CONCERTED ACTION
ENERGY PERFORMANCE
OF BUILDINGS

EPBD implementation in Portugal

STATUS AT THE END OF 2012

1. Introduction

The implementation of the Directive 2002/91/EC on Energy Performance of Buildings (EPBD) in Portugal is reaching the maturity stage. Field implementation started in 2007, based on the three decrees published in 2006 that were recently revised to transpose the tighter requirements of the recast EPBD (2010/31/EU). Nearly 100 different stakeholder institutions made contributions that resulted in the actual revision, aimed among others at improving the methodologies and certification processes, based on the extensive experience gained over the last 5 years. It is expected that the updated legislation will fit better to the market needs and reality. The new regulations should be officially adopted by the government during 2013.

This report presents an overview of the current status of implementation and of the plans for the EPBD evolution in Portugal. It mainly focuses on the Energy Performance (EP) requirements, the Energy Performance Certificates (EPCs) and inspection systems, including quality control mechanisms, training of Qualified Experts (QEs) and information campaigns.

2. Energy performance requirements

This chapter presents an outline for the transposition and implementation of the EPBD energy performance requirements in Portugal. It also describes the transition to the cost-optimal EP requirements and the action plan towards Nearly Zero-Energy Buildings (NZEBs).

2.1 Progress and current status

Energy efficiency requirements for residential buildings were first introduced in Portugal in 1991, and in 1998 for non-residential buildings. In 2006, the building codes were revised for all buildings due to the transposition of the EPBD 2002/91/EC. The building energy efficiency codes are again being revised to transpose the 2010 recast EPBD (the process started in 2010 and the technical committees completed their job in September 2012). The following sections describe how the national requirements evolved from the 2006 to the currently proposed updated version, addressing the most relevant aspects of the revised building codes.

2.2 Format of national transposition and implementation of existing regulations

Besides the reinforcement of the EP requirements in 2006, the EPBD transposition introduced for the first time in the building codes the need to issue an Energy Performance Certificate (EPC). To effectively implement these requirements, ADENE designed, developed and currently supports the National System for Energy and Indoor Air Quality Certification of Buildings (SCE), which is based on a central registry and database. The quality of the EPC is guaranteed by training the Qualified Experts (QE), performing periodic Quality Assurance (QA) assessments of their work and supporting them through a telephone and e-mail helpdesk. The QEs are also technically supported by guidance documents available online, namely FAQ's and manuals to issue the certificates using the central registry's online platform.

Authors

Paulo Santos,
Pedro Mateus,
Rui Fragoso
ADENE

National Websites *www.adene.pt, www.dgeg.pt, www.apambiente.pt, www.casacertificada.pt, www.casamais.adene.pt, www.sce.adene.pt*

Figure 1: Training sessions for qualified experts.

To become a QE, candidates (engineers or architects) must undergo training and pass an exam. Recently, complementary training sessions were promoted by ADENE to improve the qualifications in specific areas such as lighting, Heating, Ventilation and Air-Conditioning (HVAC), renewable energy systems and building simulation programs.

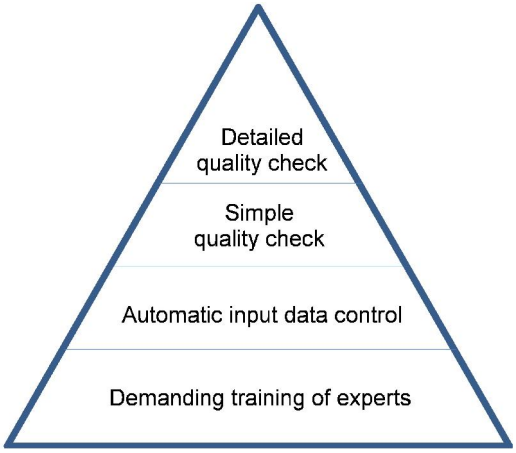


Figure 2: Quality assurance scheme.

The QA system is based on the assessment of a random sample of the EPCs issued daily. It has been proven to be an important tool in improving quality of the work of the experts. Until the end of 2012, about 14,000 EPCs have undergone (or are undergoing) a QA assessment. In the worst case scenario, the QA process can lead to a fine, (so far, fines have been imposed on 7 experts). In general, when the QE does not comply with the regulations, he is required to correct the calculations and issue another EPC, supporting himself the corresponding costs. In order to evaluate the work of QEs and consumer satisfaction, a mystery client strategy has also been put in place. These mechanisms have contributed to an evident quality improvement of the information and accuracy in the EPCs issued by the experts.

