

Energy Performance connected Regulations in Existing Buildings

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Summary

Based on a questionnaire filled in by the participants to the ENPER -TEBUC project, this paper reviews the various energy related regulations that apply or could apply to existing buildings in the EU.

Although the stock of existing buildings constitutes the major field for energy conservation in the building sector, very little regulations apply to it and most of the countries have to rely on voluntary schemes and or subsidised procedures to support implementation of many energy conservation options that are considered cost effective and often part of the regulation or energy performance code for new constructions.

Some of the reasons that impede mandatory application of the considered measures are recorded, but (other) regulation itself seems to constitute the major obstacle.

Introduction

The replacement rate of the existing building stock with new buildings is generally low (1-2% per annum in most member states). Therefore the influence of standardisation/regulation of new buildings on the overall energy performance of the building stock takes some time to take effect. Of course, standardisation/regulation of new build does indirectly influence the existing stock but if a more direct means can be identified i.e. through regulation related to renovation/refurbishment, then much more rapid impact will be achieved.

The aim of the task within the ENPER-TEBUC project is to review existing and developing methods of applying building regulations to existing buildings, to identify the limitations of those methods and suggest ways in which those limitations might be overcome. To identify other potential measures and make recommendations for further work that might be required. A specific subtask will be to look at the potential for building certification to provide an effective vehicle for improving the existing building stock.

This paper describes the review of existing measures.

Review of regulatory measures applying to existing buildings

Most building regulations so far only address the construction of new buildings. However in the last past years several suggestions have been made, how energy efficiency in existing buildings could be improved through regulations. These proposals, stemming e. g. from the Netherlands and from Germany have to be reviewed as well as new suggestions to be developed.

A first step is to identify which measures are currently already implemented throughout Europe. A set of possible regulatory measures has been identified which are the following:

- Limit(s) on indoor temperature (heating/cooling)
- Measures making it compulsory to implement thermostatic zone control
- Measure requiring individual billing
- compulsory measures related to a periodic inspection of boilers
- compulsory measures related to a periodic inspection of HVAC
- compulsory measures related to control systems for heating
- compulsory measures for hot water in existing building
- compulsory retrofit/replacement of existing boilers depending on their age
- compulsory measure(s) related to efficient lighting
- mandatory energy audit
- mandatory energy labelling in buildings

For each of these measures, a questionnaire¹ has been elaborated in order to collect the information on:

- Whether the measure exists in the country on a mandatory basis for existing buildings
- Which types of (existing) buildings are concerned
- What is or are the precise requirements
- What kind of conditions for application or exemption
- How the compliance is checked
- When the regulation has been (or will be) implemented
- Which is (are) the main reason(s) that impede a mandatory application
- Whether there any non-regulatory measures on the same topic and of which kind

Global information on the existing building stock (number, surfaces, energy consumption) as well as economic data (cost of measures, savings,...) are also collected in order to be able to assess cost effective energy saving potentials at EU level, at a later stage of the project.

Situation in the EU

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Indoor temperature limit(s)	No	No	No	Yes	Yes	No	No	No	Yes	Yes	Yes
Thermostatic zone control	No	No	No	Yes	No	Yes	Yes	No	No	No	No
Individual billing	Yes	No	Yes	No	Yes	No	No	No	No	No	No
Periodic inspection of Boilers	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No
Periodic inspection of HVAC	No	No	No	No	No	Yes	No	No	Yes	No	No
Control systems fo heating	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No
Domestic Hot Water	No	No	No	Yes	No	Yes	Yes	No	No	No	No
Boilers replacement/retrofit	No	No	No	No	No	No	No	No	No	No	No
Efficient lighting	No	No	No	No	No	Yes	No	No	No	No	Yes
Energy Audit	No	No	Yes	No	No	Yes	No	No	No	No	No
Energy labelling in buildings	No	No	Yes	No	Yes	Yes	No	No	No	No	No

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To date little of these measures is applicable in the various countries. Greece plans to impose many of the measures but not until end of 2002 or 2003.

