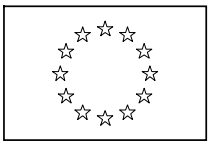

COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 11.5.2001
COM(2001) 226 final

2001/0098 (COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the energy performance of buildings

(presented by the Commission)

EXPLANATORY MEMORANDUM

1. Introduction

In its Green Paper "Towards a European Strategy for Energy Supply"[1] the Commission highlighted three main points:

- The European Union will become increasingly dependent on external energy sources; enlargement will reinforce this trend. Based on current forecasts, if measures are not taken, import dependence will reach 70% in 2030, compared to 50% today.

- At present, greenhouse gas emissions in the European Union are on the rise, making it difficult to respond to the challenge of climate change and to meet its commitments under the Kyoto Protocol. Moreover, the commitments made in the Kyoto Protocol must be regarded as a first step; climate change is a long-term battle involving the entire international community.

- The European Union has very limited scope to influence energy supply conditions. It is essentially on the demand side that the EU can intervene, mainly by promoting energy savings in buildings and in the transport sector.

These observations provide strong reasons to economise the use of energy wherever possible. The residential and tertiary[2] sectors have been shown to be the largest overall end users, mainly for heating, lighting, appliances and equipment. Numerous studies and practical experience show that there is a large potential for energy savings here, probably larger than in any other sector[3]. Member State and Community efforts to realise this potential need, therefore, to be intensified.

The Green Paper concludes in this regard that, in general, the Community programmes for the support and promotion of new technologies have not succeeded to bring about the application of new standards on energy efficiency in buildings in many Member States. Therefore, more emphasis should now be placed on concrete measures such as the establishment of a clear legislative framework to reduce growth in demand.

The scope for energy saving in the buildings sector and possible measures to realise the large potential here have also been important topics in the European Climate Change Programme[4].

Community action also makes the issue of energy demand management and energy savings a commitment in Candidate countries where, in general, a very large potential for energy savings exists in the residential and tertiary sectors.

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1 COM(2000)769 of 29 November 2000.

2 Tertiary includes offices, wholesale and retail trade, hotels, restaurants, schools, hospitals, sports halls, indoor swimming pools, etc. but excludes industrial buildings.

3 Mesures d'Utilisation Rationelle de l'Energie (MURE) Database, European Commission 1998.

4 COM(2000)88 final of 8 March 2000.

2. Objective and Scope of Proposed Directive

The basic objective underlying this draft Directive is to promote the improvement of the energy performance of buildings within the EU, ensuring in so far as possible that only such measures as are the most cost-effective are undertaken.

Given the low turn-over rate of buildings (lifetime of 50 to more than 100 years) it is clear that the largest potential for improving energy performance in the short and medium term is in the existing stock of buildings. The proposed Directive lays down a framework that will lead to increased co-ordination between Member States of legislation in this field. The practical application of the framework, however, will remain primarily the responsibility of the individual Member States.

The proposal covers four main elements:

A) Establishment of a general framework of a common methodology for calculating the integrated energy performance of buildings.

B) Application of minimum standards on the energy performance to new buildings and to certain existing buildings when they are renovated.

C) Certification schemes for new and existing buildings on the basis of the above standards and public display of energy performance certificates and recommended indoor temperatures and other relevant climatic factors in public buildings and buildings frequented by the public.

D) Specific inspection and assessment of boilers and heating/cooling installations.

A common methodology for integrated energy performance standards

There is a strong tendency towards an integrated approach in building standards and codes that are being developed in and outside the EU (e.g. in the U.S., Australia, Canada and New Zealand). Such an approach can integrate, in addition to the quality of insulation of the building, heating installations, cooling installations, energy for ventilation, lighting installations, position and orientation of the building, heat recovery, active solar gains and other renewable energy sources. With today's highly insulated new buildings and the trend towards low energy houses, these additional factors play an increasingly large role and should therefore be included in regulatory provisions. Such an integrated approach will give more flexibility to designers to meet energy reduction standards in the most cost-effective way. An integrated approach for the energy performance of buildings has to varying degrees already been applied in D, F, UK, I and NL and some other Member States intend to do the same. In some cases it is mandatory. A common approach on this basis would contribute to a more level playing field as regards the efforts made by Member States to achieve energy savings in the buildings sector. It would also facilitate the comparison of buildings throughout the EU for prospective users and make it easier for designers and constructors to apply standards in other Member States.

