systems efficiencies and energy sources: electricity, gas, fuel, renewables, etc.). Minimum quality requirements also apply to the envelope (insulation and shading) and to the systems efficiencies.

Non-residential buildings (with an installed HVAC power above 25 kW – otherwise they follow the residential requirements) must be assessed by **detailed hourly simulation**. The software is open choice, although it must be recognised as a valid software (it must meet accuracy requirements specified on the basis of ASHRAE standard 140 – a list of recognized softwares is made available by the national certification system, and updated as necessary). These buildings must have a predicted primary energy consumption below a certain maximum threshold specified by the regulations, under nominal use conditions.

Only a recognised engineer or architect can “sign” the energy study for residential buildings. For non-residential buildings, only recognised engineers can sign the study.

Innovative systems must be included through provision of the appropriate system efficiency and other parameters required by the respective energy models. These parameters must be made available by the manufacturer following a credible procedure (study by an independent laboratory and/or following applicable standards).

 In Spain, you can follow a prescribed or a component based approach for both minimum requirements and energy certification assessment.

For the performance based approach, there is an official common tool based on dynamic simulations and a document containing the requirements for alternative calculation tools.

For alternative calculation tools, the document includes:

- General considerations about modelling (hourly based, dynamic, multizone simulation method)
- Minimum capabilities (elements, systems and strategies that can be dealt with)
- For the different boundary conditions, components, systems or strategies:
  - Common assumptions of modelling
  - Minimum level of modelling required
  - Default values
  - Data requested to the user.

Alternative calculation tools must not be understood as tools to calculate a specific innovative system, but alternative tools to the official one. However, no alternative tool was developed so far.

The innovative systems appear due to:

- elements, systems or strategies beyond the minimum capabilities,

- default values,
- common assumptions of modelling in some cases.

Question 2 How is compliance and control organised in your country?

 In Belgium, studies have shown that the previous energy regulations were not well applied. According to various stakeholders, the main reason was a lack of control by the authorities. For that reason, compliance controls were considered as very important.

The regional EPB regulations organise the compliance controls and foresee the penalties to be paid if a building owner does not respect the requirements and/or if a rapporteur make an incorrect declaration.

This control framework is not only strong in the law, but also in reality. The Flemish Region do both paper control and on-site control (for the two other Regions, it is too early to say if control took place, as the legal framework is too new).

As the control framework is **strong**, everything should be organised so that there is little range for discussion between the authorities and the building owner of the rapporteur. In the same sense, the principle of equivalence approach should be organised in such a way that it does not become an escape routes… to the controls!

 In the Czech Republic, there is a state authority – State Energy Inspectorate (SEI) accredited to control fulfilment of obligations resulting from EPBD implementation. SEI has power to set a penalty when first warning to the building owner was not answered.

In reality SEI does not have enough inspectors to control whole building stock under EPBD obligation.

 In Denmark, the local authority checks whether the design of the building comply with the Building Code and then give a *permit to build* the building.

Proof of compliance with the energy requirements must be made after the completion of the building in order to obtain the *permit to use* the building. Control of compliancy with building regulations is the responsibility of the local authority where the building is located. In practice the control of the building in relation to the energy requirements is performed by the energy consultants who also issue the energy certificate.

 In Finland, the municipality checks whether the design of the building comply with the Building Code. The main responsible person in the building process is the principal designer. His duty is to ensure the sufficient quality and comprehensiveness of the designs for the building project so that they can be used to establish that the requirements set for building are met. The principal designer is responsible to the building supervision authorities for carrying out his duties in an appropriate manner during the building project's design stage and the construction work. The control framework is "strong" according to the law.

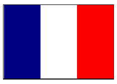
Together with the party engaging in a building project, the principal designer shall, as required by the quality and difficulty of the project:

- ensure that required basic information is available and that it is consistent and up-to-date, and make it available to the designers;

- ensure that all designers involved in the project know which part of the required designs is their responsibility;
- organize the collaboration of the designers from different fields;
- ensure that sufficient time has been allotted to design work in the timetable; and
- ensure that all required designs are drawn up and that they have been confirmed to be mutually compatible and consistent.

The municipality's (building inspector) responsibility is to check the design and its accordance with the building code, and safety issues (e.g., structural safety) of construction. e.g., foundations including thermal insulation of foundations (frost protection). In general, realisation of details is not checked, but in the design phase the inspector may give guidelines for good practice.

Sometimes challenging structural designs are checked by the second party (another designer, who takes the responsibility of the design). This kind of procedure is mainly done from the structural safety point of view. In the realisation phase some subcomponents concerning the energy efficiency of the building are checked voluntarily by the construction company. These checks (for example: thermography, pressure tests) are part of the normal quality control of the construction work, but this depends mainly on the customer demand and the undertaking company. Some companies have better quality control than others. The control framework in the realisation phase is "strong", if the structural safety is in focus, but "quite loose", concerning the energy efficiency.



In France, the compliance and the control are made by the Technical Studies Centre of the Ministry of Equipment. Until begin of 2008, the compliance and controle were pedagogic. Since the end of this year, the control and compliance became more strict with judicial proceedings if no compliance to the regulation.

The control is based on the technical report (XML output) and the control on the site.

In Germany, the compliance control is in the hands of the local administrations (based on the federal states building law). The responsible person for meeting the EPBD requirements is the buildings owner. By this the control framework is kind of simple but therefore not really loose. The reality however is that the compliance is usually only checked when there is a legal case (e.g. tenant vs. building owner) and it has to be found out if the requirements are met or not.

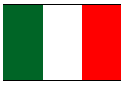
In Greece, although the regulations and requirements, including prescriptions for the set up of a control and compliance system, are expected to be fully in place by the beginning of 2009, in practice compliance with the EPBD in Greece is expected to be moderate unless:

a) a good promotion programme is established to inform and raise awarenes about the importance and advantages of energy saving and certification

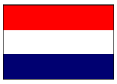
b) financial incentives and supporting tools and mechanisms are promoted to finance energy saving investments and the uptake in the buildings market and

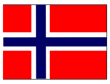
c) a good working and strong mechanism for control and compliance is established to further ensure the actual performance and effectiveness of certification.

Unfortunately, the control and compliance mechanisms in the country are often underemployed and overloaded with work, so that they would rather be defined as ‘weak’ and only moderate results can be expected in practice.

 In Italy, the responsible for the execution of works on construction site (site engineer) has to make a declaration that works have been executed according to what stated in the documents presented to the municipality when the permit of building was requested. Municipality may decide to inspect the works, during the execution, or check how they were realized, within 5 years from the end of the works. Municipality make these inspections on request of the buyer or of the renter.

However, in practice, in most part of Italy, these inspections don't happen. It is upon the technical office of the municipality to decide if he makes the inspections or not.

 In the Netherlands, the control is strong according to the law: when a Building Permit is requested, one should proof that the EP requirement is reached. For this the Building Permit requestor needs to submit the EP calculation including additional proof to the Municipality of the city where the building will be build.

 In Norway, much of the responsibility for control rests on the shoulders of the building contractors themselves. However, the local the building authorities have two important means of quality control:

- Administering a building permit to each individual building project, based on an application from the builder. In theory, the authorities are expected to evaluate the energy performance calculations as part of the whole application, but in practice this is rarely prioritized due to lack of resources. Moreover, the point below is designed to prevent abuse of the system.
- Administering of general operating permits to contractors based on a general evaluation of their competence. If it turns out that a company has somehow violated its right to “self-control”, the building law or code, they can loose their general operating permit. This has occurred a number of times in the past.

 In Poland, there is no mandatory control of energy certificates. The possible control can be performed on a basis of civil law procedures; in future hopefully (before the end of the 2008) it will be changed.

 In Spain, compliance is mandatory to get the building permit. Control framework should be established at a regional level, but not a single inspection has been performed at any region so far.

Question 3 Are there systems than can be considered as innovative according to the definition mentioned in § 1? Explain why. If yes, give examples.

 In Belgium, yes, as the current standard calculation procedure does not cover all the systems already on the market and can not cover any system that does not exist yet.

The innovative systems are mainly systems with time dependant characteristics, which are not covered by the method based on a monthly model (as ventilation on demand, double skin façades…)

 In the Czech Republic, calculation methodology covers most of all innovative systems which are available on the market. Inside the methodology there are steps where the expert can choose a better value than what is set as default value to take into consideration using of advanced technology in the building.

Lighting – control type of the lighting system – manual/photo cell dimming;

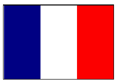
COP values – for heat pumps or cooling generation installation.

Pumps - weigh factor for heating/cooling/DHW pumps control system.

 In Denmark, yes, as the current version of the calculation procedure used does not cover all types of systems on the market. Examples are advanced double facades, preheating of ventilation air by ground pipes etc. However, most innovative systems can be handled indirectly in the calculation procedure.

 In Finland, yes, as the current standard calculation procedure does not cover any innovative systems at all.