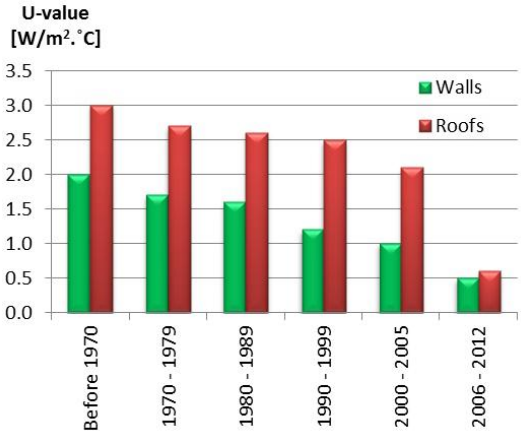


Figure 3: Mean wall and roof U-values for new construction.

ADENE has been compiling and publishing statistics based on the data stored at the central database, aiming at characterising different aspects related to the EP of the building stock. These include general aspects like the distribution of ratings in EPCs issued in new and existing buildings, to detailed technical information like average envelope characteristics for new construction in different decades. The statistics are periodically published at ADENE´s website and also sent to relevant stakeholders, such as real estate agents, magazines and the National Statistics Institute.

2.3 Cost-optimal procedure for setting EP requirements

The requirements adopted in the 2006 building code were already established on the basis of cost-effectiveness, assuming values with a reasonable payback period. For the revised 2013 code requirements will take into consideration the comparative methodology framework for calculating cost-optimal levels published by the European Commission. As these values were not yet available by September 2012, provisional values have been estimated. The building code is however structured in a way that it allows a quick and easy update of requirements according to cost-optimality, if necessary. Besides tightening the envelope requirements for residential buildings, the revised codes will also include technical systems requirements.
For residential buildings, the system requirements include ventilation, space heating, air- conditioning (AC), Domestic Hot Water (DHW) and renewable energy systems. For non-residential buildings and in addition to the requirements applicable to the residential sector, requirements for lighting, lifts (after 2015), and Building Energy Management (BEM) systems will also be set.

2.4 Action plan for progression to NZEB

The national action plan for the progression to Nearly Zero-Energy Buildings (NZEBs) is now under development, and the key targets and milestones defined. The adopted definition of the NZEB, establishes a relation with cost-optimal evaluations and NZEBs are defined as buildings that cumulatively offer:

Time interval		Before 1990	1990-2006		2006-2012		2012-2016		2016-2021		After 2021	
			Lisbon	Bragança	Lisbon	Bragança	Lisbon	Bragança	Lisbon	Bragança	Lisbon	Bragança
U-value [W/(m2.K)]	External **walls**	None	1.4	0.95	0.7	0.5	0.5	0.35	0.4	0.3	0.35	0.25
	External **roof/floor**		1.1	0.75	0.5	0.4	0.4	0.3	0.35	0.25	0.3	0.2
	External **window**		4.2	4.2	4.2	3.3	2.9	2.4	2.8	2.2	2.4	1.8
	Flat thermal		None		2xU-value (closest element)							
Maximum energy needs kWh/(m2.year)	**heating**[1]		64	135	52	117	Currently not available					
	cooling[1]		18				18	15	18	15	18	15
	DHW[1]		None		38.9		Requirements on equipments efficiency					
Maximum window solar gain factor **g-value**			0.15 (light inertia) 0.56 (medium/heavy inertia)									
Ventilation (ACH)			None		≥ 0.6		≥ 0.4					
Renewable energy systems			None		RES mandatory							
Minimum **air conditioning** eficiency			None				Label C[2]		Label B[2]		Label A[2]	
Minimum **boiler** efficiency			None				86%		89%		92%	

1- Values for an average size (120 m^2) building

2- Eurovent label

Table 1: Evolution of minimum requirements for building components and final energy needs from 1990 to 2021 (expected).

i) components compatible with the upper level of the cost-optimal evaluations;
ii) implementation of renewable energy that covers a very significant fraction of the minimised building needs. This energy must be produced on site (whenever possible) and/or, alternatively, when the local production may be insufficient, e.g., in urban areas, as nearby as possible. Numerical indicators are also being studied and will be made available following the conclusion of the cost-optimal procedures. The primary energy factors, that also play an important role, will be gradually revised until 2020, to incorporate the effort made by Portugal to have clean and renewable electricity.