A common methodology could then form the basis for integrated minimum energy performance standards for different building categories to be adopted by the Member States, reflecting local circumstances, particularly climatic differences.

Application of these standards to new buildings and to certain existing buildings when they are being renovated

New residential buildings and dwellings as well as new buildings in the tertiary sector should meet the minimum energy performance standards based on an integrated methodology. Furthermore these standards should also be applied to larger (i.e., greater than 1000 m^2) existing buildings, when the buildings undergo larger renovations. It should be noted that the indoor climate conditions should be given due consideration when these standards are applied.

Certification schemes for new and existing buildings on the basis of the above methodology

One of the main reasons for market imperfections as regards investment in energy efficiency on the rental market is the fact that the owner and renter of a building, dwelling or office have different interests. As the renter normally pays the energy bill, the incentive for the owner to invest in energy efficiency is weak. The best way to make these investments more attractive is to provide clear and reliable information to prospective renters. Clear information will influence the rent that can be asked and therefore will be an incentive for owners to make investments in the energy efficiency of buildings and houses. Therefore, to facilitate the transfer of this information on the energy performance of buildings and apartments, energy certificates for new and existing buildings and dwellings should be available when these are constructed, sold or rented out. This certification, which should not be more than 5 years old, should be based on the same integrated approach as used for the minimum standards for new buildings and should include accompanying advice on how to improve the energy performance of the building.

In the case of public authority buildings and certain privately owned or occupied buildings frequented by the public, energy certificates not more than 5 years old must be prominently and permanently displayed for the public. Public authority buildings and buildings frequented by the general public are able to demonstrate efficient technology and to set examples by incorporating energy efficiency measures into the renovation of such buildings. Appropriate measures can make the public aware of the energy performance of these buildings and also provide recommendations to improve them. This is best done by means of a certification procedure.

In addition, for public authority buildings and buildings frequented by the general public, in order to inform the public and to promote the proper use of heating, air-conditioning and ventilation systems, certain information should be clearly displayed.

The displayed information should include the range of indoor temperatures and, when local climatic conditions require it, other relevant climatic factors such as relative humidity, that are recommended by the authorities for that specific type of building. This will help to avoid unnecessary use of energy and to safeguard comfortable indoor climatic conditions (thermal comfort) in relation to the outside temperature.

The current inside temperature and, when appropriate other relevant climatic factors, should also be displayed and indicated by means of a reliable device or devices.

Certification for new buildings is at present mandatory in DK, D and UK. For existing buildings, only Denmark has a mandatory scheme but several Member States have voluntary programs.

In Denmark, a calculation on the basis of the database of 3.5 years of certification of 160,000 houses showed a total cost of the certification of ca 25 M€ and identified potential savings measures of ca 125 M€. These measures reduced the costs for energy for the consumers by 20M€ each year. In this particular case, certification, together with the implementation of identified measures, provided a more than 13 % return on investments.

Specific inspection and assessment of heating/cooling installations

Heating installations are recognized to be a key issue as regards energy efficiency. Boilers with an effective output of more than 10 kW, the power necessary for smaller households with accumulation capacity, up to boilers for blocks of flats, offices, etc. should be regularly inspected to improve their operating conditions. Such an inspection is compulsory in 10 Member States whilst the others apply voluntary schemes and information programs.

In the case of boilers more than 15 years old, the entire heating installation should be inspected and advice should be given to the users on alternative solutions which could reduce energy consumption.

Similar measures need to be taken as regards cooling systems, in particular in larger buildings.

3. Energy consumption in the buildings sector

The total final energy consumption in the EU in 1997 was about 930 Mtoe. A simplified breakdown of this demand shows the importance of buildings in this context: **40.7 %** of total energy demand is used in the residential and tertiary sectors, most of it for building-related energy services (see Table 1). It should also be pointed out that approximately 10 % of the consumed energy in buildings comes from renewable energy sources (RES).

Space heating is by far the largest energy end-use of households in Member States (57%), followed by water heating (25 %). Electrical appliances and lighting make up 11% of the sector´s total energy consumption (see Figure 1). For the tertiary sector (see Figure 2) the importance of space heating is somewhat lower (52 % of total consumption of the sector), while energy consumption for lighting and office equipment and "other" (which is mainly office equipment) are 14% and 16%, respectively.

