CONCERTED ACTION
ENERGY PERFORMANCE
OF BUILDINGS

Implementation of the EPBD in Norway

Status in November 2010

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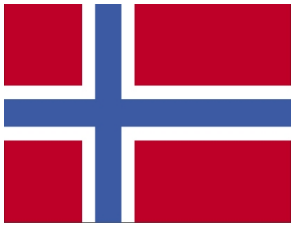


National websites:

- *www.energimerking.no*
- *www.be.no*
- *www.standard.no*

1 > Introduction

The EPBD was fully implemented in Norway in 2010. Since the last report was published in June 2008, the transition period for implementing minimum requirements for new buildings is over, and the regulation for the certification of buildings and the inspection of boilers, heating systems, ventilation and cooling systems has been adopted and come into effect.

By the beginning of November 2010, approximately 40,000 energy certificates have been issued, mostly after the 1st of July 2010. During the coming months, one will be able to see how well the energy certificate is established in the building market. An evaluation of the present regulation will naturally take place along with considerations following the recast Directive.

This report presents an overview of the current status of implementation and of the further plans for the implementation of the EPBD in Norway. It addresses certification and inspection systems, including the status for quality control mechanisms, the status for qualified experts in the market, information campaigns, incentives and subsidies.

2 > Certification

Certification of buildings

In Norway, the implementation of the EPBD is the overall responsibility of the Ministry of Petroleum and Energy, together with the Ministry of Local Government and Regional Development. The Norwegian Water Resources and Energy Directorate is the managing body for the certification and inspection schemes. The National Office of Building Technology and Administration manages the system of minimum requirements for new and renovated buildings. The two institutions naturally cooperate on issues such as the calculation methodology for energy performance of buildings.

The legislation was in place from the 1st of January 2010, but following input from the European Surveillance Authority, the regulation was revised as of the 1st of July 2010[1]. With the last revision, there is no transition period, but it will take some time before all buildings are certified. In particular, this refers to existing buildings over 1,000 m^2, which are not being sold or rented out.

[1]Regulation for energy certification of buildings and inspection of boilers, heating systems, ventilation and A/C systems: *http://www.lovdata.no/cgi-wift/ldles?doc=/sf/sf/sf-20091218-1665.html*

ENERGIMERKING BYGG

Even if a number of buildings were certified in the first part of 2010, it was not until the summer that the process took off. As of the 1st of November 2010, more than 40,000 certificates have been issued. The estimated number of apartments and houses being sold annually is 100,000, indicating that a considerable share is already being certified. Approximately 3,100 certificates were issued by qualified experts whereas the rest were issued by home owners.

As of the 1st of July, the obligation of energy certification is in force for both residential and non-residential buildings. Certification of non-residential buildings will naturally take longer and cover smaller numbers of buildings. As of the 1st of November, approximately 300 certificates have been issued for non-residential buildings.

The energy performance certificate

The Energy Certificate is the legal document produced during energy certification. The regulation requires this document to be shown to potential buyers, etc. However, parts of the certificate, for instance the Energy Label, can be used as a short version.

The Energy Certificate (*Energiattesten*) has the following content:

Identity data. On top of the front page is the address and necessary data to identify the building or the apartment given, as well as the name of the person or organization responsible for issuing the certificate, normally the owner, as well as the person who has registered the data.

The Energy Label. This matrix presents the result of the calculation in two dimensions. Firstly, on the vertical axis, the grades A to G are called the Energy Grade and represent the *calculated delivered energy* need. Secondly, on the horizontal axis, the Heating Grade represents to what *extent heating of space and water can be done with renewable energy sources* - other than electricity and fossil fuels. The character represents the Energy Grade and the colour represents the Heating Grade. An explanation is given on the front page.

Measured energy consumption. An average of the energy use per energy carrier for the last three years is shown at the bottom of the front page. This is required for non-residential buildings, but for residential buildings it is only encouraged.

