

<b>Title of the measure:</b>	EU 10	Performance of Heat Generators for Space Heating/ Hot Water (Directive 92/42/EEC)
------------------------------	-------	-----------------------------------------------------------------------------------

### **General description**

With regard to ordinances on heating plant, there has since 1992 been the Pan-European Directive 92/42/EEC dated 21 May 1992 "on the efficiency of new hot-water boilers fired by liquid or gaseous fuels". This Directive, which represents a measure within the parameters of the SAVE programme to promote energy savings in the Community, stipulates the requirements on the efficiency of new water boilers which are fired by liquid or gaseous fuels and whose nominal output is 4 kW or more, or less than 400 kW, i.e. a large part of the heating boilers in households and the small-scale consumption sector.

The efficiency of the boilers is determined as a function of output and for standard boilers can vary between around 85% and 89% under full load conditions. For low-temperature and condensing boilers, the ranges are 88.4% - 91.4% and 91.6% - 93.6% respectively.

Member States may not prohibit, restrict or impede the placing on the market or entry into service within their territories of appliances and boilers which comply with the provisions of this Directive.

Similar to the mandatory uniform labelling of electrical household appliances in all member countries and the establishment of target values for refrigeration and freezer appliances, it is also true in the case of the regulations on heating plant (since the suppliers in the European countries are in competition) that harmonisation of the regulations, at least in the case of new plant, is of major importance for implementation of the single European market, because different mandatory regulations on the level of the individual country create barriers to inter-Community trade.

Lack of harmonisation would also hinder the purpose of the regulations in individual countries. Directive 92/42/EEC in particular is therefore based on the reasoning that high efficiency requirements for hot-water boilers have the consequence that the range of technical specifications of equipment available in the market is reduced; this facilitates series production and promotes economies of scale. In the absence of a regulation which makes requirements on a sufficiently high level binding, the danger exists that completion of the single market will bring with it a tangible output reduction for heating equipment because boilers with poor efficiency ratings can penetrate the market."

Energy consumption by heating plant is most comprehensively regulated in the household sector as a whole. While neither the thermal insulation regulations nor the regulations on energy efficiency of electrical appliances include old equipment and plant operation, the regulations on small heating plants, in particular, attempt to impose strict requirements on old equipment, which must in part lead to premature replacement. The demand for new appliances, which must then comply with the new status of the EU Directive on heating plant, then increases at least in countries which impose and monitor correspondingly tough requirements on old equipment. For this reason, the effects of heating-equipment and small heating-plant ordinances cannot be clearly separated. It would, therefore, be meaningful on a Pan-European basis to supplement EU Directive 92/42/EEC on new plant with appropriate harmonized regulations on plant operation. In combination with the increased requirements under the heating plant ordinances, these measures can contribute more to energy savings in the short time than, for example, toughening of the thermal insulation regulations for new buildings because of the long cycle period of houses. This picture could only be changed by regulations on old building stocks.

### **Impact evaluation**

#### **Impact evaluation (methods and results)**

##### **Methods**

The method used in the main evaluation study is an ex-ante scenario analysis up to 2005 and 2010 (see

MURE case study 2)

### Results

Implementation of the EU Directive on heating plant under national regulations has taken place in all member countries. See Table 2 with regard to notifications of implementation of the EU Directive by the member countries. The source of this information is the CELEX database.

Table 2: Implementation of EU Directive 92/42/EEC under national regulations, as notified by the member countries (CELEX database)

	<b>Implementation date</b>
Austria	(1986)
Belgium	1997 *
Denmark	1994
Finland	1994
France	1994
Germany	1994
Greece	1993
Italy	1994
Ireland	1994
Luxembourg	1996
Netherlands	1992
Portugal	1994
Spain	1995
Sweden	1993
UK	1993