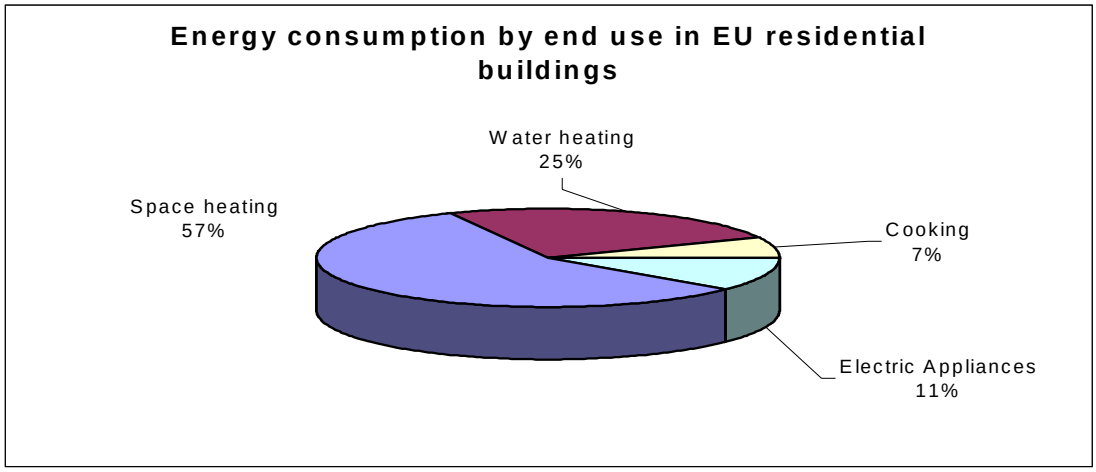

Figure 1: Energy consumption in the residential sector[5]

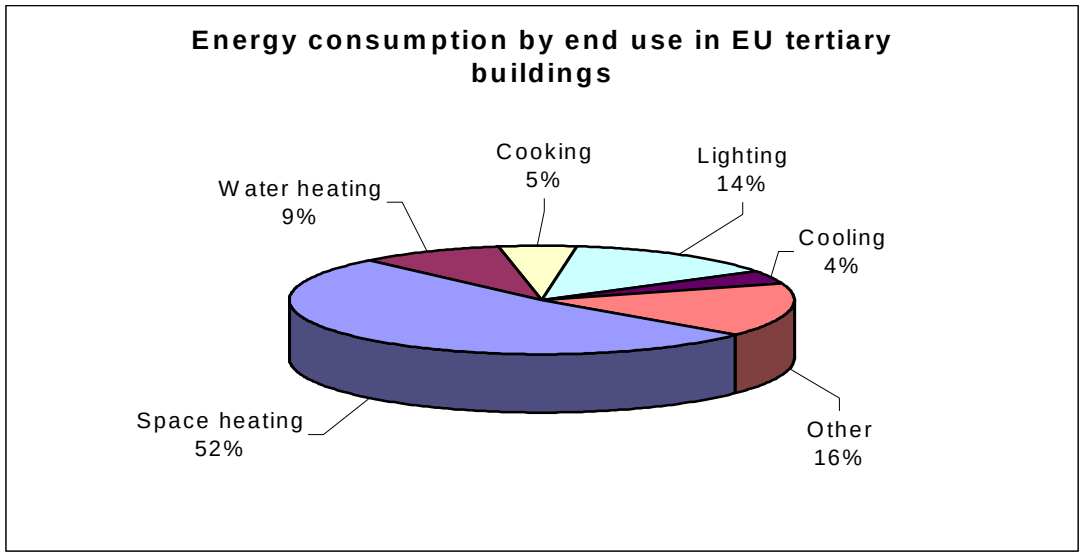

Figure 2: Energy consumption in the tertiary sector[6].

5 COM(2000)769 of 29 November 2000

6 *Ibid*

Table 1: European Union Final Energy Demand by Sector and by Fuel in 1997 (Mtoe)[7]