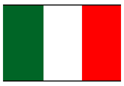
The innovative systems are mainly systems with time dependant characteristics, which are not covered by the method based on a monthly model (as ventilation on demand, double skin facades…), but - in general - these can be used, if representative monthly performance values can be presented and applied in the National Calculation method D5. Sometimes this is possible and sometimes not.

 In France, following the definition presented on § 1, the system or the technology who gives a better performance and who is not covered by Th-CE procedure is considered as an innovative system.

 In Germany, the current standard calculation procedure in comparison with other national standards covers many but not all the systems already on the market and can not cover any system that hasn't been thoroughly measured and analysed yet. The calculation uses default values for some systems (or part of systems). These default values often are mostly chosen conservatively, in order to prevent products that do not perform as good as their

competition get 'a free ride'. Consequence is that the 'good' products might be underestimated when they use the default values. If a system that is included by a default value in the calculation standard but has proven (by measurements in national labs followed by an assessment at the national admission office (DIBT)) to be more efficient than the default the product specification given by the national admission office and published in the German Federal Gazette can be used instead of the default value. For systems that can't be calculated with the currently used standards, it is allowed to use other ways of evidences as long as they are accepted by the local administrations. One of the other ways is the principle of equivalence that uses a method to compare a standard technology with an innovative technology in order to show that the innovative technology is at least as good as the standard technology.

 In Greece, many systems like buried pipes, night cooling, ventilation on demand, double skin facades, renewable energy sources, etc., and especially all passive and/or hybrid cooling systems are not expected to be included in the national regulations and can therefore be considered as innovative systems according to the definition given above.

 In Italy, The standard method does not cover any innovative method or technologies. Many technologies and systems (natural ventilation, hybrid ventilation, bio-climatic technique, and so on) are often applied and can be considered as innovative.

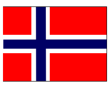
The only exception is for time dependent envelope systems, whose performance, according to the national regulation, has to be assessed by dynamic simulation for non residential buildings having a volume greater than 10000 m^3.

 In the Netherlands, yes, as the current standard calculation procedure does not cover all the systems already on the market and can not cover any system that does not exist yet. In addition, the calculation used default values for some systems (or part of systems). These default values often are not chosen too high, in order to prevent products that do not perform as good as their competition do not get 'a free ride'. Consequence is that the 'good' products are underestimated when they use the default values. There are 3 options to obtain a better value:

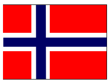
- The standard has a detailed method to come to better values
- The standard points to other standards (e.g. European measurement standards) with which you can prove a better value
- You use the principle of equivalence to prove you have a better value.

Only the systems which need to use this last category are innovative systems is, conform the definition used in this task.

For examples: see the next question (there are no general characteristics of innovative systems, other than the definition itself).

 In Norway, there are two categories of innovative energy technology that cannot be given credit in the energy performance calculations as prescribed in the building regulations:

- *Fixed parameters in the energy calculations*: The building code purposefully gives no credit to technology for reducing internal heat gains such as Energy Star IT equipment (except for automatic dimming of lighting, though this also has a conservative lower limit). Furthermore, promotion of adaptive thermal comfort is not given credit. See Norway's answer to Question 1 for an explanation. Although VAV systems are given credit, fixed values are given for minimum allowed flow rate. These minimum values are higher than innovative VAV systems can achieve. Also fixed values are given for thermal bridges.
- *Energy control volume*: The building code sets requirements for both *net energy demand* and *delivered energy (max. 60% can be electricity/fossil)*. The approach for primary energy is flexible, since assumed system efficiencies are not fixed by the regulations. However, there is an artificial differentiation between ventilation heat recovery units with conventional heat exchangers, and those with integrated heat pumps. For example, rotary heat exchangers are given full credit whereas exhaust air heat pumps or combi units get no credit in terms of reducing the building's *net energy demand*., as heat pumps are a supply system outside the of the building's net consumption control volume.



In Norway, there are two categories of innovative energy technology that cannot be given credit in the energy performance calculations as prescribed in the building regulations:

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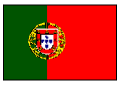
- *Energy control volume*: The building code sets requirements for *energy demand* as opposed to primary energy or delivered energy (including system losses due to production of heat or cold, controls, and distribution). In other words, the efficiency of active energy delivery systems is not accounted for yet. Thus heat pumps and solar water collectors get no credit. Thus there is an artificial differentiation between ventilation heat recovery units with conventional heat exchangers, and those with integrated heat pumps. For example, rotary heat exchangers are given credit whereas exhaust air heat pumps or combi units get no credit. *Passive* technologies are given credit because they reduce the *energy demand*. Thus passive solar heating (e.g. double façade) and passive cooling (use of thermal mass, or nighttime free cooling of cooling coils) are all given credit.

In Poland, there are innovative systems that are possible to apply that cannot be analysed within the monthly balance. Many of them are implemented in new non residential buildings, and are not regulatory driven. Their implementation is a decision of investor, or other stakeholder, and is reasoned by market competitiveness or by economy. The energy regulation, in case of innovation, in non residential building does not require determination of its energy performance. Usually, the performance is assessed by international simulation software available on market mainly due to the need for self conviction of the decision about undertaking the innovation. The energy characteristics of the system are taken from accompanied European Norm or Aprobate issued by EOTA institution.

 In Portugal, no request has come up yet in the market… on the other hand, the system is open enough that manufacturers of new innovative systems may act independently without any further need for government recognition.

 In Spain, yes. The scope of the national calculation tool is limited. Innovative systems as defined in § 1 can appear mainly in the following cases:

- Cooling or heating generation system whose performance curves can not be expressed in the same way as more conventional systems (for instance geothermal heat pumps).
- Some cooling or heating generation systems based on the use of environmental heat sources and sinks (for instance ground ducts for preheating or precooling ventilation air)
- Some cold or heat storage devices (for instance those based on ice or other PCM type)
- Embedded cooling or heating emitters (floors, walls or ceilings)
- Special elements of the envelope (double skin, roof ponds)
- Combination between systems (for instance sorption cooling based on solar thermal energy).

In other cases, although the performance of some strategies can be assessed by the standard EPB calculation methods, the use of very restrictive defaults values prevents their fair evaluation. This is the case of demand controlled ventilation, night cooling, etc.

In this group it can be also included some commercial products for generation of heat and cool whose curves of performance (not the nominal values) are much better than those included as default. This is the case for instance of the inverter system used in some heat pumps units. In this case, if the manufacturer can prove by measurements in accredited labs followed by an assessment by an official admission office (such as IDAE in Spain) the improved values, they can directly be used by the national common tool. In most of other cases, the use of the principle of equivalence in a broad sense can solve the situation.

Question 4 Can the following systems be considered as innovative according to the definition mentioned above?

Included means the standard calculation procedure covers this system/technology; this therefore not an innovative system in your country.

Innovative means the standard calculation procedure does not cove this system/technology; this is therefore an innovative system in your country.

Other stands for other cases, including if not relevant.

	Belgium			**Czech Republic**			**Denmark**			**Finland**		
	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	Innovative	Other	Included	**Innovative**	Other
Ventilation on demand controlled by humidity?		**X**			**X**	1		X			**X**	
Ventilation on demand controlled by CO_2?		**X**			**X**	1	X				**X**	
Displacement ventilation?		**X**				1	X				**X**	
Decentralised ventilation						1	X			X		
Double skin façades? (passive)				X			X			1		
Double skin façades? (actively ventilated)		**X**		X				X			**X**	
Ground exchanger? (for passive cooling of ventilation air)			1			1		X			**X**	
Free cooling with natural night ventilation?			1			1	X			X		
Paint coating (in order to reduce solar gains through walls)?			2			1			X		**X**	
Phase changing materials?		**X**				1		X			**X**	
Products to increase airtightness?	3			X			X			X		
MicroCHP	X			X				X		X		
Absorption heat pump		**X**		X				X		X		
Gas driven heat pump		**X**		X				X			**X**	
Gas driven air conditioning	4			X				X			**X**	
Heat recovery unit (ventilation)	X			X			X			X		
Counterflow heat recovary unit (ventilation, high efficiency > 0,80 à 0,85)	X			X			X			X		
heat recovary unit (shower water)	X			X					X		**X**	
Humidity recovery	4					1			X		**X**	
DC ventilators	X			X			X			X		

	Belgium			Czech Republic			Denmark			Finland		
	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	Innovative	Other	Included	**Innovative**	Other
(embedded) concrete core activation		**X**				1		X			**X**	
Smart control via BEMS		**X**			**X**	1		X		X	**2**	
PVT collector (t = thermal)		**X**		X				X			**X**	
Daylight sensor (lighting)	X			X			X			X		
Presence detection sensor (lighting)	X				**X**	1	X			X		
Triple glazing	X			X			X			X		
High performance window frames	X			X			X			X		
Solar protection glazing		**X**			**X**	1	X			X		
IR reflective thermal insulation (e.g. multiple reflective film)		**X**			**X**	1			X	1		

Notes for Belgium:

1: This system/technology is currently not covered by the standard calculation procedure, but studies are foreseen in order to include it in the next revision of the procedure.