To support the implementation of the action plan, several measures were identified and will be made operational until 2020. The measures that are related not only to financial aspects but also to policies and campaigns, will support the transition towards a more efficient building stock by 2020. These measures are based both on national strategies, including those envisaged in other action plans (the Energy Efficiency Action Plan and the National Renewable Action Plan), and on European support initiatives that are foreseen to become available throughout the following years. Specific measures include, for instance, the current review of the building codes to transpose the recast EPBD, followed by the training of the building workforce and experts, which will be supported by the promotion of financial incentives and the development of real NZEB case studies.

2.5 Any other relevant information

In order to bring the QEs closer to the citizens that need an EPC, ADENE has supported the development of an online platform named *www.casacertificada.pt*. In this platform, the citizens can advertise their intention to obtain an EPC and receive several proposals from different QEs. The platform contains also information and mechanisms to bridge the gap between suppliers of energy efficient materials or equipments, and homeowners who intend to implement the EPC recommendations.

3. Energy performance certificates

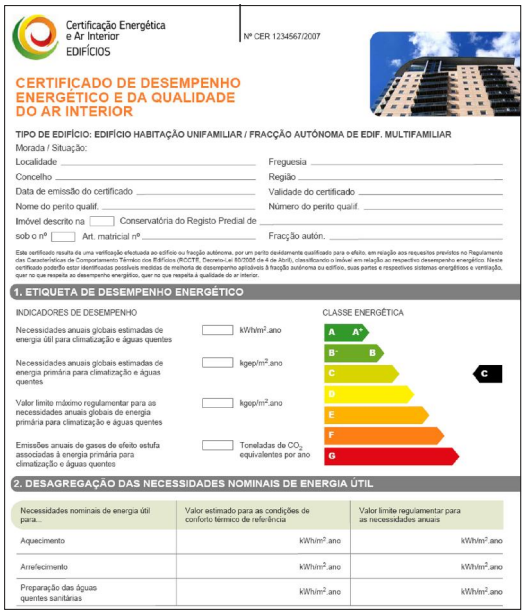
By December 2012, more than 555,000 EPCs were issued since the scheme was launched in July 2007. About 80% of these were issued since January 2009, for existing buildings, upon sale or rent.

Since 2009, around 2,500 EPCs for new buildings and 9,000 EPCs for existing buildings are being issued every month, covering nearly 90% of the licensing and selling processes that take place in the country. This way, a national database of certified buildings is being fed with up-to-date information that will be useful for monitoring the progress of different aspects of the implementation of the

Figure 4: SCE logo.

Certificação Energética e Ar Interior EDIFÍCIOS

Figure 5: Cover page of the EPC.


Certificação Energética e Ar Interior
EDIFÍCIOS

Nº CER 1234567/2007

CERTIFICADO DE DESEMPENHO ENERGÉTICO E DA QUALIDADE DO AR INTERIOR

TIPO DE EDIFÍCIO: EDIFÍCIO HABITAÇÃO UNIFAMILIAR / FRACÇÃO AUTÓNOMA DE EDIF. MULTIFAMILIAR

Morada / Situação:

Localidade — Freguesia

Concelho — Região

Data de emissão do certificado — Validade do certificado

Nome do perito qualif. — Número do perito qualif.

Imóvel descrito na Conservatória do Registo Predial de

sob o nº Art. matricial nº Fracção autón.