Final Energy Demand by sector / Final Energy Demand by fuel	**Buildings (residential + tertiary)**	% of total final energy demand	**Industry**	% of total final energy demand	**Transport**	% of total final energy demand	**Total**	**% of total final energy demand**
Solid fuels	8,7	0,9%	37,2	4,0%	0,0	0,0%	**45,9**	**4,9%**
Oil	101	10,8%	45,6	4,9%	283,4	30,5%	**430,1**	**46,2%**
Gas	129,1	13,9%	86,4	9,3%	0,3	0,0%	**215,9**	**23,2%**
Electricity (incl. 14% from RES)	98	10,5%	74,3	8,0%	4,9	0,5%	**177,2**	**19,0%**
Derived heat	16,2	1,7%	4,2	0,5%	0,0	0,0%	**20,4**	**2,2%**
Renewables	26,1	2,8%	15,0	1,6%	0,0	0,0%	**41,1**	**4,4%**
Total	**379,2**	40,7%	**262,7**	28,2%	**288,6**	31,0%	**930,5**	**100,0%**

[7] "Energy in Europe - European Union Energy Outlook to 2020", Special Issue November 1999, the Shared Analysis Project, European Commission.

4. Potential savings through energy efficiency measures in the building sector

4.1 Scope of the initiative

Aspects of energy in buildings used for heating, hot water, cooling and lighting purposes will be addressed in the present initiative. It should be noted that this document covers the building envelope, including windows, and installed equipment such as heating, air-conditioning and ventilation. It does not cover measures for non-installed equipment such as domestic appliances (including cooking), which together are responsible for 18% of the total energy consumption in the residential sector. In the tertiary sector, lighting, which accounts for 14% of the sector´s energy consumption, is for the most part installed equipment and therefore included. Non-installed equipment is estimated to account for around 20% of the tertiary sector´s consumption, due partially to the large share of office equipment. For non-installed equipment, specific policies such as labelling, mandatory minimum efficiency requirements, voluntary agreements, etc. have been implemented or are envisaged in the Action Plan for Energy Efficiency[8].

4.2 Global savings potential

As regards energy in buildings that is used for heating, hot water, air-conditioning or lighting purposes, a savings potential[9] of around **22%** of present consumption is estimated to exist and can be realised by the year 2010[10]. As stated in the European Climate Change Progress Report, this figure has been based on the assumption of a normal rate of retrofitting and rehabilitation for existing buildings, a net increase in the building stock of around 1.5%/year, and a successively increasing share in the use of best available technologies in buildings[11].

In its Green Paper "Towards a European Strategy for Energy Supply"[12] the Commission re-states the indicative target from the Council Resolution of 7 December 1998[13]: to improve energy intensity of final consumption by a further 1 percentage point per year over that which would have been otherwise attained. For the building sector, meeting this indicative target would result in avoided energy consumption of over 55 Mtoe, equivalent to avoided CO_2 emissions of around 100 Mt/year or around 20 % of the EU Kyoto commitment. Meeting this target would also realise two-thirds of the available savings potential in the sector, while making allowance for price fluctuations and possible "rebound effects"[14]. However, for this to be achieved effective action is required.

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8 "Action Plan to improve Energy Efficiency in the European Community" COM(2000)247 final.

9 In this context, savings potential is generally defined in terms of investments in energy-efficient technology having a pay-back period of eight years or less, allowing a high rate of return compared to alternative investments, including investments in energy production.

10 "*Mesures d´Utilisation Rationnelle de l´Energie (MURE)"* Database, European Commission *1998. Op, Cit.*

11 ECCP Progress Report (2000), http://europa.eu.int/comm/environment/climat/eccp/htm

12 COM(2000)769 of 29 November 2000. *Op. Cit.*

13 Council Resolution of 7 December 1998 on energy efficiency in the European Community (98/C 394/01).

14 Studies using the PRIMES model and Ecofys bottom-up approach indicate that the cost-effective potential for emission reduction could be between 130 Mt/year and 160 Mt/year, respectively.

4.3 Savings potential through improvements of the building envelope

In 1995 there were approximately 150 million residential dwellings in the 15 EU Member States. About 32 % of the current stock was built prior to 1945, about 40 % between 1945 and 1973-75, and about 28 % since 1973-75[15]. On average 56 % of the residential buildings are owner-occupied, ranging from almost 40% in Germany to almost 80% in Spain. 66% of the dwellings in the EU-15 are in single family houses, with 80 % and more in Germany, Ireland, Luxembourg and the United Kingdom.

The most recent available EUROSTAT survey on residential energy consumption (published in 1999) shows significant differences in terms of insulation measures carried out among Member States, connected partially but not wholly to the varying climatic conditions between countries. Measures implemented are shown in table 2. The figures indicate the percentage of those participating in the questionnaire who had implemented measures[16].