2: Not relevant: as solar gains are supposed to come through windows only, the emissivity or the solar reflectance of opaque surfaces has no impact on the energy performance.

3: The calculation procedure takes into account only the final result of a pressurization test, whatever the construction materials used.

4: It is taken into account only for school and office buildings, with fixed efficiency.

Notes for Czech Republic:

1: This system/technology is currently not covered by the standard calculation procedure.

Notes for Finland:

1: If monthly effect on the U-value can be presented.

2: If the effect on the monthly energy performance can be presented.

	France			Germany			Greece			Italy			Nether-lands		
	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	**Innovative**	Other
Ventilation on demand controlled by humidity?	X			X				**X**			**X**			**X**	
Ventilation on demand controlled by CO_2?	X			X				**X**			**X**			**X**	
Displacement ventilation?		**X**			**X**			**X**			**X**			**X**	
Decentralised ventilation		**X**		X				**X**			**X**			**X**	
Double skin façades? (passive)			1	X				**X**			**X**		X		
Double skin façades? (actively ventilated)			1	X				**X**			**X**			**X**	
Ground exchanger? (for passive cooling of ventilation air)			1	X				**X**			**X**			**X**	
Free cooling with natural night ventilation?			1	X				**X**		X				**1**	
Paint coating (in order to reduce solar gains through walls)?		**X**		X				**X**		X					2
Phase changing materials?			1			1		**X**			**X**			**X**	
Products to increase airtightness?		**X**		X				**X**			**X**		X		
MicroCHP			1	X				**X**			**X**			**1**	
Absorption heat pump	X			X				**X**			**X**			**X**	
Gas driven heat pump	X			X				**X**			**X**			**1**	
Gas driven air conditioning	X			X				**X**			**X**			**X**	
Heat recovery unit (ventilation)	X			X				**X**		X			X		
Counterflow heat recovery unit (ventilation, high efficiency > 0,80 à 0,85)	X			X				**X**		X			X		
heat recovery unit (shower water)			1		**X**			**X**			**X**			**X**	
Humidity recovery		**X**		X				**X**			**X**		X		
DC ventilators	X			X				**X**			**X**		X		
(embedded) concrete core activation		**X**				1		**X**			**X**			**X**	
Smart control via BEMS		**X**		X				**X**			**X**				3
PVT collector (t = thermal)		**X**		X				**X**			**X**			**X**	
Daylight sensor (lighting)	X			X				**X**			**X**		X		
Presence detection sensor (lighting)	X			X				**X**			**X**		X		
Triple glazing	X			X				**X**		X			X		
High performance window frames	X			X				**X**		X			X		
Solar protection glazing	X			X				**X**		X			X		
IR reflective thermal insulation (e.g. multiple reflective film)		**X**		X				**X**			**X**		X		

Notes for France:

1: This system/technology is currently not covered by the standard calculation procedure, but studies are foreseen in order to include it in the next revision of the procedure.

Notes for Germany:

1: In preparation, will be integrated in the next revision of the calculation standard.

Notes for The Netherlands:

1: These systems will be included in the new version of the EP calculation, which is under preparation.

2: Solar heat gain through walls is not taken into account in the current version of the EP calculation. It will be in the next version, so than this is a parameter which can be used for equivalence.

3: Control systems are not taken into account in the EP calculation and the principle of equivalence can therefore not be used for these systems.

	Norway			Poland			Portugal			Spain		
	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	**Innovative**	Other	Included	**Innovative**	Other
Ventilation on demand controlled by humidity?	2			X			1				**X**	
Ventilation on demand controlled by CO_2?	2				**X**		1				**X**	
Displacement ventilation?	2				**X**		X			X		
Decentralised ventilation	2				**X**		X			X		
Double skin façades? (passive)	2				**X**			**X**			**X**	
Double skin façades? (actively ventilated)	2				**X**			**X**			**X**	
Ground exchanger? (for passive cooling of ventilation air)	2					1		**X**			**X**	
Free cooling with natural night ventilation?	2					1	X					1
Paint coating (in order to reduce solar gains through walls)?	2					2	X				**X**	
Phase changing materials?	2					2			2		**X**	
Products to increase airtightness?	1					2			2		**X**	
MicroCHP	4					1	X				**X**	
Absorption heat pump		**5**			**X**		X			X		
Gas driven heat pump		**5**				2	X				**X**	
Gas driven air conditioning	4					2	X				**X**	
Heat recovery unit (ventilation)	1			X			X					2
Counterflow heat recovary unit (ventilation, high efficiency > 0,80 à 0,85)	1			X			X					2
heat recovary unit (shower water)		**3**				2	X					2
Humidity recovery	1					?	X				**X**	
DC ventilators	1				**X**		X					
(embedded) concrete core activation	1				**X**				2		**X**	
Smart control via BEMS		**3**		X			X				**X**	
PVT collector (t = thermal)	4			X			X					3
Daylight sensor (lighting)	3				**X**		3					4
Presence detection sensor (lighting)		**3**			**X**		3				**X**	
Triple glazing	1			X			X			X		
High performance window frames	1			X			X			X		
Solar protection glazing	1			X			X			X		
IR reflective thermal insulation (e.g. multiple reflective film)	1			X			X			X		

Notes for Norway:

1: These are technologies that are accounted for in both methods of the building code, i.e. *simple prescriptive requirements* and *advanced performance-based requirements*.

2: These are technologies that, in our opinion, can be accounted for by conducting an advanced energy consumption simulation (*advanced performance-based requirements*)

3: The building code purposefully gives no credit to technology for demand-control of internal heat gains, with the exception of lighting. See Question 1 for an explanation.

4: Building code requirement that 40% of net energy demand is not supplied by electricity or fossil fuels. Energy supply system efficiencies are not fixed, but should be documented.

5: The building code has different complementary requirements for *net energy demand*, and *delivered (primary) energy consumption*. This creates a situation where ventilation systems with heat pump heat recovery are treated differently from ventilation systems with air-to-air heat exchangers. This can act as a market barrier for heat pumps in ventilation systems

Notes for Poland:

1: The technology is known and sample calculation of its performance can be found for demo projects. However it is not or can be difficult to be included in routine calculation.

2: There is an awareness of the technology however no evidence of its application in Poland

Notes for Portugal:

1: A predicted average value of the airflow rate would need to be provided and justified for residential buildings. For the non-residential buildings, simulation models should be able to handle the control variables and mechanisms.

2: Items marked as “other” will be hard to include in the residential regulations, but they can be integrated (depending on designer skills) in the detailed simulations for non-residential buildings.

3: Non-residential only.

Notes for Spain:

1: Only prefixed values of the air changes per hour for residential buildings.

2: Included in the Air Handling Units

3: Included via a fraction of the energy needs (heating, domestic hot water or lighting) covered by solar system.

4: Only included for non-residential buildings.

Question 5 Is there a legal framework to assess the energy performance of innovative systems? If yes, describe it.

In this questionnaire, we distinguish the legal framework and the technical framework. The legal framework is the set of laws that allows to make the assessment of innovative systems and that organise it. The technical framework is the set of rules that specifies how to make the assessment study. The technical framework may be or may be not included in the legal framework. Please, keep this distinction in mind when answering the questions.

Describe the features of the legal framework that seems the most important to you. The next questions could perhaps be to some extend redundant with your answer here, but this approach should help us to really understand your national situation.

 In Belgium, yes (currently operational in the Flemish Region only, but it is possible that the two other Regions follow the same way).

Due to the complexity of Belgium, the study of equivalence includes two steps:

1) Firstly, the manufacturer must apply for a "study of equivalence" at the Belgian Organisation for Technical Approvals (UBAtc/BUtgb). As all Belgian Technical Approvals, the study is made by a small group of experts and discussed by a larger group. Once an agreement is reached, a document called ATG-E is delivered. However, this document does not necessarily indicate how to use it in the regional calculation procedures.

2) The manufacturer can then provide this ATG-E, as well as a technical dossier, at the Flemish Region, that take the final decision, including about how to make the link between the ATG-E in their own regional calculation procedure.

In summary:

- only one organisation can produce the ATG-E, but several organisations can be involved in the technical works to produce the ATG-E,
- the study is approved at Regional level.

The legal framework does not say anything about the way to evaluate the innovative systems, from a technical point of view. This is given to UBAtc/BUTgb.

This legal framework is not applicable for "innovative buildings" (buildings that use a innovative system that is only used in that building), but the Flemish Region is expected to create another legal framework for those buildings.

This principle of equivalence is not expected to be applicable to the certification of existing buildings that are sold or rented.