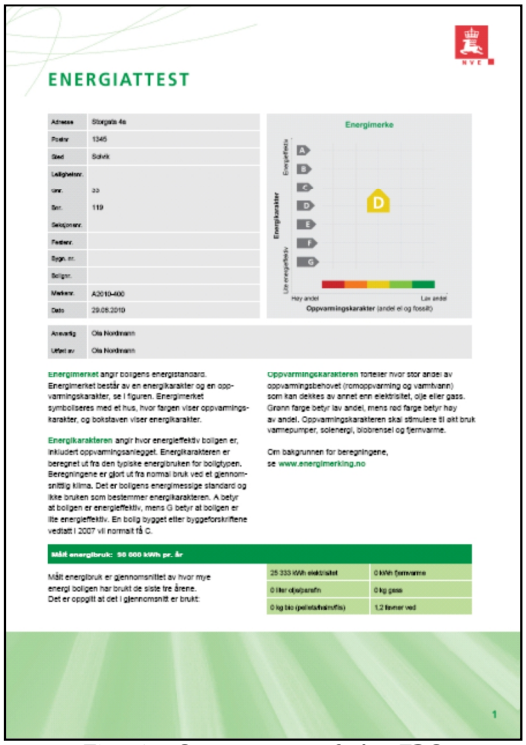


Fig. 1 – Cover page of the EPC

Fig. 2 –Recommendations for the improvement of energy performance

User influence. On page 2, a paragraph is devoted to general advice on energy use which can save energy, even if it does not affect the calculation of energy performance.

Recommendations. A summary of the recommendations. A more extensive description is given in an Appendix.

Central input data. On page 3, the most central input data given by the owner is reproduced, to allow the reader to check obvious data like building type, building year, etc.

Information and Help Desk. The last page is devoted to general information on Energy Certification and contact data for the Help Desk is provided.

A short version of the Energy Label is the profile of a building with the same combination of letter and colour as in the energy Label matrix, see left.

There are only small differences between certificates for residential and non-residential buildings. The differences are mostly on language and relevance of content.

The Norwegian scheme of certification is characterized by the option of “self-assessment” for the owners of existing apartments and residential buildings. This way, the Government wants to stimulate the individual owners’ interest in their own energy use and possible efficiency efforts. When using the self-assessment option, the owner gives input data on the Internet to the Energy Certification System. The system allows the input of information regarding building year, room area, building type etc., finds corresponding typical values for the parameters needed for the calculation, and the certificate is instantly produced. The user can choose a “simple” version, which is the quickest and only suited for buildings with typical values, and detailed registration, where a certain amount of additional details is needed. A detailed registration is required to be able to get a recognition for enhancements or a building standard that is better than the norm for the year of construction. The list of recommendations following the self-assessment can only be a vague indication of the best efficiency measures for this building. However, when an expert performs the certification, he/she is responsible for all the input data, as well as the detailing of recommendations for improvement. This implies that certificates generated by a non-expert will be more general than those of an expert.

Validity of energy certificates is 10 years.

New buildings will normally achieve the energy grade C, although this depends on the efficiency of the heating system in place. A and B are normally reserved for buildings with better energy quality than required.

Certification of new buildings requires a qualified expert. The Energy Certification System is designed to import the result of the calculations from external energy calculation systems. This is beneficial in particular for developers of new buildings, who can use the same expert, the same software and, for the most part, the same input data as in the required calculation, to control compliance with minimum requirements. This way, the developer can easily take the energy character into consideration at an early stage of the project. The qualified expert will also be able to use data for technical installations that are not accessible to unqualified people doing self-assessment, e.g., efficiency of recovery units in ventilation, COP of heating and cooling installations.

The developer is obliged to present a certificate, when the building is on the market, and correct this later, if built different from the project plans. **Major renovations** require the same certification and requirements as new buildings in terms of the building regulation.

For **existing** residential buildings, there is a choice between expert certification and self-assessment. For **existing non-residential buildings,** an expert is always needed and he/she can choose between several options regarding the registration of data. For complex buildings, where the standard requires a dynamic calculation, the expert has to use one of the qualified external calculation systems.

The Directive includes special requirements for **public buildings**. The Government has decided that all non-residential buildings shall have the same obligation. This implies that all non-residential buildings over 1,000 m^2 shall have a valid energy certificate, and its summary has to be displayed to the public.