Table 2: Thermal insulation and glazing in some EU Member States

Insulation Type	FIN	S	DK	IRL	UK	D	NL	B	F	L	A	P	GR
No insulation			1	13	10		14	21	21	55	39	23	77
Loft/roof insulation	100	100	76	72	90	42	53	43	71	35	37		16
Cavity wall insulation	100	100	65	42	25	24	47	42	68	2	26		12
Floor insulation	100	100	63	22	4	15	27	14	24	5	11		6
Double glazing	100	100	91	33	61	88	78	62	52	20	53	3	8

While there has been some improvement compared with the results of earlier surveys, large differences remain between Member States.

The current average heat loss in the EU for new buildings is presently about half of what it is for the pre-1945 housing stock[17]. The total energy used in new dwellings is 60 % of that used in old dwellings. An upgrade of thermal insulation regulations and improved efficiency for installed equipment for existing dwellings, bringing them close to current buildings codes, would help to realise this important savings potential, making it a very desirable and in most cases a cost-effective option.

A comparison of thermal building regulations in the European Union has been carried out. The comparison below shows that rather extreme differences exist in building regulations even after these have been made comparable by correcting for climatic differences using so-called "degree days".The comparison is made by using the model building regulation of Denmark and applying it to each Member State after climatic correction. Consumption as measured by the application of this model

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15 Sciotech (1998), "Electrical Heating and Cooling of Residential Dwellings", study financed by the SAVE Programme of the EC.

16 "Energy Consumption in Households", p.23. EUROSTAT 1999. The figures are indicative to the extent that insulation quality is not taken into account and methodology may vary somewhat between Member States. Complete data from Italy, Portugal and Spain are not yet available.

17 55W/m^2 compared with 100 W/m^2.

building code is, in many cases, dramatically lower than with existing national thermal insulation codes (see Figure 3).

Figure 3: Energy consumption in Member States according to their existing national building regulations compared to the Danish model regulation adjusted for climatic differences[18] [19].

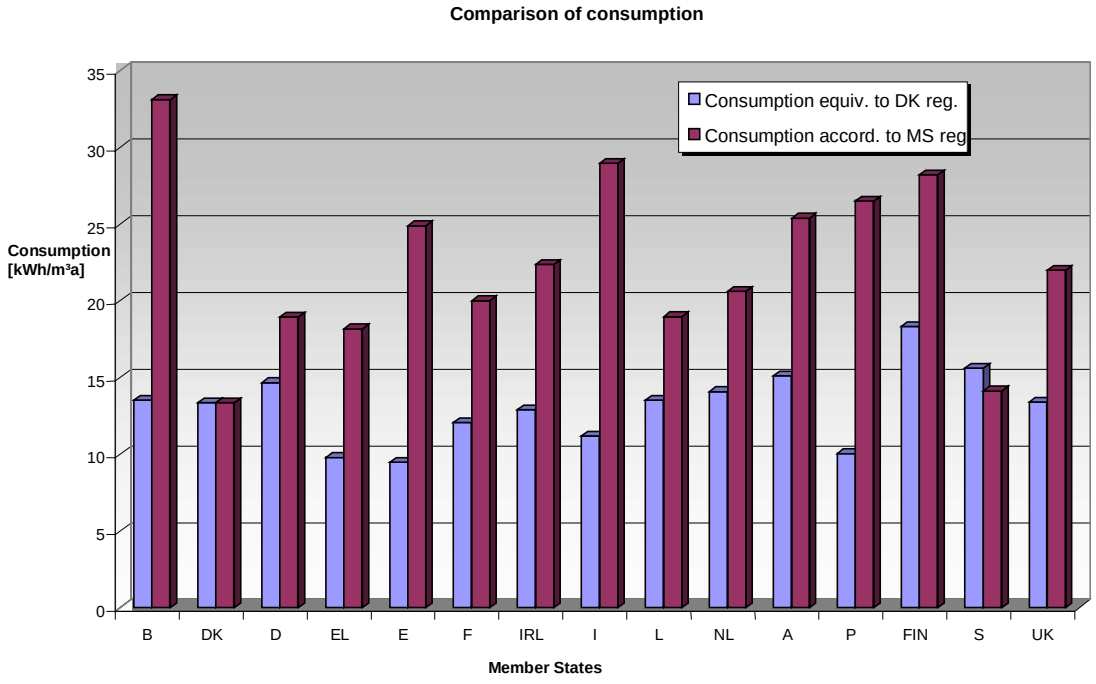

Figure 3 illustrates that a European initiative intended to improve the energy performance of buildings by promoting improved Member State thermal insulation regulations to a level already attained by some Member States could result in substantial energy savings for the EU as a whole.

