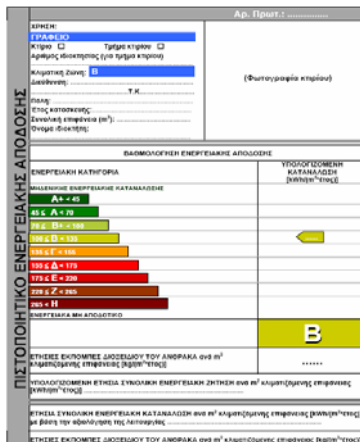




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Energy performance certificate

## Greece: Impact, compliance and control of legislation

This paper aims to summarise how in Greece the implementation of the EPBD has changed the national EP requirements and has influenced the building stock. It describes the national way of handling with EPBD compliance and control and tries to identify interesting approaches and possible bottlenecks.

### 1 > Introduction

In Greece there was no specific regulation concerning the energy performance and certification of buildings until the Energy Performance of Buildings Directive (EPBD). The pre-existing relevant regulations have been:

- > the Greek Thermal Regulation, implemented in 1981, which prescribed limits for U-values and restricted heat transfer through the building envelope,
- > the Technical Codes of the Technical Chamber of Greece (TOTE): 2421/86 for the installation of boilers for the heating of buildings, 2423/86 for the installation of cooling systems in buildings and 2425/86 for the calculation of cooling loads in buildings.

In 2008, the Greek Law 3661/2008 'Measures for decreasing the energy consumption of buildings' was voted, according to which the Energy Performance Regulation for Buildings (KENAK) is foreseen. The Energy Performance Regulation for Buildings is going to be implemented during 2009 and it refers to the energy performance of new buildings, as well as existing buildings under specific conditions. The new regulation defines the methodology for the calculation of the energy consumption of buildings, sets the minimum energy performance requirements and prescribes the issue of an energy performance certificate, the inspection of boilers and air-conditioning systems and the implementation of a national body of energy inspectors, in compliance with the European Directive 2002/91/EC.

The calculation method will be based on the simply hourly method (ISO: 13790:2008 E). The proposed methodology is the asset rating methodology (according to CEN) and concerns the classification of a building by its energy consumption, taking into account the thermal characteristics and the electromechanical equipment of the building.

Table 1: Limit values for energy classification according to KENAK (Numeric values for  $R_r$  and  $R_s$  will be fixed later)

Classification	Limit values
A	$EP < 0.50R_r$
B	$0.50R_r \leq EP < R_r$
Γ	$R_r \leq EP < 0.50(R_r + R_s)$
Δ	$0.50(R_r + R_s) \leq EP < R_s$
E	$R_s \leq EP < 1.25R_s$
Z	$1.25R_s \leq EP < 1.50R_s$
H	$1.50R_s \leq EP$

All new buildings, as well as existing buildings >1000m<sup>2</sup> which undergo major renovation, should be at least category B, according to the limit values set in Table 1.

## 2 > Impact of the EPBD on the national requirements

As there were no energy performance requirements in Greece - other than the maximum U values for new constructions build after 1981 - the implementation of the EPBD clearly has impact on the severity of the requirements in terms of energy efficiency. Main changes are:

- > the introduction, for the first time, of the energy performance certificate,
- > the definition of specific energy performance levels,
- > the definition of specifications for different building systems,
- > the consideration of renewables in buildings above 1.000 m<sup>2</sup>

and many more. Additionally, with the implementation of the EPBD, for the first time there are requirements for existing buildings >1.000 m<sup>2</sup> when being renovated.

Similarly, the existing requirements for indoor climate, including airflow rates and ventilation requirements, set points for heating and cooling, humidity levels, etc., as described in the Technical Order of the Technical Chamber of Greece (T.O.T.E.E. 2425/86), are becoming obligatory and more widely used. With the Energy Performance Regulation (KENAK), climatic zones are increased to 4 instead of the existing 3 in the previous national regulation.

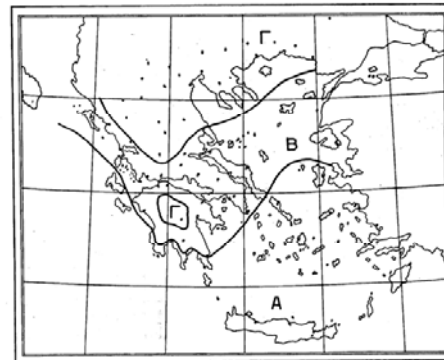


Figure 1: climatic zones according to the existing thermal insulation regulation of 1979



Figure 2: climatic zones according to the new energy performance regulation (KENAK)

In general, the requirements introduced in the country through the KENAK do not differentiate much from those of EPBD Art. 7. In specific related to the validity of the certificate, the regulation implies that the validity shall not exceed 10 years and in case a building, which already has a certification, undergoes renovation or extension in a way that affects its energy performance, the validity of the certification expires at the end of the renovation or extension.