The calculation methodology

The calculation methodology used for the Energy Grade is defined by the standard NS 3031:2007. This standard has been developed to provide a framework for both minimum requirements and energy certification. It is based on CEN standard EN 13790, plus numerous other relevant CEN standards.

The Energy Grade is defined by calculated delivered energy to the building – irrespective of energy carrier, including all energy factors, as delivered to the building, if used under normal climatic and usage conditions. The result in kWh per m^2 produces the Energy Grade from a given table, below.

Building category	Delivered energy						
	A	B	C	D	E	F	G
	Lower or equal to	Lower or equal to	Lower or equal to	Lower or equal to	Lower or equal to	Lower or equal to	Lower or equal to
	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2	kWh/m2
Small buildings	79	118	158	231	305	458	No limit
Apartment blocks	67	100	134	184	235	353	No limit
Nursery schools	90	135	180	228	276	414	No limit
Offices	84	126	168	215	263	395	No limit
Schools	79	118	158	208	259	389	No limit
University buildings	95	143	191	240	289	434	No limit
Hospitals	179	268	358	416	475	713	No limit
Nursing homes	136	203	271	328	384	576	No limit
Hotels	135	202	269	321	373	560	No limit
Sports facilities	109	164	218	272	325	488	No limit
Trade service buildings	129	194	258	309	360	540	No limit
Cultural buildings	105	158	210	256	302	453	No limit
Industry and workshop buildings	106	159	212	270	329	494	No limit
			Based on minimum requirements (TEK 2007)				

The Heating Grade is calculated from a set of assumptions on what share of the heating demand each technology and source can realistically cover. For instance, an automatically driven system with biofuel is considered to cover up to 80 % of the demand, an air to air heat pump will normally cover only 30 %. For self-assessment, these figures are fixed but, with an expert, the exact data can be used.

Quality assurance (QA)

Quality assurance is of the highest importance in order for the market to have trust in energy certificates. The quality assurance has several main elements:

Control in the market. The general public, and the actors in the buildings and housing market, are informed about the duty of energy certification and that they can easily check the main data input given by the owner. Faulty input may give another grade than it should be, and may be considered a defect in the performance of a contract. This is the same mechanism which is actively used in the sales process of buildings and apartments.

Supervision of the process. NVE is responsible for the supervision of how well the market actors live up to the requirements of the regulation. From the first year of operation, NVE has been planning a systematic supervision covering issues such as: are certificates presented at sale, are certificates visible in the lobby of large non-residential buildings, does the data input represent the building object, does the expert meet the competence requirements, etc.? Supervision will be performed with the initiative of the NVE and as a follow up to information received about possible problems. Supervision is an instrument for improved design of the certification scheme and to uncover grave breaches in the duties.

Adequate preparation. NVE has, throughout the preparation phase, gone through a long series of actions to ensure that the certification is well planned. In the early stages, a large number of parties from research institutions, industry and non-governmental institutions have taken part in the discussion on the main design of the certification scheme. Important lessons are also taken from other countries' experiences during their preparations. Later, in the more detailed preparation, NVE has been responsible for the development of the IT system and the library of typical values. During the development phase, extensive testing took place to see that it meets the main user demands and that the calculation results are reasonable.

Data checks. Embedded in the IT system, a number of data checks are developed. This is important in particular for the self-assessment functionality. The checks of data validity cover both the format, but also the data range, which is allowed to be used. A continuous evaluation of these checks is needed to allow the necessary freedom of choice of parameters.

Penalties. The regulation includes a fine for the breach of duties. In the first phase, NVE has announced that information and guidance will be most important, and that fines will only be issued for serious breaches. No fines have been issued yet, as the regulation has only been in force for a few months.

The target of NVE is to have reviewed all the different types of actors, according to the regulation, within the first year: experts, sellers of apartments/houses, owners of non-residential buildings, estate agents.

3 > Inspections - Status of implementation

Articles 8 and 9 of the EPBD are implemented in the same regulation as energy certification. The requirements are also in force since the 1st of January 2010. It must however be noted that the practical implementation is slower. Up until the 1st of July 2010, the regulation provided for a transition period, and the change came as a surprise to building owners. Also, in the information given to the public up until now, the main emphasis has been on energy certification.