It should also be pointed out that the above calculations are based on the assumption that the theoretical standards are effectively applied in practice.

4.4 Savings potential of boilers

Directive 92/42/EEC has introduced minimum efficiency requirements for residential hot water boilers, thus ensuring that all new boilers have a reasonable efficiency. However, SAVE studies have indicated that there are, in the EU, more than 10 million boilers more than 20 years old. The savings potential which could be realised by the replacement of these old boilers is calculated by itself to result in reduced consumption by over over 10 Mtoe or around 5% of the energy used for heating in the residential sector.

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18 FhG-ISI (1999), A Comparison of Thermal Building Regulations in the European Union, MURE Database Case Study N° 1, Study carried out in the framework of the MURE project, financed by the SAVE Programme of the EC, http://www.mure2.com/Mr-fr5.htm

19 Simplified calculation, not taking into account solar heat recovery, internal heat sources, ventilation losses; exclusion of heating system efficiencies or energy and insulation cost differences. In cases where several codes exist in the same Member State, only one code has been chosen. In some cases, regional codes are stricter than national codes.

The annual overall efficiency of boilers is improved by the correct matching of the boiler to the heating installation (radiator system), by reducing stand-by losses, by the use of control devices and by the correct sizing of the boiler for the building and climate. Old boilers have much lower nominal and part-load efficiencies and most of them are oversized for various reasons, including the economic incentive for the installer to promote larger and more expensive boilers. The combination of oversizing, high stand-by losses and low efficiency results in an overall efficiency which is 35% below that of new boilers, which are properly dimensioned and installed, and which comply with existing EU minimum efficiency standards.

It should be pointed out that the benefit of a new, modern boiler, assessed only on the basis of its nominal efficiency, is often not sufficient to justify the cost of replacement of a boiler which is still running. An integrated calculation should therefore be made which includes the above-mentioned factors in the life-cycle cost of the new boiler and in the alternative cost (and risk) of retaining the existing boiler.

4.5 Savings potential of other installed equipment

Lighting consumes about 9 Mtoe, or around 4% of total energy in the residential sector, where the majority of lighting fixtures are not permanently installed in the building. In the tertiary sector, where the large majority of lighting is provided by fluorescent lighting which is installed in the building, lighting consumes around 18 Mtoe, or 14% of the sector's energy, as has been pointed out. A large potential savings exists in lighting, especially in the tertiary sector. Savings in the order of between 30% and 50% could be achieved with the use of the most efficient components, the use of control systems and the integration of daylighting and related technologies. These savings, of between 6 Mtoe and 9 Mtoe, represent a significant share of the available potential in the building sector. The recently launched EU GreenLight Programme demonstrates that most of the energy savings in lighting are highly cost-effective.

Air-conditioning is a rapidly growing consumption activity in the residential and tertiary sectors. The total consumption of energy for air-conditioning, which is about 3 Mtoe, or 0,7% of total final energy consumption in the two sectors combined, will double by 2020 if current trends persist. The cost-effective savings potential is about 25%. Much could be achieved by 2010 if the right policy measures are in place at an early stage, including minimum efficiency requirements for air-conditioning equipment.

4.6 Potential for environmentally-friendly energy generation installations

In many buildings, there is a promising potential for reducing CO_2 emissions and saving energy by means of an integrated approach, whereby traditional energy savings on the building envelope are combined with environmentally-friendly energy generation. While this sort of energy generation could in many cases be decentralised and on-site, connection to existing district heating/cooling networks can also be an important means to improve a building’s overall energy performance.

Environmentally-friendly energy generation installations relevant to the buildings sector can broadly be divided into three main groups:

- Renewable energy sources

- Combined heat and power (CHP) and district heating/cooling

- Heat pumps (only in specific cases and under certain conditions)

Renewable energy sources (RES)

On 10 May 2000 the Commission adopted a proposal for a Directive on the promotion of electricity from renewable energy sources[20], which was taken as a matter of priority by The European Parliament and the French and Swedish Presidencies. It is expected that in 2001 this proposal will result in a regulatory framework for electricity from renewable energy sources, including indicative targets for the Member States.