1. ETIQUETA DE DESEMPENHO ENERGÉTICO

INDICADORES DE DESEMPENHO — CLASSE ENERGÉTICA

Necessidades anuais globais estimadas de energia útil para climatização e águas quentes — kWh/m².ano

Necessidades anuais globais estimadas de energia primária para climatização e águas quentes — kgep/m².ano

Valor limite máximo regulamentar para as necessidades anuais globais de energia primária para climatização e águas quentes — kgep/m².ano

Emissões anuais de gases de efeito estufa associadas à energia primária para climatização e águas quentes — Toneladas de CO_2 equivalentes por ano

A+ A B B- C D E F G

C

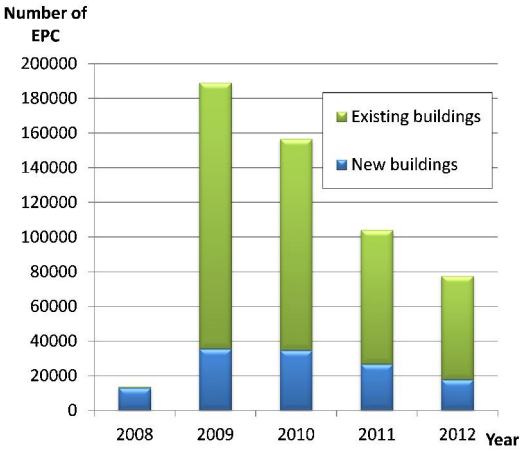
2. DESAGREGAÇÃO DAS NECESSIDADES NOMINAIS DE ENERGIA ÚTIL

Necessidades nominais de energia útil para...	Valor estimado para as condições de conforto térmico de referência	Valor limite regulamentar para as necessidades anuais
Aquecimento	kWh/m².ano	kWh/m².ano
Arrefecimento	kWh/m².ano	kWh/m².ano
Preparação das águas quentes sanitárias	kWh/m².ano	kWh/m².ano

Directive, from basic statistics, such as the number of certified buildings, to impact assessment, including estimated energy savings. 90% of EPCs in the database were issued for residential buildings and 10% for non-residential buildings. In Portugal, the definition of a public building includes every non-residential building owned by private or public entities. This definition is wider than the strict interpretation of the EPBD requirements. Currently, 1% of the total number of EPCs issued corresponds to public buildings.

The database has been used to produce information useful for the revision of the technical regulations, such as tightening of minimum requirements and optimisation of operational rules. Figures 6 & 7 present information extracted from the database on the evolution of EPCs issued and the energy label distribution.

Figure 6: EPC evolution for new and existing buildings.



3.1 Progress and current status on sale or rental of buildings

The database contains mainly EPCs of existing residential buildings. Comparing the number of EPCs issued for this type of buildings with the existing building stock, we can conclude that nearly 10% of the building stock already has an EPC. Building sales has been one of the most successful market segments for the implementation of the EPBD. The rental

Figure 7: Energy label distribution for new and existing buildings and breakdown for residential, non residential and public buildings.

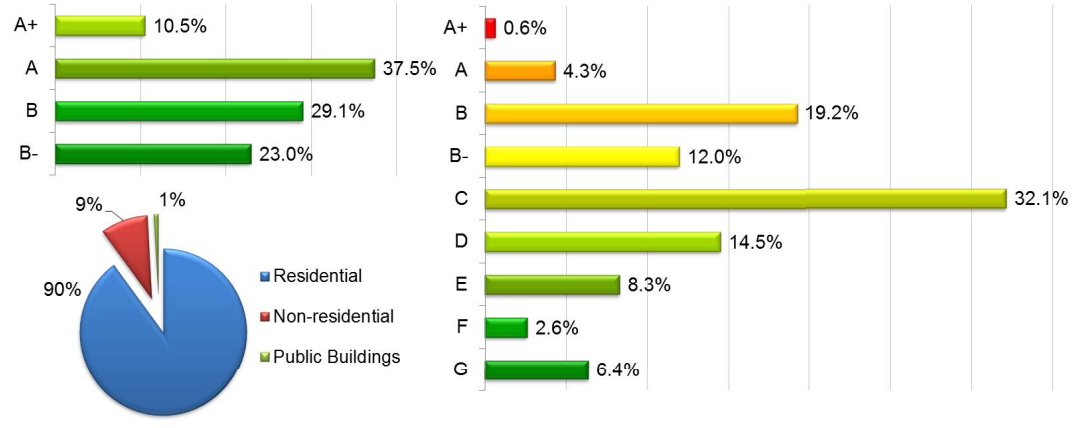


Table 2: Limit values established by the Portuguese IAQ legislation.