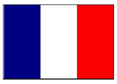
 In the Czech Republic, general EPBD law and relevant decree don’t describe how to include new innovative system into calculation methodology. It is obvious that new technology/product must have all necessary technical permits to be positioned on the market.

It can be foreseen that University or Association of energy auditor can give a suggestion to the Ministry (implementing body) to improve recommended EPBD calculation methodology according to new product on the market.

 In Denmark, there is no standardised legal framework for assessing the energy performance of innovative systems directly. However, for what concerns innovative systems, the calculation procedure can be updated gradually and quite quickly to be able to take into account the effects of innovative systems. For what concerns innovative buildings, the building owner will ask SBi how to make the calculation for their building and the local building authorities will accept or not the assessment. So, even if there is no legal framework, there should not be barrier for innovative systems.

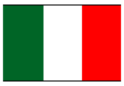
It is up to the local building authorities to decide whether a building design can get credit for energy conservation technologies that generally don't get credit in the Building Regulation. It is up to the building developer to provide satisfactory documentation (e.g. energy calculations) when applying for dispensation. There is no formal format for such applications.

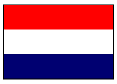
 In Finland, the Building Code obliges you to meet various requirements and point to standards which you need to use to prove that you meet these requirements. In addition, the Building Code states that it is always possible to use other methods to prove that you meet the requirements. The municipality checks whether you comply with the Building Code. So when you use an alternative method, it is up to the municipality to decide if the result from this alternative method is equivalent to the requirements. The principle of equivalence is included in the Building Code itself. The principle of equivalence is not expected to be applicable to the certification of existing buildings that are sold or rented.

 In France, a system that is not covered by French regulation procedure (Th-CE), must be an object of a request named Titre V for the approval of the project with the innovative system or for the calculation method applied for all buildings. The technical study must be addressed to the Ministry for Ecology Sustainable Development and Spatial Planning. The study must proof the respect of requirements.

 In Germany, the Building Code (Energieeinsparverordnung) obliges to meet various requirements and points to standards which are needed to prove that these requirements are met. In addition, the Building Code states that it is possible to use other methods to prove that the requirements are met in the case that the standard does not cover the technology that shall be used. The local administration checks whether you comply with the Building Code. So when an alternative method is used, it is up to the administration to decide if the result from this alternative method is equivalent to the requirements. (Note: an alternative method can not be an alternative for a whole standard but only for a small part of a standard relevant to an innovative system or building component). This is true for both new and existing buildings.

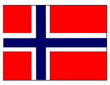
 In Greece, there is no legal framework to assess the energy performance of innovative systems yet. The question would still remain how to integrate the performance of innovative systems into the calculation methodology.

 In Italy, no: the national building code does not foresee any legislative framework for the evaluation of innovative systems.

 In the Netherlands, the Building Code obliges you to meet various requirements and points to standards which you need to use to prove that you meet these requirements. In addition, the Building Code states that it is always possible to use other methods to prove that you meet the requirements. The municipality checks whether you comply with the Building Code. So when you use an alternative method it is up to the municipality to decide if the result from this alternative method is equivalent to the requirements. (Note: an alternative method can be an alternative for a whole standard or for only a small part of a standard). There is no technical framework related to equivalence other than the rule that equivalence needs to be in line with the intention of the law and the standard to which the law refers.

Because certification of existing buildings is not related to requirements in the Building Code, equivalence plays no role in the certification of existing buildings at the moment.

In addition to the principle of equivalence, there is also a so called ‘statement of quality’. This is used for complex situations which are not taken into account in the EP standard itself. In these situations the EP standard refers to specific standards (often standards describing a measurement method) with which the performance of the specific situation (often a relative new system) can be determined.

 In Norway, just as in Denmark and Finland, it is up to the local building authorities to decide whether a building design can get credit for energy conservation technologies that generally don’t get credit in the Building Code. It is up to the building developer to provide satisfactory documentation (e.g. energy calculations) when applying for dispensation. There is no formal format for such applications, but basic guidelines are given in [1].

When performance-based regulations were introduced in Norway, the need to apply for dispensation from the requirements became generally unnecessary. Whereas in the past, with prescriptive-based regulations, dispensation was often sought for alternative solutions that satisfied regulations requirements, it is difficult to conceive of general cases where building authorities will grant exemptions to the performance requirements.

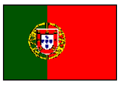
Now, with the new performance-based building code, dispensation is generally only given for rehabilitating existing buildings. Moreover, “special reasons” must be given that outweigh the intentions behind the building code without compromising minimum levels of security, health, safety and usability. There are rational reasons why some innovative energy technologies do not get credit in the new building code. This includes demand-control of internal heat gains, and the irrelevance of energy delivery efficiency. See answer to question 3. Therefore one can not expect to get dispensation in such cases.

Although such technologies do not get energy-performance credit in the building code, they can still be installed without asking for dispensation, so long as the building complies with the code if the innovative technology is ignored in the energy calculations. Such technologies can become popular due to short payback time.

References:

[1] *Veiledning til Teknisk forskrift*, 4.utgave 2007, Chapter ”*Innledning*” , subchapter ”*Dispensasjon*”, http://www.be.no

 In Poland, there is no legal framework for energy performance of innovative systems.

 In Portugal, there is no official scheme, see question 2.

 The legal framework distinguishes between requirements for innovative buildings and for innovative systems.

For innovative buildings, it is not necessary to have a previous approval, but merely include in the energy certificate the complementary information that proves the performance of the innovations applied to the specific building. In this case, two energy scales will be calculated, one with and one without the innovation.

For innovative systems the legal framework states the concept of additional capability as “any extension or modification of the calculation standard oriented to deal with elements components, equipments or strategies nor included in the national calculation tools”.

Additional capabilities require a software and/ or a methodology that have to be previously approved. This also applies to the coupling of existing software (such as TRNSYS) to the national calculation tools.

The practical application of the innovations is carried out based on two complementary strategies:

Removing the default values and using the principle of equivalence. - The manipulation of the default values is a powerful means to include indirectly (via equivalent parameters, coefficients or properties) the performance of innovative systems in the calculation methods. When the default values are not used, the national tool will request the addition of the complementary information that proves the new values used. The procedure to get these new values is typically implemented by a software in a pre-processor stage. As the default values can be constant or time-dependent, this strategy can enlarge considerably the scope of the official method.

Allowing a parallel process to evaluate the performance of some specific issues not covered by the national scheme. This evaluation of the innovative systems can be carried out by any software that uses a procedure previously approved.

The input data of this parallel tool must be consistent with inputs and intermediate outputs of the national tool. At the same time, the result of the parallel tool will be finally integrated in the national tool, where the full evaluation of all the energy features of the building will take place.

To allow this parallel process, the national common tool will make accessible the intermediate results of the simulation process. The control of the results provided by the parallel process (and introduced as input data in the official tool) will be done in a similar way as for the default values.

The conceptual difference between the two cases is that in the former, the parameters of equivalence of the innovative system are weakly coupled to the rest of the building performance, whereas in the later there is a strong coupling.

In all cases, the procedure to get the equivalence parameters has to prove to be conservative. That is, the results obtained using the principle of equivalence must be always poorer or equal to those that will be achieved if the algorithms that characterize the performance of the innovative system were fully integrated in the simulation method.

Question 6 **Please, provide the legal references of the <u>legal</u> framework, if any. Specify also the official national terminology (in both national language and English) for what ASIEPI WP6 calls "innovative systems" and "principle of equivalence".**

In the Flemish Region of Belgium:

In the Decree of 07-05-2004 (superseded by the Decree of 22-12-2006), the Flemish Parliament has given the right to the Flemish Government to organise the legal framework for the assessment of innovative systems.

The Flemish Government has given this right to the Flemish Minister of Energy in the Governmental Order of 11-03-2005 that includes the standard calculation procedure.

The Ministerial Order of 10-04-2007 specifies this legal framework *(Ministerieel besluit betreffende de vaststelling van de gelijkwaardigheid van innoverende bouwconcepten en technologieën in het kader van de energieprestatieregelgeving – Free translation: Ministerial Order regarding the assessment of equivalence of innovative construction concepts or technologies in the framework of the energy performance regulation).*

Innovative systems are called: *innoverende bouwconcepten en technologieën (innovative construction concepts or technologies)*

Principle of equivalence is called: *gelijkwaardigheid (equivalence)*

In the Czech Republic, §6a of the Energy Management Act 406/2006 Coll. specify the legal framework (Zákon 406/2006 Sb. o hospodaření energií) for EPBD. Decree 148/2007 Coll. about energy performance of buildings specifies minimal requirements and calculation procedure (Vyhláška 148/2007 Sb. o energetické náročnosti budov).

There is no term for innovative systems and for principle of equivalence in both documents.

In Finland, there is no exact legal framework concerning the "innovative systems" and "principle of equivalence". The principle of equivalence is included in the Building Code itself and is implicitly referred to in several parts of the Finnish Building Code.