The present proposal addresses the specific potential benefits of integrating RES installations into buildings, covering not only electricity but, equally important, heat generation.

The Green Paper "Towards a European Strategy for the Security of Energy Supply"[21] underscores the importance of developing new and renewable energy sources. It cites the White Paper on RES[22], which estimates that a total installed capacity of 100 million m^2 of solar collectors can be achieved by 2010 (the installed capacity was 9,0 million m^2 in 1998[23]). In a follow-up report on the White Paper[24], which contains more detailed break-downs of the different sectors and technologies, it has been estimated that a large proportion of these solar collectors could be for domestic hot water production (50%), space heating (11 %) and large collective solar heating systems (19%), all relevant to the buildings sector. Photovoltaics is expected in the White Paper to contribute with a total installed capacity of 3000 MW_p by 2010 (from today´s level of around 200 MW_p) of which most is expected to come from grid connected installations integrated into the structure of the buildings (roofs or facades). To reach this potential, however, there is a need for more effective measures and incentives[25].

With regard to biomass, solid biofuels such as logwood, woodchips and pellets are already used, in particular in the residential sector, for heating and hot water. The applications can be both for individual single-family heating and central heating units in large buildings and apartment blocks and, according to the above-mentioned follow-up report on the White Paper, they can provide substantial capacity by 2010 .

Combined heat and power (CHP) and district heating/cooling

Combined heat and power (CHP), suitable for individual buildings and groups of buildings, is another generation technology, which can make a positive contribution

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20 COM(2000)279 final.

21 COM(2000)769 of 29 November 2000, *Op. Cit.*

22 "Energy for the Future: Renewable Sources of Energy", White Paper for a Community Strategy and Action Plan, COM(1997)599 final.

23 Eurostat

24 "Ex-ante Evaluation on the Impact of the Community Strategy and Action Plan for renewable Energy Sources", ALTENER Contract N° 4.1030/T/98-020.

25 In the city of Barcelona for example, under a special ordinance that came into effect on 1 August 2000, most new buildings will have to be fitted with solar panels unless it can be proved that a particular building cannot produce at least 25% of its hot water requirements from solar panels.

to the overall energy performance of a building. Due to the efficient use of the fuel used[26] both for electricity and heat production, CHP is an energy-efficient solution that saves fuel and thereby also contributes to reducing CO_2 emissions.

Increased use of CHP in the buildings sector could make a major contribution to meeting the indicative Community target of doubling the total share for CHP electricity production to 18% by 2010[27]. CHP is applicable mostly in larger buildings such as apartment blocks, hospitals, hotels, leisure centres, airports, shopping centres, and other large office buildings. In the medium to long-term, micro cogeneration units for installation in the residential sector may also offer an additional potential. Connection to existing district heating or cooling networks will often offer an energy efficient option to meet the heating or cooling demand of a building. Where such systems are in operation, connecting more buildings to the network must be a priority. District heating/cooling is also a supply option to consider when planning and developing new residential areas.

Heat pumps

Heat pumps are yet another supply option, which, under certain circumstances, could contribute positively to saving energy in buildings. Heat pumps can have high efficiencies and are applicable in some cases both for single and multi-family dwellings for space heating. Apart from Sweden, the market penetration for heat pumps in most EU countries is modest. The high investment costs compared with other technologies are seen as a major barrier but costs are falling and efficiencies improving.

Promotion of decentralised energy generation in buildings should for all three of the above categories be carried out in a way whereby both demand and supply measures are analysed in an integrated manner. For example, use of energy-efficient or CO_2-free supply forms in buildings with very poor insulation should generally not be encouraged.

4.7 Savings potential in terms of building design and orientation: The bioclimatic dimension

It is estimated that taking full account of existing bioclimatic or ecological dimensions when designing and locating buildings can reduce energy requirements significantly over the lifetime of a building. In certain cases, buildings which already meet high thermal insulation standards can reduce energy demand by up to 60 % by using proper passive solar design, optimised active solar systems for domestic hot water and space heating, improved daylighting and natural cooling and solar/glare control. New buildings can be constructed in this manner with one-fourth of present space heating requirements[28]. Even with existing buildings, where the design and location are already fixed, this savings potential can be significant if favourable conditions exist and are properly exploited .