Norway has adopted option a) on Article 8 of the EPBD, establishing a regular inspection of boilers. On Article 9, the inspections must cover both air conditioning

and ventilation systems. Rather than the EPBD's minimum size defined in effective rated output, the regulation sets the threshold in the size of the area served by the system. This is considered more practical for building owners. In addition it includes split units and enables the inspection of purely ventilation systems, without cooling devices. This is a fairly common way of heating and cooling in Norway.

The inspection requirements, thus, are:

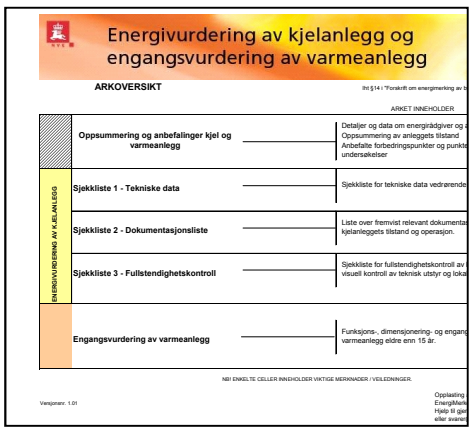
- Boilers using fossil fuels serving a heated area over 400 m^2 must be inspected every 4 years and every 2 years if over 2,000 m^2
- Heating systems using fossil fuels, serving a heated area over 400 m^2 and older than 15 years require a one-off inspection
- Air conditioning systems serving an area over 500 m^2 should be inspected every 4 years.

The CEN standards used as basis for the inspection schemes are NS-EN 15379 "Inspection of Ventilation" systems", NS – EN 15240 "Inspection of Air Conditioning Systems" and NS –EN15378 "Heating systems in buildings - Inspection of boilers and heating systems". The introduction of these inspection schemes is a new requirement for the building owner, and it is expected that it will take time for the market to adapt. For boilers, a voluntary inspection scheme is already widespread, but for heating and AC systems, the inspection will be a new routine.

It is the building owner's duty to arrange the inspection. The report from the inspection shall be uploaded onto the Energy Certification System at NVE, as well as being available on the premises. The content of the report is outlined in the regulation:

- Identification of building and system
- Description of system
- Summary of evaluation with any deviations from normal situation
- Registered data
- Recommendations
- Signature of the expert
- General information on the inspection report

NVE established a template form for each type of inspection. These forms can be downloaded in excel-format and used directly by the expert. Other formats and technical systems are allowed, as long as the data and evaluations are given on a level comparable with NVE's template. This template defines a large number of points to be checked and the data to be registered. These are considered necessary to fulfil the objectives of the inspection and give a reasonable return on the cost. For building owners who have good documentation of the systems and have regular maintenance in place, the task of inspection will not cause a large extra cost. It is allowed to use an expert who is already involved in maintenance, as long as he/she meets the requirements of competence. For building owners who neglect the continual need for maintenance, the task of inspection can be very substantial. The Government's first objective is to give an incentive for all owners of technical systems to establish good routines for service and maintenance.


Energivurdering av kjelanlegg og engangsvurdering av varmeanlegg

ARKOVERSIKT

ARKET INNEHOLDER

ENERGIVURDERING AV K.JELAN.EGG

Oppsummering og anbefalinger kjel og varmeanlegg

Sjekkliste 1 - Tekniske data

Sjekkliste 2 - Dokumentasjonsliste

Sjekkliste 3 - Fullstendighetskontroll

Engangsvurdering av varmeanlegg

NB! ENKELTE CELLER INNEHOLDER VIKTIGE MERKNADER / VEILEDNINGER.

Fig. 3. First page of template form for inspection of boilers and heating systems

The duty of inspection is not connected to the duty of energy certification. However, there are obvious benefits in coordinating the tasks. Any inspection report will be of benefit to the certification expert. For an expert to inspect a heating system, it will be of benefit to lean on the calculations for energy performance of the building in question. And, for the owner, the whole process can be more effective, if done by a limited number of experts, and in cooperation.