The building sector in Greece corresponds to about 36% of the total final energy demand and consumption. The implementation of the EPBD is expected to lead to effective measures for energy efficiency in buildings, sometimes leading to energy conservations of up to 20 - 40%. Since new buildings should meet the minimum energy requirements when being constructed, a clear reduction of the energy consumption for new buildings is expected and hopefully a change in tendency towards building more efficient buildings. Existing buildings with a total area >1000m<sup>2</sup>, which undergo major renovation, will also be upgraded in order to meet the minimum energy requirements. National action plans include the creation of energy performance certificates, energy audits and measures taken in order to upgrade buildings. The proposed requirements are expected to change the building market and affect the market prices, especially for new buildings.

Although implementation has not yet started, already some technical measures for better energy performance of buildings are being taken. The Greek Thermal Insulation Regulation already imposes better thermal insulation in buildings, as well as the use of double-glazing systems. Every day factors, like the energy prices and the rise in temperature, especially in the urban areas, are forcing people to think about cost-effective energy solutions, like the use of passive cooling techniques (night ventilation, solar shading etc.), or even more advanced techniques like cool paints, green roofs, PV's, glazing with thermal breaks and other. The actual implementation of such techniques is not yet advanced, but it is expected that the implementation of the EPBD in 2009 will boost the market for such mechanisms of energy efficiency.

The building market is already being affected. New products promoting energy efficiency in buildings have been launched: new insulation materials, new types of glazing, cool materials and other building products, which contribute to a better energy performance of buildings.

It is anticipated that the owners of the better energy performing buildings will be able to demand higher prices for them, since their performance means that lower running costs are expected. Conversely, owners of poorly performing buildings will have to lower prices, or invest in improving their performance, in order to make them attractive.

### Minimum ventilation requirements

There are already minimum ventilation requirements set by national legislation in Greece. These requirements will not be differentiated by the implementation of the EPBD. However, in the new regulation, the audit of the air-conditioning system includes the audit of the ventilation system as well.

According to the new regulation KENAK, the reference building is naturally ventilated. The ventilation requirements for buildings set by KENAK are differentiating according to the use and type of building. For tertiary buildings, or buildings with mechanical ventilation, the ventilation system of the reference building should fulfill a number of prerequisites, among which:

- > Ventilation according to the maximum expected number of people and the minimum quantity of air per person.
- > Mechanical ventilation system is included by heat exchanger with a heat recovery coefficient  $n_R=0,6$ .

### Additional requirements and related regulations

Besides requirements explicitly demanded by the EPBD, other relevant regulations mainly motivate energy efficiency and the use of renewable energy. There is no obligation to use renewable energy in buildings. However, the objective of the Greek Government is to increase the use of renewable energy resources by 20% until 2010. Implementation is often slow and bureaucratic. There are, however, good examples of initiatives to promote the use of renewable energy, like Law 3468/2006 on the electricity production from renewable energy sources and cogeneration and the recently proposed financial and practical incentives to stimulate as well the low scale and building installation of photovoltaics by simplifying the installation procedures. According to those, the PV installation up to 10 kWp can be realised with a small permission of works by the Ministry of Environment, Physical Planning and Public Works. This is a motive for citizens to install PV on their roofs without being involved in very time-consuming and costly procedures.

The use of solar collectors appears in Greece from 1980. The wide use of solar collectors is due to tax incentives set by the Greek Government in the past. According to the new regulation, solar collectors should cover a specific percentage of the yearly thermal loads due to domestic hot water consumption. This percentage depends on the climate zone and the possibility of installation of a solar collector on the roof of the building.

*Table 2: conversion of final energy to primary energy use.*

Final energy use	Conversion to primary energy	CO <sub>2</sub> emissions per energy unit [kgCO <sub>2</sub> /kWh]
Natural gas	1,05	0,196
Heating oil	1,1	0,264
Electricity	2,9	0,989
Biomass	1,0	---

### 3 > Compliance and control<sup>1</sup>

With the implementation of the EPBD the definition of energy inspector and energy expert is being officially introduced for the first time in Greece. A group of energy experts will be authorised to serve the certification process objectives. This group will be certified by national legislation and its task will be to perform energy audits of buildings (new and old). The energy experts will be an independent group under Governmental supervision.

Energy experts should fulfil specific requirements. They might be engineers or experts from other scientific fields related to energy aspects.