Parameter	Limit value
CO_2	1,800 mg/m³
CO	12.5 mg/m³
PM_{10}	0.15 mg/m³
H_2CO	0.1 mg/m³
VOC	0.6 mg/m³
O_3	0.2 mg/m³
Rn	400 Bq/m³
Bacteria	500 CFU/m³
Fungi	500 CFU/m³
Legionella	100 CFU/l

Table 3: IAQ index matrix.

IAQ Index	PM_{10}		$PM_{2,5}$		VOC		CO		H2CO		CO_2		Rn	
	(µg/m³)		(µg/m³)		(µg/m³)		(mg/m³)		(µg/m³)		(mg/m³)		(Bq/m³)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Very good	-	<30	-	<15	-	<400	-	<3	-	<50	-	<1600	-	<200
Good	31	50	16	25	401	600	3.1	5	51	75	1,601	2,250	201	300
Average	51	100	26	50	601	1,200	5.1	10	76	100	2,251	2,925	301	400

market hasn't been so successful in providing EPCs, mainly due to difficulties on having suitable control mechanisms. The current trend in the market however, shows a decline in the number of building sales and an increase of rentals. The new regulations therefore contain stronger control mechanisms to overcome the factors that prevented EPCs in rental from being issued. Such mechanisms are the obligatory advertisement of the energy label before the building is rented or sold and when offered to the market.

3.2 Progress and current status on public and large buildings visited by the public

Every non-residential building larger than 1,000 m^2 is required to display an EPC at the main entrance. Currently, there are more than 5,000 public buildings certified and many more in the process of being certified. EPCs in public buildings are updated every six years. The indoor air quality part is updated depending on the building typology, varying from two years for critical typologies (e.g., schools, hospitals and nursing homes), to six years for other typologies.

The Indoor Air Quality (IAQ) is a complementary issue in the Portuguese EPCs. For new buildings, legislation was based on a prescribed method to establish the ventilation requirements for indoor compartments, in terms of fresh airflow rate per person and per unit of floor area. In the revised building codes, this aspect will be fine-tuned to ensure a good balance between IAQ and energy efficiency. For existing buildings, the requirements are based on maximum indoor air pollutant concentrations.

In the new legislation, a two stage approach will be established: a first diagnosis based only on CO_2 and particles levels, followed by a full IAQ audit of a full set of pollutants if a certain threshold, of either CO_2 or particles, is exceeded.

3.3 Implementation of mandatory advertising requirement – status

Advertising the EP indicator was not a requirement before the recast EPBD although some real estate agents have advertised the energy performance of A-class buildings, like the example presented in Figure 9.

ADENE together with the Portuguese real estate association (APEMIP), is developing a preferential access to the Portuguese Certification System for buildings (SCE) database for real estate agents, in order to enhance the information exchange between the EPC and the advertisement. Advertising the EP indicator will become mandatory in the revised regulations and there will be penalties for those who will not comply with this requirement.

3.4 Information campaigns

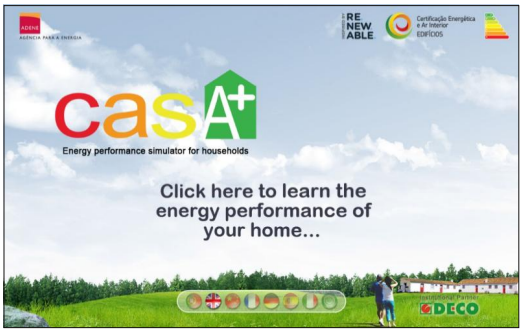
To promote/enhance the SCE, ADENE launched an advertising campaign. In the first year (2007) the campaign slogan, 'Let's save energy to save Portugal', was displayed on television channels, in the press and on the internet. The concept conveyed was that all residential or non-residential buildings would have a colour classification and one day, all would become 'green', i.e., economically efficient and environmentally friendly.

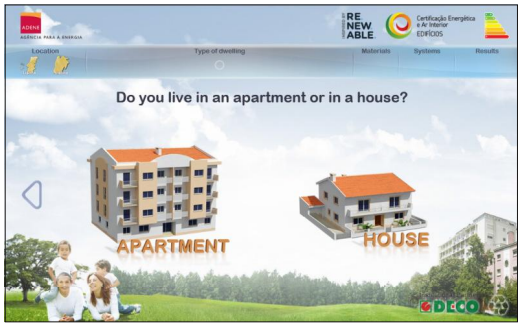
Figure 8: Public building.