4 > Qualified Experts

The regulation defines the level of competence needed to perform certification of new residential and non-residential buildings, as well as the inspection of technical systems. The requirements are set to ensure the needed competence and, at the same time, allowing the process to be coordinated with related processes, for instance during construction. Qualified experts are allowed to use the expert "entrances" to the Energy Certification System.

How does one become an expert?

The potential expert must ensure that he/she meets the requirements and be prepared to present documentation to the owner or to NVE, if requested. The requirements are largely defined according to general and predefined groups. For certification, the requirements are given in the next table:

Building type	Type of expertise	Required education	Required experience	Length of experience
Non-residential, existing buildings	Construction and energy	Bachelor	Energy performance calculation of buildings	2 years
New buildings, incl. apartments	Construction and energy	Corresponds to the role of "controller" in the buildings regulation		

For inspections, the requirements are given in the next table:

Type of system	Type of expertise	Required education	Required experience	Length of experience
Boilers, over 400 m^2	Combustion	None	Maintenance and service of boilers	2 years
Boilers, over 2,000 m^2	Combustion	None	Maintenance and service of large boilers	5 years
Heating systems, over 400 m^2 - Two alternatives	1. Construction and energy Combustion	Bachelor	Energy performance calculation of buildings. Maintenance and service of boilers	2 years 2 / 5 years
	2. Construction and energy Combustion	2 years licensed education.	Energy performance calculation of buildings Maintenance and service of boilers	2 years 2 / 5 years
Ventilation systems, over 500 m^2 - Two alternatives	1. Construction and energy.	Bachelor	Installation or inspection of ventilation systems	2 years
	2. Construction and energy.	2 years licensed education	Energy performance calculation of buildings.	2 years
Cooling systems, over 500 m^2 - Two alternatives	1. Construction and energy.	Bachelor	Installation or inspection of cooling systems	2 years
	2. Construction and energy.	2 years licensed education.	Energy performance calculation of buildings.	2 years

It is too early to see the effects of the expected demand for experts in the market. As the requirements correspond quite well to groups of expertise already on the market, the effort is rather on stimulating the existing systems of education, rather than to establish specialized training. Specialized courses are already offered in the market.

There is no regulation of the prices in the market, so some differentiation is to be expected according to competence, precision or time needed, combination with other tasks, as well as some regional differences. Typical costs cannot yet be established.

In the first months a couple hundred experts have been active. This number is expected to grow in the coming months.

5 > National Information and Communication Campaigns

The need of informing citizens on certification

With new duties and certificates introduced to the market, there is a strong need for information campaigns. Due to limited resources, the campaigns have been of very limited extent. However, during the phase of establishment, there has been a large interest in the news media to report on energy certification. For apartments and small houses, it seems that the duty of certification when marketing for sale is widely accepted, if not acclaimed. The challenges ahead will be:

- To reach the owners of non-residential buildings (certification and inspections)
- To reach owners of residential multi-storey buildings (inspections)
- To stimulate the demand for energy certificates (market pull)

The information strategy during 2010 has had the following main elements:

Updated information and proper guidance on *www.energimerking.no*

Two leaflets, directed to the public and owners of non-residential buildings

Editorial material to be used by magazines, newspapers, technical magazines etc.

A help desk was established in cooperation with Enova (National Energy Fund/Administration). Both the public and professional parties can get help on the content of the schemes, as well as user-related problems within the Energy Certification System.

6 > National incentives and subsidies

The Government gave high priority to letting energy certification for apartments and small houses be free of charge for those who accept a rather simple data input. Aside from that, there are no plans for any financial support towards owners to fulfil the duty of the new regulation.

For the time being there are no incentives regarding energy efficient buildings directly connected to energy certification or inspections. However, Enova is expected to make use of the Energy Label among their criteria for financial support.

Enova offers a wide number of support mechanisms to stimulate building developers to go beyond minimum requirements, as well as for owners to develop a good practice of maintenance and energy administration. A growing general interest for passive houses and low energy houses is generating a lot of information in the market, and political discussions on possible incentives for those who apply for these types of buildings.