The principle of equivalence is not used as a phrase. There is a long phrase concerning guidelines in the regulatory framework: "*Ohjeet eivät ole velvoittavia, vaan muitakin kuin niissä esitettyjä ratkaisuja voidaan käyttää, jos ne täyttävät rakentamiselle asetetut vaatimukset.*", which means "*Guidelines are not binding and it is possible to apply solutions other than those given in guidelines, provided that such solutions meet the requirements set for construction work.*"

In France, the articles 81 and 82 of the Ministerial Order of 24-05-2006 specify the legal framework (*Arrêté du 24 mai 2006 relatif aux caractéristiques thermiques des bâtiments nouveaux et des parties nouvelles de bâtiments – Free translation : Order of 24 May 2006 related to the thermal characteristics of new buildings and new parts of buildings)*

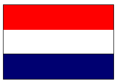
There is no term for innovative systems; the regulation speaks about *cas particuliers* (particular cases). Those can be buildings (*bâtiments particuliers*) or systems (*systèmes particuliers*).

There is no official term for principle of equivalence, but commonly the term *titre V (title V)* is used, in reference to the legislation that organise the principle of equivalence.

 In Germany,

On the basis of § 1, clause 2, § 2, clauses 2 and 3, § 3, clause 2, § 4 each in connection with § 5 as well as the § 5a sentence 1 and 2 of the energy saving law in the version of the declaration of September 1st 2005 (German Federal Gazette I, p. 2684) the German government decrees the "Energieeinsparverordnung" (= energy saving decree).

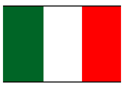
In § 23 of the energy saving decree the use of alternative assessment methods for building material, building components and building systems ("anderweitige Bewertung für Baustoffe, Bauteile und Anlagen") is allowed in case there are no available generally accepted rules of technology ("Regeln der Technik"). The generally accepted rules do include the EP standards like Din V 4108-6, DIN V 4701-10 and DIN V 18599 but also other German and European standards and should be preferably used.

 In the Netherlands, the term for principle of equivalence is 'gelijkwaardigheidsverklaring'. For what ASIEPI calls innovative system, we don't have a word. The word 'innovatief system' is used in a broader perspective that the focus of ASIEPI.

The principle of equivalence in NL is laid down in article 1.5 of Building Code 2003 (Bouwbesluit 2003).

 In Poland, there is currently no legal framework for innovative systems; in case of conflict between system and general building requirements it is possible to get an individual permission after proofing the right performance of system.

 In Spain, an approved document ("documento reconocido" in spanish) will be produced according to article 3 of the Royal Decree 47/2007, of 19th of January, related to the Basic Procedure for the Building Energy Performance Certification. The provisional title is "Document for acceptance of technical solutions and additional capabilities to the reference and alternative computer programs for buildings energy certification". (Free translation of "Documento de aceptación de soluciones técnicas y capacidades adicionales a los programas de referencia y alternativos de certificación energética de edificios")

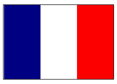
In Denmark, Italy and Greece, there is no legal framework concerning innovative systems.

Question 7 Please, specify which one of the following situations applies in your country.

1. Innovative systems are only systems that are not included in the standard calculation procedure(s). The assessment of innovative systems procedure **<u>can not be used</u>** to prove that a specific system performs better than the default value that the one given by the standard calculation procedure, and there is **<u>no other scheme</u>** to assess its actual performance.
2. If a system performs better than the default value than the one included in the standard calculation procedure(s), its actual performance **<u>can be evaluated but according to another procedure</u>** than the one to assess the performance of innovative systems.
3. If a system performs better than the default value than the one included in the standard calculation procedure(s), its actual performance **<u>can be evaluated with the same procedure</u>** than the one to assess the performance of innovative systems.
4. Not relevant (explain why).

 In Belgium, Flemish Region : 1.

 In Finland: 3.

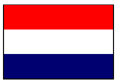
 In France: 2.

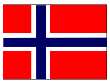
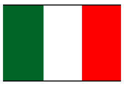
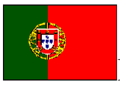
 In Germany: 2.

(If the difference in the quality of the system can be measured according to a standard measurement procedure (e.g. boiler efficiency) the improved value has to be measured at an accredited institute and certified at DIBT and published in the Federal Gazette. Then the improved value can be inserted in the standard calculation procedure.

If the difference in quality can not be measured according to a standard procedure because it is a different kind of system (e.g. solar wall for preheating of supply air) the system can be assessed with an alternative calculation method (e.g. simulation program). The alternative calculation method can however not be used for the total assessment of the building with the innovative system.)

 In Greece, the legal framework is not yet known, however option 3 is expected to be the most possible one.

 In the Netherlands: 3.

 In Norway: 3
 In Poland: 2 or 3 according to expert's opinion.
 In Spain: 3.
   In the Czech Republic, Denmark, Italy, Portugal: 4 as there is no specific framework to assess innovative systems.

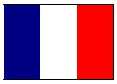
Question 8 According to the legal framework, who is allowed to make the performance assessment study? A single organisation? A specific type of organisations? A few organisations? Many of them?

In Belgium, UBAtc/BUTgb responsible for study, but technical work done by a group of experts (research centres, universities,…).

In the Czech Republic there is no legal principle of equivalence.

In Denmark, the local building authorities decide who is to carry out the performance assessment, so in theory anyone can do it. Typically, however, they will use consulting engineers, universities, building research institutes or other professional accredited test facilities for performance tests.

In Finland, everybody can make the performance assessment. Until now neither the person/company who makes the alternative calculation nor the alternative method has to apply to certain rules. But of course when the calculation does not make sense, the municipality will not approve of it and will not give the building permit. In Finland VTT is one of the trusted organisations, of course other consultants can present their calculation too.



In France, the technical study made by the engineering firm or by the building owner has to be approval by the Ministry for Ecology Sustainable Development and Spatial Planning.

In Germany, the experts to carry out the energy performance assessments for new buildings are fixed in the law of the federal states. In most federal states this means for non-residential buildings a diploma, bachelor or master in architecture, civil engineering, building systems engineering, electrical enginieering or mechanical engineering. In case of residential buildings the choice of experts includes also master craftsmen of the building sector. Until now neither the person/company who makes the alternative calculation nor the alternative method have to apply to certain rules. But of course when the calculation does not make sense, the local administration will not approve of it and will not give the building permit.

The problem is that it is not easy to judge these alternative methods.

In Greece, the legal framework does not yet specify such requirements.

In Italy, there is not yet a legal framework for innovative systems. According to the Decree 115/2008, issued on may 2008, ENEA will be in charge to establish the National Agency for Energy, and in this framework will have, among other tasks, to define procedures for qualification of innovative systems.

In the Netherlands, everybody can make the performance assessment. Until now neither the person/company who makes the alternative calculation nor the alternative method have to apply to certain rules. But of course when the calculation does not make sense, the municipality will not approve of it and will not give the building permit.

The problem is that it is not easy to judge these alternative methods.

In Norway, in principle, anyone can conduct a performance assessment. However, normally a consultant engineer is used. It is up to the local building authority to judge the credibility of the application.

In Poland, any party with recognised qualification can do it for a single project. This is not equivalent for general applications until the technology will go through the standard certification procedure, but even in this case the energy performance in building is not checked.

In Portugal, any recognised laboratory, i.e., recognised by the quality system for testing with the adequate standards, or LNEC, the Portuguese National Civil Engineering Lab. (EMBRI member).

In Spain, there are no requirements regarding the institution that can produce performance assessment studies.

Question 9 According to the <u>legal</u> framework, who can approve the study? It is at national or at local (municipality) level?

In Belgium, the study itself is discussed at a national level (UBAtc/BUTgb), but the final decision on how to make the link between the standard EP calculation procedure and the study of equivalence is to be taken at Regional level.
In the Czech Republic there is no legal principle of equivalence.
In Denmark, the local authorities approve and accept the study.
In Finland, the municipality is the one who makes the final decision.
In France, the Ministry for Ecology Sustainable Development and Spatial Planning.
In Germany, the local administration is the one who makes the final decision.
In Greece, the legal framework does not yet specify this situation.
In Italy, AEEG approve the study (see Question 5).
In The Netherlands, the municipality is the one who makes the final decision.
In Norway, the local building authority approves building applications.
In Poland, the Ministry that is accepting the exclusion from standard regulation, by appointing the expert – only for single application.
In Portugal, ADENE (Portuguese Energy Agency) is the operational entity controlling all the aspects of the building certification system. ADENE may ask for input

from any other entity.
In Spain, the studies for innovative systems will be approved by the Advisory Commission for Building Energy Certification (Comisión Asesora para la Certificación Energética de Edificios”. Specific studies for innovative buildings will be approved as decided at Regional level.

Question 10 Is there a <u>legal</u> framework for the assessment an innovative system or concept used in only one building?

This question was influenced by the way the principle of equivalence is organised in Belgium, where, originally, that was not foreseen: only systems could use the principle of equivalence. That's changing now.