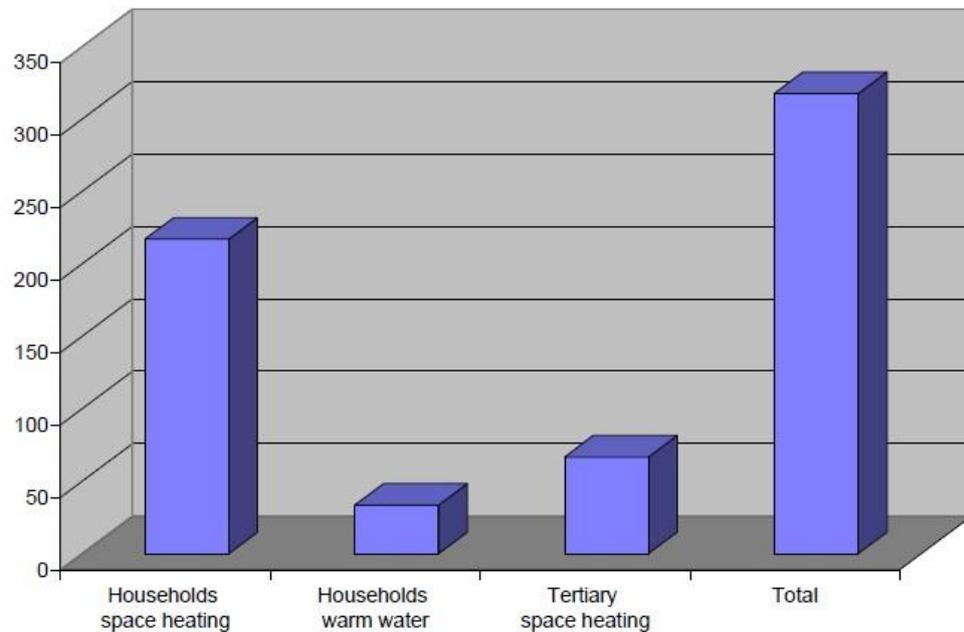
\*corrected by national information

Source: CELEX Database

The impact of the EU Boiler Directive was intensively discussed in a MURE case study (see references). In the first section of the case study, the EU directive is briefly summarised. In the second section national regulations i.e. the translation of the EU directive into national law, are being outlined and their qualitative differences are being analysed. The main differences between the countries arise from the speed with which the Directive, which was issued in 1992, has been translated into national law. While the Netherlands had integrated the Directive already by 1993 into their national laws, it took other countries up to four additional years. All countries analysed allowed for transition periods for the introduction of the new efficient boilers up to the end of 1997, which was the maximum allowed by the Directive 92/42/EEC. For this reason, the boiler directive started to have impact only in 1998. Most EU Member Countries, except Germany have taken up the requirements of the Directive without adding substantially to them, while Germany introduced the additional requirement that low-temperature boilers (or better) would only be admitted. In the last section of the case study a first approach is made for calculating the amount of energy saving and reduced carbon dioxide emission. The energy savings and reduction in carbon dioxide emissions were calculated for the year 2005 taking into account the time of introduction of the boiler directive at the national level, the turnover in the boiler stock, the efficiencies of the boilers existing before the introduction of the Directive, and the share of fuels concerned by it (liquid and gaseous fuels but neither electric heating nor boilers fired with solid fuels). In the years before and after 2005 the savings build up continuously until the full boiler stock is penetrated after roughly 15-25

years. Countries such as Sweden with strict regulations concerning boiler efficiencies already before the introduction of the Directive have correspondingly lower savings compared to countries with less strict national regulation. The savings in Germany can partially be attributed to the additional requirements of low-temperature boilers. About three quarters of the carbon dioxide reduction is contributed by the household sector, representing about 10% of the CO<sub>2</sub> emissions from the boilers concerned by the Directive in this sector.

Figure 1 Energy savings in 2005 in the residential and tertiary sector due to the EU boiler Directive 92/42/EEC (static approach)



Source: MURE case study 2

The three scenarios the interaction with building codes are considered:

- scenario A: the static approach, based on the 1995 demand for heating (no new regulation to improve thermal insulation standards)
- scenario B: new regulation to improve thermal insulation of new buildings (Danish Standard)
- scenario C: new regulation to improve thermal insulation of new buildings (Danish Standard) + intensification of insulation of old buildings

The result of this scenario analysis is given below:

Table 3: Savings of energy and CO<sub>2</sub>-emissions in the households in 2010 in the scenarios A,B and C (EU15, space heating only)

	Revision <sup>1</sup> of national thermal insulation regulation planned for	Energy savings 2010					
		Scenario A (status quo)		Scenario B (better insulation of new buildings)		Scenario C (insulation of new and old buildings)	
		PJ	mio. t CO <sub>2</sub>	PJ	mio. t CO <sub>2</sub>	PJ	mio. t CO <sub>2</sub>
A	2005	11,78	0,82	11,37	0,79	10,25	0,71
B	1999	26,68	1,83	24,45	1,68	19,23	1,32
DK	2005	0,00	0,00	0,00	0,00	0,00	0,00
FIN	2003	2,15	0,16	2,04	0,16	1,76	0,13
F	2005	62,11	4,19	60,25	4,07	54,35	3,67
D	2000	103,98	7,09	97,22	6,63	78,50	5,36
GR	2005	3,56	0,27	3,46	0,26	3,13	0,24
IRL	2005	3,43	0,24	3,32	0,24	2,99	0,21
I	2005	37,24	2,42	35,90	2,33	32,36	2,10
L	2005	0,38	0,03	0,36	0,02	0,33	0,02
NL	2001	27,71	1,65	26,26	1,57	21,72	1,30
P	2005	0,01	0,00	0,01	0,00	0,01	0,00
E	2005	2,03	0,14	1,97	0,13	1,77	0,12
S	2005	0,00	0,00	0,00	0,00	0,00	0,00
UK	2001	71,83	4,34	67,72	4,10	55,95	3,38
<b>EU15</b>		<b>352,89</b>	<b>23,19</b>	<b>334,34</b>	<b>21,97</b>	<b>282,36</b>	<b>18,56</b>