Evolution of Minimum quality requirements in building regulations

Following the implementation of the EPBD, the energy requirements in the Norwegian building regulation were revised in 2007. In 2010, the requirements were further adjusted. In 2008, the political parties in the Norwegian Parliament, with one exception, agreed that all new buildings should be of passive standard by 2020.

The Ministry of Local Government and Regional Development has recently received a report from a commission on energy efficiency in buildings. The commission recommends that the passive standard should be implemented as a requirement in the building regulations by 2015. The same ministry is currently working on a white paper on building policy, where it is expected that future evolution of the energy requirements in the building regulations will be addressed.

The Norwegian building regulation contains specific energy limits for different building types. The requirements are set in kWh/m^2 final energy demand per year within the building envelope considering heat recovery from ventilation system, but without considering system losses and without considering energy export. There are also different component requirements for the building envelope, technical installations and solutions for an environmentally friendly energy supply. There are specific requirements for heat recovery of ventilation air in ventilation apparatus (yearly mean heat recovery rate), SFP factor (specific fan power), and equipment for shading or other precautions to avoid the use of cooling systems. Energy demand for lighting, hot water and all technical equipment are also considered, but so far only standard values are applied.

The Norwegian energy requirements are set with regard to 13 different building categories. An example of the development for some of the main properties necessary to fulfil the Norwegian minimum energy requirements for commercial buildings, single family houses, and apartment buildings can be seen in the table below. The requirements are the same for single family houses and apartments, listed below as dwellings.

Requirement	1997	2007	2010
Net energy demand (kWh/m^2 year)	-	Single family house: 125 + 1,600/m^2 heated floor area Apartment: 120 Commercial building: 165	Single family house: 120 + 1,600/m^2 heated floor area Apartment: 115 Commercial building: 150
Total area of glass/doors	20% of the heated floor area	20% of heated floor area	20% of heated floor area
U-value: exterior wall	0.22 W/(m^2K)	0.18 W/(m^2K)	0.18 W/(m^2K)
U-value: roof	0.15 W/(m^2K)	0.13 W/(m^2K)	0.13 W/(m^2K)
U-value: exposed floors	0.15 W/(m^2K)	0.15 W/(m^2K)	0.15 W/(m^2K)
U-value: glass/doors	1.6 W/(m^2K)	1.2 W/(m^2K)	1.2 W/(m^2K)
Thermal bridges	-	Single family house: 0.03/(m^2K) Other buildings: 0.06/(m^2K)	Single family house: 0.03/(m^2K) Other buildings: 0.06/(m^2K)
Heat recovery of ventilation air	60%	70%	Dwellings: 70% Commercial building: 80%
Air tightness (Air changes/hour by 50 Pa pressure difference)	Single family house: 4.0 Other buildings (with more than two floors): 1.5	Single family house: 2.5 Other buildings (with more than two floors): 1.5	Single family house: 2.5 Other buildings (with more than two floors): 1.5
SFP factor	-	Dwellings: 2.5 kW/(m^3/s) Commercial building: 2.0 kW/(m^3/s)	Dwellings: 2.5 kW/(m^3/s) Commercial building: 2.0 kW/(m^3/s)
Screening factor for glass/window (gt)	-	-	0.15 (all buildings)

Other impacts

After only a few months of operation, it is still too early to evaluate any impacts other than the first-hand results in number of certificates.

One of the main objectives of the new regulation is to increase general attention towards good energy aspects in buildings, leading to good energy performance. It will be difficult, also in the future, to attribute any increased interest and attention to the new regulation alone. The results will also depend on other financial measures, information and the more general trend in the market for increased energy quality.

8 > Conclusions and future planning

With a very short period of practical experience, the certification of apartments and small houses should be considered a success. More emphasis is needed on the duties regarding non-residential buildings.

NVE has a long list of priorities for further development of the Energy Certification System. This includes an improved detailed registration, improved functionality for professional users etc. This practical approach is vital to improve users' experience of the system.

The regulation needs to be evaluated after some time. At present, this need seems to fit well with the need to evaluate the implications of the EPBD recast. NVE expects this activity to take place during 2011.

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More details on the IEE Programme can be found at www.ec.europa.eu/intelligentenergy

This report can be downloaded from *www.epbd-ca.eu* and also from *www.buildup.eu*