Figure 9: Energy label in advertising houses for sail.

Figure 10: Model for energy efficiency certification in Portuguese buildings - 'One Day, all buildings shall be green'.

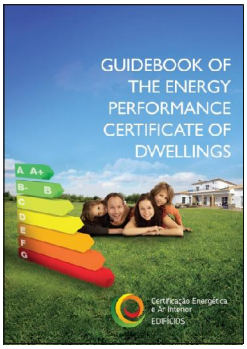
Figure 11: Energy performance simulator for households.





This was represented by the image of a Rubik's cube in a clear reference to the SCE's ultimate goal: to turn all of the cube's sides the same colour, in this case green.

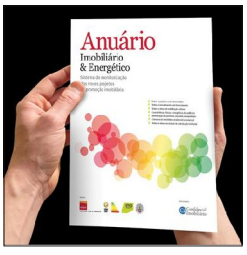
Figure 12: Guidebook of the EPC.



During 2011 and 2012, the promotion of EPCs was based on the presence at more than 100 different kinds of events like fairs, workshops, conferences and seminars all over the country, with the opportunity to reinforce and disseminate the advantage of the EPC and to stress the importance of implementing the improvement measures.

In these events, ADENE also displayed an online interactive EP simulator for households 'CasaA+' *www.casamais.adene.pt*. This simulator is used only for promotional purposes and is based on a straightforward calculation methodology and simple questions about the building. It is not intended (nor accepted) to replace the work of the QEs. Through the simulator it is possible to estimate an energy rating for a specific house and, more importantly, to try out different improvements and simulate their impact on the energy performance. Since its development in 2009, the software has been upgraded and is now available in eight different languages, with specific versions for some countries, like Luxembourg, China, Angola or Mexico, which shows its attractiveness to the general public.

Figure 13: Real state energy performance yearbook.



In order to specifically promote the EPC, ADENE produced a flyer named 'Guidebook of Energy performance certificate for dwellings'. This guidebook aims at helping the general public to understand the information that appears in the EPC, explaining in simple words the different items and concepts listed in the EPC. This flyer is available both in Portuguese and English.

To further promote the EPC, ADENE established a number of protocols with relevant entities in the sector, including professional associations, universities and public institutes. In this context, the first edition of the real state energy performance yearbook ('Anuário Imobiliário & Energético') was published in 2010 to provide a statistical compilation of main characteristics of new buildings in Portugal, namely the distributions of the EPC label, main energy consuming equipment, type of building, floor area, location, etc..

ADENE has also been involved in energy efficiency awards for the buildings sector, such as the annual Lisbon Real State exhibition (SIL) and the Arquitetar award. This award assessed a range of buildings (residential and non-residential) and the EPC label played a relevant role to select the winners.

The impact of the information campaigns was assessed in 2010. The results revealed that 76% of the inquired participants had already heard about the EPC and, among those that already had an EPC, 75% would recommend friends and relatives to obtain an EPC. This study also revealed the importance of the EPC recommendations for those who implemented them.

3.5 Any other relevant information

The EPC is being progressively required for obtaining public funding and tendering processes, e.g., to apply and receive financial incentives from the national Energy Efficiency Fund (FEE) and from the National Strategic Reference Framework (QREN).

In order to promote energy savings and boost the relevance of recommendations identified by the QEs, an additional report is produced automatically by the central registry to each EPC issued. This report provides complementary information and further details on how to implement the recommendation, stating the materials, equipment performance and possible technical hitches on its practical execution. It is a document produced to bridge the gap between home owners and

contractors. The aim is to provide added value information to the home owner in order to enhance the uptake of the recommendations and to define the individual impact of each recommendation before and after its implementation.