<sup>1</sup> years in *italic* are set by default

According to Conti (1996), periodic checks on the efficiency of heating plant can, if fully implemented, save up to 276 PJ across Europe in five years (i.e. around 55 PJ a year). Under EU Directive 92/42/EEC on heating equipment, assuming that it was implemented by ordinances in most countries from 1995 (in some cases, this did not happen until later) and using the methodology described in Ziesing et al. (1997), around 312 PJ (21.4 million t CO<sub>2</sub>) could be saved in 2005. Through a heating plant ordinance which in the case of replacements or new plants permits condensing boilers only (low-temperature or condensing boilers are stipulated in Germany), 538 PJ (36.9 million t CO<sub>2</sub>) can be saved. These deliberations took no account of premature replacement of heating equipment resulting from national requirements under the regulations on small heating plant.

Only gas and oil-fired boilers were taken into account as only these are covered by the EU Directive. The CO<sub>2</sub> savings are, therefore, also less than for the equipment stock as a whole because only the emission factors for these two energy carriers were taken into account.

No major distortions in favour of a particular energy carrier are created by the EU Directive 92/42/EEC, because coal is not taken into account, and in any case makes up only about 10% of energy requirements for heating. Shifts between oil and coal are also unlikely because the efficiency levels of modern oil-fired low-temperature boilers are as high as that of gas boilers. The ratio might shift significantly in favour of gas boilers only in the case of increased preference for condensing boilers.

Replacement of boilers for preparation of hot sanitary water (and only those which are centrally heated by oil or gas, which are the only ones affected by the Directive) contributes a further saving of 19 PJ or 1.3 million t of CO<sub>2</sub>. Here it must be remembered that a number of countries have very few centrally heated boilers, or use the energy carrier electricity, which is not covered by the Directive. With increased penetration of condensing boilers, a saving of 33 PJ (2.1 million t CO<sub>2</sub>) is achieved for hot-water boilers. As in the case of heating equipment, the calculations were based on assumptions about boiler replacement, development in the total number of boiler plants by 2005 and efficiency improvements. In a study of the EU, it is estimated (Fissamber et al., 1997) that, on complete implementation of Directive 92/42/EEC in 2010, 469 PJ of primary energy will be saved per year. With the current fuel mix in the EU, this is equivalent to a reduction in CO<sub>2</sub> emissions of 20-26 million t a year.

<b>Ex-post evaluation</b>	1995	2000		
direct CO <sub>2</sub> (kt)				
Energy (TJ) (Fuels/Electricity)				
<b>Ex-ante evaluation</b>	1995	2000	2010	2020
direct CO <sub>2</sub> (kt)			23.200 <sup>*)</sup>	
Energy (TJ) (Fuels/Electricity)			350.000 <sup>*)</sup>	

\*) only space heating. Hot water and space heating see Figure 1 for 2005

## Historical data

## References

- Council Directive 92/42/EEC of 21 May 1992 on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels, Official Journal L 167 , 22/06/1992 P. 0017 - 0028
- Conti, F.: *La Direttiva SAVE sulla certificazione energetica degli edifici*, La Termotecnica, Settembre 1996, S. 77-85.
- FhG-ISI (1998a): MURE Case study 2 - Impact of the Introduction of the EU Boiler Directive 92/42/EEC (FhG-ISI), see [www.mure2.com](http://www.mure2.com) (MURE References and Case Studies)
- FhG-ISI (1998b) Langfristig wirkende Einschränkungen des Energieverbrauchs in der Bundesrepublik Deutschland und der EU - Übersicht, Struktur, Entwicklung, Bewertung. Synopse der zu einer Reduktion des Energieverbrauchs führenden Vorschriften. Band I-III. Endbericht Forschungsauftrag Nr. 45/96 im Auftrag des Bundesministeriums für Wirtschaft, Fraunhofer Institut für Systemtechnik und Innovationsforschung (FhG-ISI), ECN (Petten, Niederlande), Inestène (Paris, Frankreich), Istituto di Studi per l'Informatica e i Sistemi ISIS (Rom, Italien), March Consulting Group (Manchester, Großbritannien), Karlsruhe September 1998
- Fissamber, V.; Janssen, R.; Laponche, B., Lees, E.: *The SAVE programme. Evaluation of the European Union Programme (1991-1995)*, Endbericht an das Generaldirektorat für Energie (DGXVII) der Europäischen Kommission, Brüssel, Februar 1997.
- Ziesing, H.-J. u.a.: *Politikszenerarien für den Klimaschutz*. Untersuchungen im Auftrag des Umweltbundesamtes. Hrsg. von G. Stein und B. Strobel. Band 1: Szenarien und Maßnahmen zur Minderung von CO<sub>2</sub>-Emissionen in Deutschland bis zum Jahre 2005. Jülich: Forschungszentrum, 1997