Limit(s) on indoor temperature (heating/cooling)

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Indoor temperature limit(s)	No	No	No	Yes	Yes	No	No	No	Yes	Yes	yes
Temperature limits for heating				21°C	19°C				20-23°C	18/20 °C	19°C
....for cooling				27°C	none				23-25°C	none	none

Countries which have this type of measure have no compliance checking system. The indoor temperature may differ depending on the type of building (health sector...).

Many reasons impeding a mandatory application are presented, but it seems that the principal drawback is the difficulty to check compliance.

Measures making it compulsory to implement thermostatic zone control

Country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Thermostatic zone control	No	No	No	Yes	No	Yes	Yes	No	No	No	No

Although the measure is not widely implemented as mandatory in all existing buildings, it is either:

- compulsory when the building is renovated like in Denmark

in DK: The answer NO is valid for existing buildings which are not retrofitted. If an existing building is retrofitted the same regulations are valid as for new buildings (then it would have been a yes). The global philosophy in Denmark for existing buildings is that we haven't got any regulations at all (except labelling see later on). Anyhow it is normal in Denmark in existing buildings to have thermostatic zone control and valves, individual billings and inspection of the heating systems etc.

- Or strongly recommended and supported by incentives like in Austria, Denmark, Norway or UK

In UK: There are many initiatives that encourage householders and building owners and occupiers to install adequate controls for heating systems amongst other things. These are run as part of the UK government's Energy Efficiency Best Practice Programme (EEBPP) which generally applies to all buildings except existing housing. This sector is mainly targeted by the Energy Saving Trust (which is funded by government). In addition, there are government grants available for householders, particularly those who are 'old and cold' through the Home Energy Efficiency Scheme (HEES) and related schemes. Energy suppliers are also under an obligation to improve the energy efficiency of their customers.

Measure requiring individual billing

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Individual billing	Yes	No	Yes	No	Yes	No	No	No	No	No	No
When has the regulation been or when will it be implemented	1998		1997		1979						

This measure is naturally more frequently observed in countries having a large proportion of collective dwellings equipped with central heating. France has the most ancient regulation in this field.

In FR: all collective dwellings with central heating system must be equipped:

- From construction for those having a building permit posterior to February 1980,
- all those constructed prior to this date must have been equipped before December 1985 unless: either 1) it is impossible from a technical point of view or 2) it is economically unacceptable (cost > 10 years of energy consumption for heating)

Although it contributed to important savings, some poor consequences have been observed:

- The savings do not remain stable in the long term because of slackening behaviour
- Designers tend to abandon collective heating for individual heating

compulsory measures related to a periodic inspection of boilers

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Periodic inspection of Boilers	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No
When has the regulation been or when will it be implemented	2000	1978	1980		1977	2002			1998		

This seemingly rather frequently implemented measure encompasses in practice two different situations:

- Countries (Austria, Belgium and Denmark) where all types of buildings and boiler sizes are considered on a yearly basis
- Countries like France and Spain where only large equipment (>100 kW) is concerned by a visit (periodicity is variable (yearly or twice a year in Spain depending on the fuel used, every 3 years in France)

compulsory measures related to a periodic inspection of HVAC

The measure exists only in Spain for the time being (and is planned soon for Greece) which may be due to the fact that , in those southern countries, there is much more need for air conditioning and thus more concern related to HVAC plants good running and maintenance.

compulsory measures related to control systems for heating

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Control systems fo heating	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No
When has the regulation been or when will it be implemented					1978	2002	1992		1998		

In practice, all the countries that have mandatory indoor temperature limits for heating (Finland, Sweden or UK) make it somehow obligatory to have some control system for heating, at least in large buildings of the collective residential or non residential type.

When evaluating the potential gains for this type of measure, one should not add it to the savings provided by mandatory temperature limits. The later defines an objective, control systems (including the different thermostatic zone controls) are only means to reach it.

compulsory measures for hot water in existing building

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Domestic Hot Water	No	No	No	Yes	No	Yes	Yes	No	No	No	No

Correct sizing, water temperature limit and cylinder + pipe work insulation are the measures related to domestic hot water considered for mandatory application in a few EU countries.