4. Inspection requirements - heating systems, air-conditioning

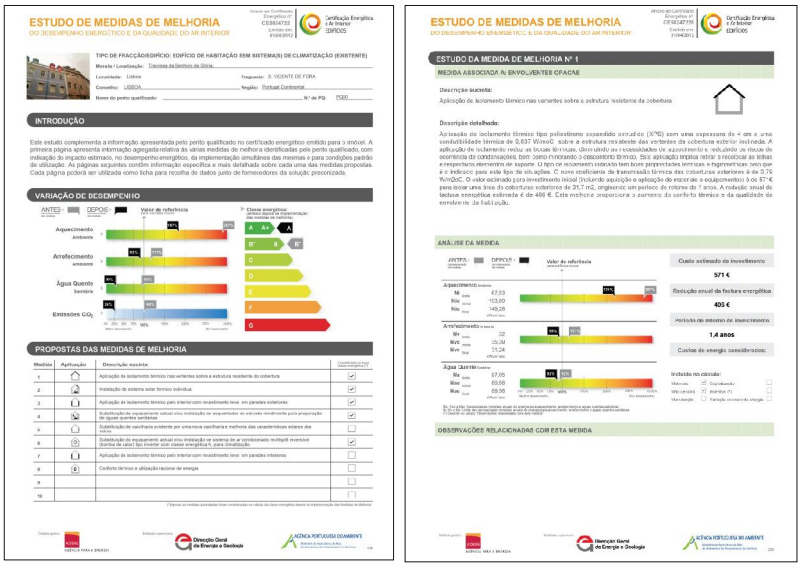
Portugal officially adopted option a) on article 8 of the EPBD, establishing a regular inspection of boilers. The inspection of boilers as well as air-conditioning (AC) systems is however still a challenging issue due to the specific climate characteristics of the country. In residential buildings the boilers and air-conditioners only operate for relatively short periods of time during the year, the real energy consumption is very low, and this hardly makes regular inspections a cost effective strategy.

In Portugal, the QE is responsible for the validation and supervision of inspections to boilers and AC systems that are usually performed by boiler and AC technicians.

4.1 Progress and current status on heating and AC systems

The inspection of boilers takes place every 1, 2, 3 and 6 years, depending on the fuel used and on its power, while the inspection of AC systems takes place every 1 or 3 years depending mainly on the power of the system. Inspections are paid by the end user or by the owner of the building. Moreover, each time a new EPC is issued, the QE checks if the inspection report is valid and includes this information on the EPC, as well as the date for the next inspection and a short summary of the inspection results. There is no template for the inspection reports, but a common set of required minimum information is defined. Inspections of boilers and AC systems are based on the assessment of efficiency under normal working conditions. Currently, inspections must simply follow the reference methodologies defined in the relevant CEN standards.

Figure 14: Recommendations report for improving energy performance.



The experience from the implementation of the inspections scheme reveals that the major difficulty is still the lack of properly trained technicians, as well as the difficulty in demonstrating to home owners the benefits of the inspections.

For residential buildings, recommendations are only implemented on a voluntary basis by the home owner. For non-residential buildings that exceed a specific consumption, the law requires the implementation of all the cost-effective measures (payback less than 8 years) recommended by the QE following an inspection. Failure to implement the recommendations within a reasonable period of time may result in a fine to the building owner.

4.2 Any other relevant information

Considering the previously described difficulties, the transposition of the recast EPBD for Portugal will no longer impose regular inspections and change to the campaigns option instead. There is a plan to provide advice to users concerning the

Figure 15: Chiller.

replacement of boilers and AC units, other modifications to the heating and cooling system and alternative solutions to assess the efficiency and appropriate sizing of the boiler or AC unit. This plan is based on delivering information together with the EPC whenever the QE finds a boiler and/or an AC system in the building. Information about inspections will also be distributed to relevant stakeholders in the market and technicians dealing with boilers and AC systems, to cover the rest of the existing building stock.

Figure 16: Typical recommendations proposed by the experts for residential buildings.