In Belgium, it is the intention to have two different assessment procedures: one for innovative systems (the ATG-E approach described previously) and one for buildings using innovative concepts (that does not have an ATG-E). Up to know, only the ATG-E approach is operational in the Flemish Region.

In Denmark, see the answer to Question 5.

In Finland, the national way called "separate clarification" applies. This means the procedure, where neutral consultant makes a calculation of the presented systems effect to the energy efficiency. This procedure can be used for any new and innovative structural or system component of the building. Of course this kind of procedure is quite expensive in a single-time-use for an innovative product manufacturer, if the results cannot be generalized to apply to all new buildings.

In France, there are two possibilities. It is possible to make a study for one project or for all building. The first one is more rapid and considered as asking for less detailed proof.

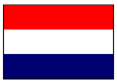
In Germany, it makes no difference whether the innovated system is used in only one building or in many buildings. The principle is that the assessment of the innovative system needs to be made on a case to case basis.

Of course when an assessment is made for one building, the same assessment can often be used in other situations again.

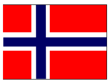
If an assessment is made often it can be used as basis for a new default value in the revision of the standard.

In Greece, the question is not relevant as there is currently no legal framework to assess the performances of innovative systems.

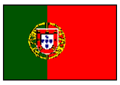
In Italy, in principle yes, but it is not very convenient to undertake the procedure for one building only.


In the Netherlands, it makes no difference whether the innovated system is used in only one building or in many buildings. The principle is that the assessment of the innovative system needs to be made on a case to case basis.

Of course when an assessment is made for one building, the same assessment can often be used in other situations again.


For Norway, by default, energy performance assessments are on an individual building basis.


In Poland, it is the only way to get permission for installation the innovative technology - application for exclusion from existing regulation (as the innovative technology is not covered by regulation). Such application has to include the energy performance assessment, and proof that it will not do the harm for the users. The assessment can be done by recognised organisation or institution in a field. Some in situ measurements can be of help.


In Portugal, no limitation on the use of the study for any building, once the study is accepted.


In Spain, there is no need of previous approval of a specific procedure for innovative systems applied in a single building. However, as stated in the draft of the approved document, the use in a certain building of technical solutions not included in the reference or alternative computer programs implies the inclusion of complementary information in the energy certificate. This information is a short version of that required for innovative systems applicable in a general way for a multiplicity of buildings.


The question is not relevant for the Czech Republic, as there is no legal principle of equivalence.

Question 11 How is the quality control of the <u>equivalence study</u> organised, if any?

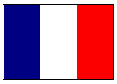
 In Belgium, a small group of experts prepares the study, and then a larger group can discuss it.

For the more "common" systems, it is the intention to develop "approval guideline documents" in order to give the market a better understanding how systems can be optimised in the context of the assessment of innovative systems.

 In the Czech Republic, no quality control scheme is in place, reputation of assessment company is a guarantee.

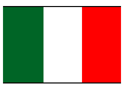
 In Denmark, yes, but only for new buildings. However, this does not only cover the innovative systems, but the entire building in general. An energy consultant (energy certification scheme) carries out the quality control of the energy performance for the building.

 In Finland, it's up to municipalities, which process the building permits.

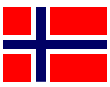
 In France, the specific quality concerns the technical study. This one must be composed following the annex V (Arrêté du 24 mai 2006) and accompanied by a case study.

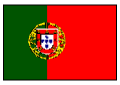
 In Germany, see answer to Question 9. The local administration will check it on case to case basis.

 In Greece, the question is not relevant as there is currently no legal framework to assess the performances of innovative systems.

 In Italy, not yet until now.

 In the Netherlands, the municipality has to agree with the equivalent calculation.

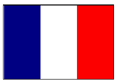
 In Norway, in practice there seems to be no stringent control of the quality of equivalence studies by the building authorities. Neither does there seem to be a demand for

such studies in the framework of the present building regulations.
 In Poland, the entity supervising construction process, once gets the application for exclusion, appoints the expert to assess the content of application. Afterward, the application becomes public.
 In Portugal, the “seal” of the recognized laboratory is enough.
 In Spain, there are two advisory commissions for energy certification and sustainability respectively that will take care of the approval of the procedures to assess the performance of innovative systems. The final word about quality control belongs to local authorities

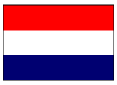
Question 12 In case of a manufactured system gets an equivalence study (as it can be in Belgium), is there any kind of product certification and/or production certification (FPC) mandatory?

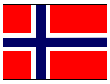
 In Belgium, yes: systems that get an ATG-E must have a limited certification of their performances that are important for the ATG-E and the company must have a limited FPC system. This is an internal rule of BUtgb/UBAtc; it's not specified in the Orders that organise the principle of equivalence.

 In Finland, no.

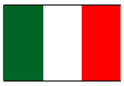
 In France, no.

 In Germany, each system, material or component used in buildings needs to have either a test certificate (CE-sign) or a single case check made by an accredited test institute (e.g. DIBT). This includes innovative systems.

 In the Netherlands, no

 In Norway, not really relevant. However, in theory, all building products must have proper documentation, and there is a Technical Approval scheme. Nevertheless, in practice, energy performance calculations are performed with incomplete reference to such background documentation.

 In Spain, no decision has been taken on this matter.

     In the Czech Republic, Denmark, Greece, Italy, Poland, the question is not relevant.

Question 13 Does the organisations involved in technical approval systems plays a role in the assessment of innovative systems in the framework of EPB regulation?

In Belgium, yes, as it goes through UBAtc/BUTgb.

(EOTA member: UBAtc/BUTgb)

In the Czech Republic, not relevant

(EOTA member: Technicky a zkusebni ustav stavebni Praha, s.p. (TZUS) Technical and Test Institute for Construction / Centrum stavebniho inženýrství a.s. (CSI) The Centre of Building Construction)

The role of organisations is case-specific, so which organisations are used in technical approval systems depend entirely upon the choice of the local authorities.

(EOTA member: ETA-DANMARK A/S)

In Finland, none specific, except municipalities, who process the building permit. The municipalities may request a consultation of a neutral organisation or another designer to confirm the plans.

(EOTA member: VTT Technical Research Centre of Finland)

In France, yes, through CSTB experts named by the Ministry.

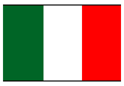
(EOTA member: CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT (CSTB))

In Germany, officially there is only a role for the municipalities to say yes to or no against an assessment. However as stated in the answer to question 12 the test institutes are involved since all systems/materials/components need to have a CE-sign or a single case test certificate.

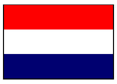
(EOTA member: DEUTSCHES INSTITUT FÜR BAUTECHNIK (DIBt))

In Greece, unknown yet, although in practice it is mostly private and/or research organisations who are already concerned with such studies out of own initiative.

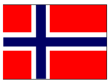
(EOTA member: HELLENIC ORGANIZATION FOR STANDARDISATION (ELOT))

 In Italy, not relevant.

(EOTA member: ISTITUTO PER LE TECNOLOGIE DELLA COSTRUZIONE (ITC))

 In the Netherlands, officially there is only a role for the municipalities to say yes to or no against an assessment.

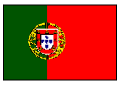
(EOTA members: there are EOTA members in NL, but they have no role in this.)

 In Norway, just as Finland and Denmark, it is up to the local authority to assess whether third party documentation is required. In general, a Technical Approval helps a lot for novel technologies, but only if the Technical Approval shows that the technology does not violate the Norwegian building regulations.

(*EOTA member: SINTEF Building & Infrastructure*)

 In Poland, in case of insulation systems it is Building Research Institute, for other technologies the adequate certification body.

(EOTA member: Instytut Techniki Budowlanej (ITB))

 In Portugal, LNEC is the only recognized laboratory to produce such documents, except for other laboratories recognized by the Quality system for specific tests.

(EOTA member: LABORATORIO NACIONAL DE ENGENHARIA CIVIL (LNEC))

 In Spain, it is still unknown. In Spain is only the IETcc the organisation that can produce these documents. Probably, the IETcc will participate as any other public or private research centre.

(EOTA members: INSTITUTO DE CIENCIAS DE LA CONSTRUCCIÓN EDUARDO TORROJA (IETcc) / INSTITUT DE TECNOLOGIA DE LA CONSTRUCCIO DE CATALUNYA (ITeC))

Question 14 Who is paying for the study?

In Belgium, the industry must pay the marginal costs for obtaining an ATG-E. The cost to deliver the formal document ATG-E with the results of the study does however not cover the cost of the study itself. This point is still under discussion.

In the Czech Republic, usually the manufacturer or trading company intends to sell the product on the market.

The producer of a particular innovative system or the owner of the building in which it is to be used will have to pay for the study – as it is in their interest to prove the performance of the system in order to market it.