When voluntary and/or support schemes (AT, DK, FR) exist, they seem to favour solar thermal solutions.

compulsory retrofit/replacement of existing boilers depending on their age

Whereas most people agree on the fact that old boilers (more than 15 years) should be replaced to limit greenhouse gases emissions and that is a cost effective measure in almost all cases, no country has decided to make it compulsory. It is widely supported on a voluntary basis and when buildings encounter major renovation, they should have their heating system upgraded to the level required by current regulation for new construction.

The main reason that impede a mandatory application is that it would be very unpopular but in general, current legislation does not permit imposing costs on people as implied here, i.e. to oblige people to undertake measures that they had not intended to.

compulsory measure(s) related to efficient lighting

country	AT	BE	DK	FI	FR	GR	IR	NO	SP	SW	UK
Efficient lighting	No	No	No	No	No	Yes	No	No	No	No	Yes
When has the regulation been or when will it be implemented						2002					2002

Some national regulations for new constructions impose minimum efficiency for the lighting service or for its components (sources,, fixtures, controls,..). From a technical point of view, most of these requirements are easily applicable in existing buildings.

Yet, this type of measure seems to have been envisaged recently only. In practice two countries so far have considered its application and this is starting only in 2002.

Conditions of application are still limited (within an audit in Greece, when renovating the lighting system of a surface of more than 100 m² for the UK. Little can be said on the practical ways for checking out compliance. In both countries, the stress will be put on lighting control systems .

mandatory energy audit

This measure is applicable in Denmark since 1997 and is foreseen to become mandatory in Greece this year. Many countries have voluntary schemes, eventually supported by state or utilities incentives .

When an energy audit is conducted, all energy end uses and all energy types are considered.

mandatory energy labelling in buildings

Similarly to energy audits (to which it may often be related) energy labelling is compulsory in Denmark since 1997 and should be applicable from 2002 in Greece and in France.

It is under development in many other countries (BE, FI, PO) and available on a voluntary basis in IR, AT, and UK. It is also incorporated in ECOPROFILE, the voluntary environmental labelling for buildings in Norway.

Expected savings

Few countries have been able to provide detailed data connected to actually monitored results of on going regulations. The most significant figures are indicated in the following table.

Measures	Energy saving as % of total consumption					
	AT	DK	FI	FR	GR	UK
1. Temperature limits	5-10% of heating	-	5%	5 to 10% of heating	~7%	
2. Thermostatic valves	5-10% of heating	-	2%			17% of heating*
3. Individual billing	5-20% of heating	-	1%	from 0 to 17%		
4. Boilers inspection	5-10% of heating	-	2%	8% (average)	~1-2%	
5. HVAC inspection	3-10% of heating	-	3%		~1-2%	
6. Heating control	5-10% of heating	-	1%	5-10%		17% of heating**
7. Hot water	50-70% of hot water (solar collector)	-	1%	35-60 % (solar collectors)		
8. Boilers retrofit/replacement	10-30% of heating	-	2%		~3-5%	20% to 32% (if condensing)*
9 Energy efficient lighting	10-50% of lighting	-	1%		~3%	26% of lighting*
10. Energy audit	?	-	2%	0 (indirect 10-25%)		
11. Energy label	?	Expected: 2-3% of total heating and electricity consumption	2%	?		

* figures only for dwellings

** with all control systems implemented

NOTE: UK also provided figures in CO2 emissions reductions; they are not indicated here for consistency reasons with the other information.

Complementary work will have to be conducted to evaluate properly the potential savings of each of these measures and to assess their average cost and cost effectiveness.

Conclusions

Although the existing building stock represents the larger potential for energy savings, very little has been harvested through mandatory application of measures that are frequently imposed on new constructions.

Unless the buildings face a major renovation, no consideration is made to the building envelope or energy losses due to ventilation.

Generally speaking, regulations are not widely used to take advantage of the progresses made in new buildings to extend these to the already built premises. The Directive of 1993 - which addressed some of these measures - has been little implemented in the field of existing buildings and it will need a huge effort to bring into force the laws, regulations and administrative provisions to comply with the new EU Building Directive in each Member country when it has been adopted.