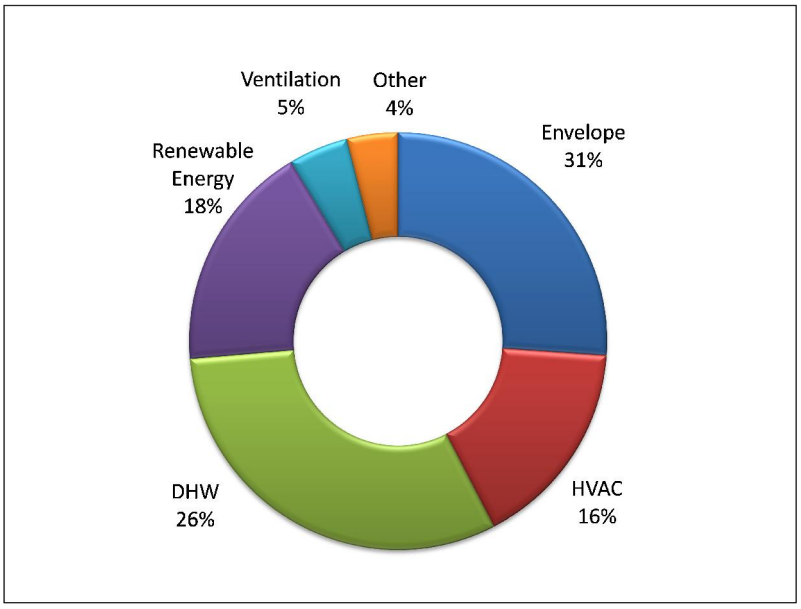
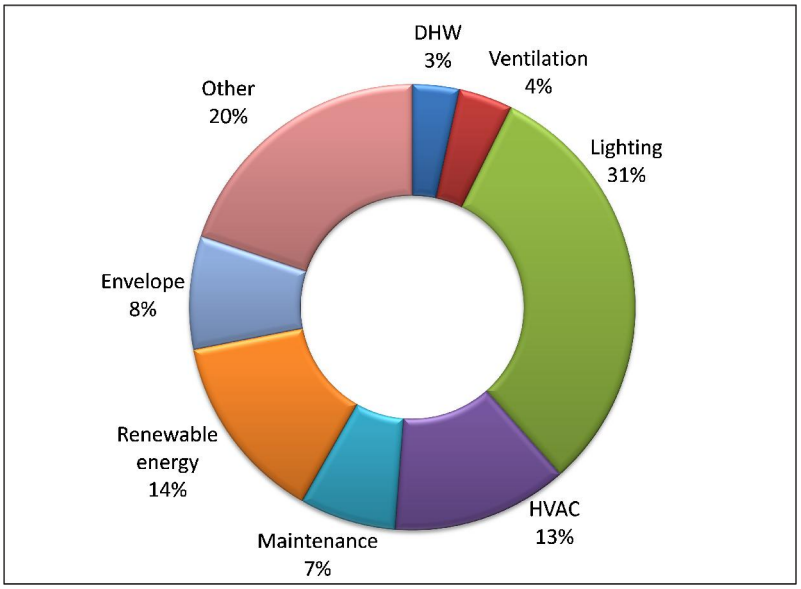


Figure 17: Typical recommendations made by the experts for non-residential buildings.



5. Conclusions and future plans

The Portuguese Certification System for buildings (SCE) has by now been in place for five years. During this period many efforts and developments took place to reach the current high level of implementation of the Energy Performance of Buildings Directive (EPBD). The recast EPBD brings new challenges to the SCE which will inevitably lead to its evolution aiming also to improve the gaps identifiyed during its development. The new legislation to be published in 2013 paves the path towards Nearly Zero-Energy Buildings (NZEB) and sets up a roadmap tightening the Energy Performance (EP) requirements progressively until 2020. Nevertheless, the legislation by itself will not be enough to push the market towards the recast EPBD goals. Thus several other strategies are being implemented to address this issue. This includes enhanced control mechanisms to promote the full SCE implementation, training the building workforce and promotion of financial incentives.

The NZEB action plan will be a key tool to reach real energy savings. However, the challenge will be on how to promote NZEB in a cost-effective way. The continuous increase of energy prices will certainly stimulate the adoption of energy efficient materials and technologies. In this process, the end user needs to be aware of how efficient the products are. One of the strategies for achieving that relies on strengthening the role of energy labels and proper communication to the public. Building components and systems are a natural target for these labeling systems aiming at moving from the building labeling perspective to the component labeling perspective in close cooperation with relevant market stakeholders.

To evaluate the impact of the EPBD implementation in the market, it will be fundamental to monitor the implementation of recommendations proposed in the EPC. One of the strategies to achieve this is the exemption of the EPC issuing fee after the implementation of recommendations. The EPC layout will also be enhanced in order to become more comprehensible for the end user and to provide added value information.

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