In Finland, the producer of technology or investor interested in its single application must pay the study.

In France, the engineering firm who make the thermal study, the Building owner or the industrial that look to valorise the innovative system.

In Germany, the one who wants the study to be performed pays for the study. Often this is industry who wants extra point for their innovative product in the EP assessment.

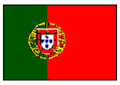
In Greece, this is still unknown; probably the industry.

In Italy, probably who wants the study to be performed will pay for the study.

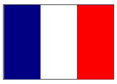
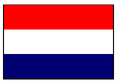
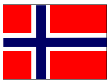
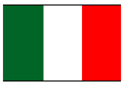
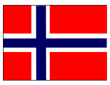
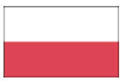
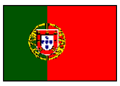
In the Netherlands, the one who wants the study to be performed pays for the study. Often this is industry who wants extra point for their innovative product in the EP assessment.

In Norway there are various sources:

- Building-specific energy performance studies are paid by the property developer.
- Technical Approval (or equivalent study) of new building products is paid by the product developer/manufacturer.

• For promising energy technologies it is possible to apply for financial support from energy agency Enova, which is mostly funded by a small tax on electricity bills
 In Poland, the producer of technology or investor interested in its single application.
 In Portugal, whoever asks for the test… Normally, the manufacturer.
 In Spain, it is not yet decided. Probably the associations of manufacturers involved in every specific innovative system. In any case, in Spain it is not allow including commercial brands in the approved documents of this type. However, for "innovative buildings" that get an energy class A or B, the extra engineering cost to produce specific studies over your building involving innovative systems are subsidized up to 75%.

Question 15 Since when is this <u>legal</u> framework to assess the energy performance of innovative systems in use?

 In Belgium, Flemish Region: legal framework since April 2007. Only one system has used the scheme so far.
 In France, since ten years.
 In Germany, the framework is § 23 in the energy performance of buildings decree. The framework is in place since the revision of the energy performance of buildings decree in 1995 which included the calculation of net heating energy need.
 In the Netherlands, since the only framework we have is the article in the Building Code, the framework is into place since the introduction of the Building Code in 1992. Before 1992 many aspects regarding the Building Permit were regulated at the level of the municipalities.
 In Norway, the Building Code, and its associated Norwegian Standard on energy performance calculation, were both revised in 2007. The new Code comes into full force in 2009.
 In Spain, it will be applicable from December 2008.
       In the Czech Republic, Denmark, Greece, Italy, Norway, Poland, Portugal, there is no legal framework

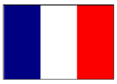
Question 16 Have there already been studies of equivalence? How many? Which ones?

 In Belgium, at the present time, only one study of equivalence (about a demand controlled ventilation system for residential buildings) has been finalised and accepted by the Flemish Region. Requests for several other systems have been submitted.

 In the Czech Republic, no information about the number of studies.

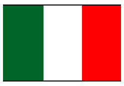
 There have been a few examples of equivalence, but they are building specific and not publically available.

 In Finland, maybe some, but I don't know exactly.

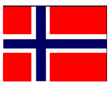
 In France, for the moment, the Ministry has received studies of equivalence concerning Wood Inserts for dwellings and air conditioning system for office buildings.

 In Germany, many studies of equivalence have been performed. There is no record of how many. The studies are not public.

 In Greece, the question is not relevant as there is currently no legal framework to assess the performances of innovative systems.

 In Italy, not yet.

 Many studies of equivalence have been performed (rough estimation: hundreds). There is no record of how many. The studies are not public.

 In Norway, studies of equivalence have been made more or less obsolete by the revised building regulations. See answer to Question 5.

 In Poland, no information about the undertaken studies.

In Portugal, as already stated, none.
In Spain, some are in progress, but none is official so far, as the legal framework is not yet approved at the time this report is written.

Question 17 Is there a technical framework to assess the energy performance of innovative systems? If yes, describe it. If yes, is this technical framework specified in the legal framework.

 In Belgium (Flemish Region), the legal framework does not specify anything about the way the equivalence study has to be carried out. This is the task to the BUTgb/UBAtc. Therefore, the technical framework of a study has to be set up when a product ask for an equivalence study.

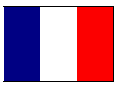
In the case of the first equivalence study for a demand controlled ventilation system, the procedure proposed in the framework of the European RESHYVENT project was further developed and used. Specific performances of the system components were evaluated by measurements, whereas the energy performance of the system was evaluated by computer simulations using CONTAM. A Monte-Carlo approach was to set up 100 sets of assumptions (occupancy scheme, building orientation…), so that the performance of the system was not evaluated for one particular building only.

At one hand, the ventilation losses of the innovative system were compared to those of a common ventilation system. On the other hand, the IAQ provided by the innovative system was compared to the IAQ provided by what was considered as the "worse" legally accepted system, from an IAQ point of view.

 In the Czech Republic, no general framework is in place. It is possible to present a new system and its energy performance to the Standardization Institute to decide if they accept it.

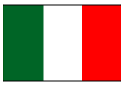
 There are no detailed rules in the legal framework, however, there are national and international guidelines/standards for the testing of innovative systems which should be followed (i.e. test temperatures, humidity etc.). The European Normative framework is typically used if it covers the innovative system in question, but for products not covered by this framework, we develop new methods for assessing the energy performance that are in line with the ideology of the EU standardisation.

 In Finland, no general framework is presented, who to do it technically, but it is always possible to present a new system and its energy performance and at the same time the technical methodology, but it's up to municipalities to decide if they accept it.

 In France, the legal framework does not specify the way a study must be performed but only specifies that the study must include all information about the performance and the calculation procedure.

 In Germany, there are no detailed rules given in the legal framework.

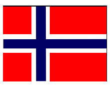
 In Greece, there is no official technical framework to assess the energy performance of innovative systems yet, although possibly some research institutes (among which NKUA) are expected to (already) be involved in defining the technical framework.

 In Italy, there is no legal framework, but a procedure for the evaluation of innovative systems is in force in the context of AEEG that evaluate systems for the accreditation of Energy Efficiency Certificates (TEE). These procedures could be easily transferred to the framework of EBPD. Innovative systems for building energy efficiency can be proposed (following a detailed procedure of evaluation) to AEEG (Autorità per l'Energia Elettrica e il Gas). AEEG can approve, asking integrations or reject the proposal. This procedure is applied in general for all energy systems, not only for buildings and, being honest, until now no application for building were presented.

 In the Netherlands, there are no detailed rules given in the legal framework. The only rule is that the result is equivalent to the regulation, including the assumptions related to the regulation.

An example: Various parameters (climate, use, ...) in the EP calculation are fixed. In an alternative method these same fixed values need to be used: e.g. the indoor setpoint temperature is 19^{O}C: an alternative method needs to use this temperature as well. It is unfair to calculate the performance of an innovative product using a lower temperature. But when you can show that your product gives the same comfort for a lower temperature (as is the case with floor heating), than the energy saving due to this lower temperature can be taken into account in the performance of this product. In this situation, it is allowed to deviate from the fixed values and still be equivalent: the assumption related to the requirement is not the fixed temperature, but the fixed comfort related to this temperature.

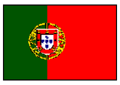
Except that, there is no technical framework. The idea about the principle of equivalence is that you are always allowed to use an alternative method to prove that your product is equivalent to the requirements. Of course, it is preferred to use an existing method (e.g. a standard or an otherwise generally accepted method), but even when this exists, it is always possible to use another route. It is unlikely that the municipality will accept such deviation of an exiting alternative method, but it can always be that your product is so special that this existing alternative also doesn't appreciate its speciality…

 In Norway, no.

In Norway, just as for Denmark, CEN or ISO standards are used whenever possible when assessing the energy performance of innovative systems. For novel energy technologies, or country-specific issues, new methods are developed as needed. An example of this is an appendix to NS 3031:2007 on calculation of defrost and fan energy.

 In Poland, as there is no such a framework, the official rules do not exist.

In Poland, no technical framework to assess the innovative system is in place. Some research studies that have been performed can be used for setting up such a system.

 In Portugal, the question is not relevant as there is no legal framework to assess the performances of innovative systems.

 In Spain, the legal framework does not include detailed rules for acceptance but rather the criteria to be used by the commission in charge of such approval and the contents of the rapport to be presented.

The criteria include issues such as the quality of the simulations performed in consistency with the requirements of the already approved document for acceptance of alternative calculation methods and about the minimum level of information to be provided in the accompanying reports.

Question 18 According to you, what are the advantages and disadvantages of both the <u>legal</u> and <u>technical</u> frameworks? What are their strengths and weaknesses? What kind of useful information could you get from other MS?