There will be a register of energy experts controlled by a national authorised Service. All experts should be registered and should obtain a permission in order to carry out energy audits.

The permissions will be categorised by the type of energy audits each expert will be authorised to carry out. Specifically, there will be two main categories of permissions; category A concerns audits of buildings with a total area less than 1000 m<sup>2</sup>, while category B concerns audits of buildings of any total area (including areas exceeding the 1000 m<sup>2</sup>). Three subcategories will define the work field for each expert: energy expert of buildings, energy experts of boilers and heating systems, energy experts of cooling systems.

There will be a record of Energy Inspectors, Energy Audits and Energy Certifications. The record will be in e-version, as database, under the responsibility of the Ministry of Development. This database could be elaborated for scientific outcomes.

#### Compliance of EP requirements and EP certification

The energy regulation KENAK, will enforce the compilation of an Energy Performance Study before construction. The Energy Performance Study:

- > will be obligatory for the approval of a building permit,
- > will be a study of the energy characteristics of the building, additional to architectural, physical planning, heating, cooling, domestic hot water and lighting studies,
- > will substitute the thermal insulation regulation (3661/2008 art.3). All calculations related to the thermal insulation of the building envelop will be part of the Energy Performance Study.

The Study will be obligatory for new buildings and existing buildings >1000 m<sup>2</sup> when being renovated and will be submitted to the authorities responsible for the building permit. The relevant Town Planning Authority is responsible for approval of the building permit and, by extension, for approving the energy study.

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<sup>1</sup> Compliance means the fulfilment of EP requirements and EP certification process while control is the mechanism for checking the compliance.

The checks of compliance of new buildings with the energy requirements will be performed by the energy consultants who also issue the energy certificate. The energy performance of a building is proved after the completion of its construction. If a new building or an existing building >1000 m<sup>2</sup> which undergoes major renovation, is not classified as at least category B, this building will be assessed as illegal construction, according to the relevant legislation. In theory, such a construction has to be upgraded to comply with the minimum requirements. How this will be in practice will prove after a few years of implementation of the KENAK.

The energy experts group, responsible also for compliance checks, will be consisted by a large number of engineers or experts from other scientific fields related to energy aspects that will carry out the audits and will issue the certification. Energy experts should follow a training session in order to achieve the right to realize energy audits. This procedure allows for sufficient expertise at the energy experts side, although the training programs are not yet in place.

Existing authorities responsible for checks or compliance (like f.e. the Town Planning authorities), may need some upgrading of expertise and personnel in order to meet the new expectations.

### **Control and penalty imposition**

There will be a responsible Institution who will control the process and the quality of energy audits. The Institution will inform and collaborate with the Consultative Committee set responsible by the Ministry of Development. The Consultative Committee will also be responsible for the economic management and accounting aspects for the proper implementation of the EPBD.

The quality control of energy audits will be carried out by the Centre of Renewable Energy Sources (CRES). Control will be based upon ad hoc sampling and will be carried out either ex officio, or upon denouncements, or upon recommendation of the Consultative Committee.

In case the quality of the energy audits or the soundness of certification is doubtful, the Institution could perform a countercheck and certification by another energy expert or by an executive expert from the Committee. Extra cost will overload the denouncement.

Once the control is performed and it is noted that the certification includes information which is false, the Ministry of Development imposes penalties. The Consultative Committee is responsible to inform the energy inspector in question 15 days in advance, in order for him/her to answer and for the Committee to find out if a penalty should be imposed.

Penalties related to energy inspectors include:

- > Inspector exclusion from energy audits for 1 up to 3 years.
- > Total inspector exclusion from record.

The Consultative Committee could also impose a pecuniary fine related to the severity of delinquency.

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#### Incentives

Several regulations and initiatives provide incentives for improved energy efficiency in buildings. One of these is the attractive kWh price for selling energy from renewables as defined in the Law for renewables. Several banks provide special loans for the integration of photovoltaics in buildings. Additionally, the Greek Government has recently developed the Project 'EXIKONOMO' which subsidises local government to upgrade the energy performance of existing public buildings and the improvement of the microclimate of open spaces. The project's aim is to improve the energy efficiency in local level, to promote applicable actions for demonstration and to motivate citizens in aspects of energy conservation and protection of urban environment.

A draft Law "Measures for the improvement of energy efficiency in final use and energy services" defines the legal frame and the financial means in order to achieve energy efficiency in the final use. The aim is to overcome the barriers in energy efficiency and promote the use of energy services of the final user. The Law allows for Third Party Financing of energy measures and other incentives to achieve better energy performance.

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