Belgium:

Advantages :

- A major advantage of the technical framework (Monte-Carlo approach) is that it reduced the risk of systems being fully designed in such a way to maximise its energy performance, and not its technical quality.
- The approach combines a central and unique procedure for each Region (and hopefully the same procedure in the 3 Regions) whereby there is the possibility for a large involvement of technical expertise from various research centres and universities.
- The legal framework can be used by the three Regions, if they wish to do so. Therefore, the industry must only apply for one study of equivalence. The final decision is of course in the hands of the Regions; theoretically, they could make different decisions, based on the same equivalence study.

Disadvantages :

- A major disadvantage it that the legal and technical structure is quite heavy; there is a lack of resource to quickly answer the demand for equivalence study.


In the Czech Republic, not relevant.


In Denmark, there is no technical framework.

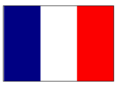

In Finland, there is no technical framework.

Advantages :

- The framework is open, whatsoever innovative system can be evaluated

Disadvantages :

- No harmonized way to evaluate, it's always case by case
- The municipalities lack technical competence, so it's possible that "stupid" system passes the building permit process
- The costs of an assessment can be high (depends on the case)


France:

Advantages :

- Following the procedure Titre V, the engineering firm or the industrial have the possibility to make just a study for the project or for the system. Following requests, the Ministry has an overview about implantation of the system into the building and decides or no to introduce the system into the regulation.

Disadvantages :

- The time necessary to obtain an answer for the procedure concerning the system is long.

 Germany:

The main advantage of the technical framework in Germany (DIN V 18599) is that it covers nearly all systems that are innovative in other countries. Therefore the system of equivalence has to be used only in very rare cases.

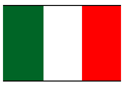
The advantages of the system of equivalence:

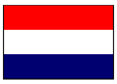
- Any product gets a chance to be taken into account, which is needed for innovation to have an impact
- The costs of an assessment are relatively low (differs from case to case)
- Nearly all systems can be calculated/simulated

The disadvantages:

- The quality of the assessments may differ.
- It is not easy for the municipality to distinguish between good assessments and bad assessments: the assessments are very technical, often you need to be an expert to understand the ins and outs.
- Because of the quality differences and the difficulty with the control it happens that products get a better assessment than deserved. This results in less real energy saving, larger energy bills, a smaller market for real innovative products and a lack of confidence in the principle of equivalence.

 In Greece, this is to be defined at a later stage.

 In Italy, it is not yet known.

 The Netherlands:

The advantages of the system:

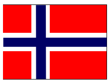
- Any product gets a change to be taken into account, which is needed for innovation to have an impact
- The costs of an assessment are relatively low (differs from case to case)

The disadvantages:

- The quality of the assessments differs largely.
- It is not easy for the municipality to distinguish between good assessments and bad assessments: the assessments are very technical, often you need to be an expert to

understand the ins and outs.

- The same goes for architects and other decision makers who choose which energy saving measures are implemented in the building: it is not easy to distinguish between real innovations and’paper’ innovations
- Because of the quality differences and the difficulty with the control it happens that products get a better assessment than deserved. This results in less real energy saving, larger energy bills, a smaller market for real innovative products and a lack of confidence in the principle of equivalence.

 In Norway, the pros and cons are just as for Finland. See also Norway’s answers to Question 2 and Question 5.

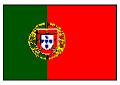
 Poland:

Advantages:

- Helps to achieve better energy performance of the building;
- Develops analytical methods of assessment of the building;
- Requires improvement of engineering knowledge of designer

Disadvantages

- Lack of time and funds
- No public recognition due to the lack of popular information

 In Portugal, no technical framework available.

 In Spain, the approach for innovative systems is potentially very flexible and yet rigorous. It gives the opportunity to include (with a quite transparent control) the huge majority of innovations. For innovative buildings the Spanish approach does not have any control scheme as it is a matter of the regional government. The quality of the reports presented can be very different and typically the responsible of approving such reports will not be qualified in most of the innovations.

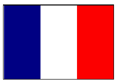
Question 19 According to you, what is the impact of the <u>legal</u> and <u>technical</u> frameworks on the market for innovative systems?

 In Belgium, since the first equivalence study was delivered to a ventilation system, it might be expected that several manufacturers of ventilation would like to use the principle of equivalence to promote their own system. However, no information is available at this time.

 In the Czech Republic, when the innovative system has proven the energy performance the reaction of the market is positive.

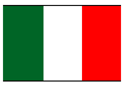
 The fact that no legal framework exists is probably a barrier towards the implementation of innovative systems. However, innovative systems have been and are being introduced in Denmark all the time, so producers of innovative systems apparently have no significant problems in marketing new products.

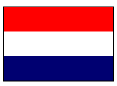
 In Finland, there is no procedure.

 In France, positive for the moment.

 In Germany, there are several examples of products which started as innovations taken into account via equivalence and are now grown-up products taken into account directly in the EP method.

 In Greece, hopefully, it will increase the market uptake for innovative systems.

 In Italy, it is not yet known.

 In the Netherlands, there are many examples of products which started as innovations taken into account via equivalence and are now grown-up products taken into account directly in the EP method. Because in NL the impact of the EP regulations on the market is large, equivalence has a reasonable impact too.

For Norway, the impact has not been studied. However, as was explained under Question 4, the lack of credit given to innovative technologies has no impact for highly profitable technologies (i.e. with high Net Present Value) because they will be utilized anyway.
In Poland, could be restricting or encouraging depending on specific solutions taken.
In Portugal, the regulations are quite open for innovative systems, the market seems to be reacting OK.
In Spain, it not yet known.

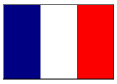
Question 20 What do the different stakeholders think of the <u>legal</u> and <u>technical</u> frameworks to assess the energy performance of innovative systems in use?

 In Belgium, not yet known.

 In the Czech Republic, a revision of EPBD calculation methodology is expected so the space for large implementation of innovative systems is available.

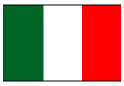
 The Danish regulations are quite open for innovative systems and the market seems to be reacting well.

 In Finland, there is no technical framework. It takes time to get a new system to the market, but if its performance is found good and usable, the previous “separate clarification” applies easier next time. Nationally, VTT has a product called “VTT Certificate”, which is widely used by construction product manufacturers.

 In France, the time necessary to obtain an answer for the procedure is so long.

 In Germany, the general aim for new products and innovative systems and technologies is to be as soon as possible included in the national calculation standard. Therefore the standard is continuously being revised (about every second year).

 In Greece, not relevant at this point.

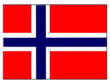
 In Italy, a lot of interest in the evaluation of innovative systems was observed in the framework of AEEG. Many requests were presented.

 In the Netherlands, the municipalities who need to approve of the studies are not equipped to do so; they find it too complicated. The industry needs the procedure to get their innovative products taken into account, but they also fear that other industry take advantage of the system: bad products can get positive equivalence assessments on paper and get away with it because the controllers find it too complex and cannot make a proper judgement. Architects/designers/builders etc also find it too complex and cannot judge the assessments and in this way cannot make proper decisions on which innovations will perform good and

which won’t.

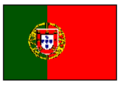
These problems have also a negative consequence for the EP regulation itself: the problems around equivalence increase the idea of some people that the EP is only a figure on paper, not related to the real energy performance. The EP regulations are seen as difficult, and the principle of equivalence largely adds to this.

More and more people doubt the positive effect of the EP, specially of further tightening the EP requirement level. They fear that further tightening will result in much more unrealistic equivalence and no actual additional energy saving.


In Norway, there was much debate over the level of ambition [kWh/m²·yr] the new building code should have. However, after it came into force there has been a generally positive response to the revised codes. However, there is debate over the following issues:

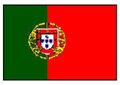
- Which energy control volume should be chosen for future revisions of the building code, i.e. delivered energy, primary energy, or CO_2 emissions? Heat pump technology is not treated as equivalent to air-to-air heat exchangers (though this is on purpose – as heat pumps are considered less reliable).
- How should we deal with the fact that true energy consumption of buildings is often higher than calculated (with for example NS 3031, ISO 13790)? How can we prevent overly optimistic design assumptions?
- How should we deal with the fact that designers often give little regard to indoor environmental quality when they conduct energy performance calculations? In particular, there is a high risk that architecturally attractive buildings, with full glazing, experience problems with overheating during summer.


In Poland, on professional fora they are positive, but this is changing once they approach the application.


In Portugal, the regulations are quite open for innovative systems, the market seems to be reacting OK.


In Spain, this is not relevant at this point. The position is in principle very positive to the existence of such a procedure.

Question 21 Any other comment?

 Portugal: The simple raising of the issue of “innovative systems” implies that regulations are fixing specific data for each component and not performance-based criteria. If the regulations state the goals and not the partial parameter requirements, all innovative systems automatically have their possibility to easily enter the market based on actual performance, provided that the new system offers a detailed description of its performance characteristics. So, it is easier for a new system to enter the market, but the costs of offering detailed data on its performance may be quite expensive for the manufacturer.