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[26] According to EUROSTAT, the EU average overall efficiency of CHP plants was in 1998 74,9% compared with an average conversion efficiency of 39,4 % in conventional power generation (CHP Statistics (1994-98) Draft Summary Report and EUROSTAT figures on conventional power generation in Commission Staff Working Paper "Completing the internal energy market", SEC(2001)438).

[27] European Cogeneration Review, July 1999.

[28] IEA (2000), IEA Solar Heating and Cooling Study, SHC, Paris.

The concept of bioclimatic design and construction includes strategies for enhancing all physical parameters and improving heating, cooling, ventilation and lighting.

A strategy for heating and cooling implies that measures are taken which, for example, maximise the use and accumulation of passive solar heat during the heating season or minimise it during the cooling season, depending on the relative lengths of the two. It includes such factors as positioning the house in such a way as to design and expose the maximum external surface area possible to the sun (or, for cooling, to protect it from the sun). It also includes taking into account prevailing wind conditions, potential and existing shading from trees, and heating and cooling accumulation potentials of surrounding terrain and bodies of water, for heat/cooling pumps and similar uses.

A strategy for lighting includes optimising the use of natural daylight to complement and reduce the need for artificial lighting. This is done by allowing for the use of daylighting techniques, including the geometry of windows, light diffusion, prism technology and similar measures.

4.8 Concluding remarks

Energy savings in the buildings sector involves many different economic and technical aspects as described above. In several Member States these aspects have been integrated into a single system to describe the energy performance of a building. With such an integrated approach the different aspects that should be incorporated into the standards for new buildings can be expressed in simple energy performance indicators. Moreover, such an approach allows added flexibility regarding details, giving designers greater choice in meeting minimum standards. In order to achieve a certain degree of harmonisation of assessment of buildings for designers and users throughout the EU, a common methodology based on such an integrated approach should be pursued.

While all Member States apply minimum standards, especially for new buildings, considerable differences exist in the level of energy performance required in these standards. These differences indicate a large potential for improvement and the need for measures to be taken to realise this potential in the most cost-effective way.

Nevertheless it should be recognised that the largest potential for energy saving is in the renovation of existing buildings. In order to address this issue, the most appropriate measure seems to be to introduce certification of buildings in order to raise awareness, and at the same time remedy the major market imperfection that owners have no incentives to invest in buildings they rent out. Special attention should be given to the effective replacement of heating installations. Moreover, buildings should meet higher standards as regards energy performance when they are renovated. As educational information to the general public, the certification of public authority buildings or certain other buildings with high energy consumption which are frequented by the public should be displayed in the buildings, along with recommended and current indoor temperatures and relevant climatic factors.

5. Justification for action at Community level

5.1 Current political context

Art.2 of the EC Treaty calls for a sustainable development of the economy of the Community. *Art.6 of the EC Treaty* reinforced these objectives of sustainable development by integrating environment policy into other Community policies. The Cardiff European Council in 1998 reaffirmed the need for integration of environment into energy policy. *Art. 175* sets the framework for adopting measures with environmental objectives.

The UN Framework Convention on Climate Change requires the parties to adopt policies and to take measures to reduce and limit greenhouse gas emissions in order to stabilise their emissions by 2000 at the 1990 level. This non-binding commitment has been supplemented by the Community 8% reduction commitment as laid down in the Kyoto Protocol of 1997. Whereas the building sector can already provide a substantial contribution to the Community efforts to meet the Kyoto target in the relatively few years left before 2012, it should play an even more important role in the period beyond 2012, where the Commission's proposal for a Sixth Environmental Action Programme foresees a 20-40 % reduction by the year 2020. On 8 March 2000, the Commission adopted the Communication on **"**EU policies and measures to reduce greenhouse gas emissions: Towards a European Climate Change Programme (ECCP)"[29]. The ECCP is based on the May 1999 Communication "Preparing for implementation of the Kyoto Protocol"[30] and follows up suggestions originally given by the Environment Council in June 1998 and in October 1999. The latter urged the Commission to put forward a list of priority actions for common and co-ordinated policies and measures as early as possible in 2000 and to prepare appropriate policy proposals.

In view of the expected increase in emissions in the absence of further measures and the challenge that the majority of Member States may face in meeting their commitments under the EU burden sharing agreement, a reinforcement of policies and measures at EU level becomes an important supplement to national climate strategies.

In its "Green Paper on the security of energy supply"[31] the Commission outlines the prospective energy situation in the EU for 2010 and beyond. One of the essential observations in this Communication is that the EU will in the short and medium term have a decreasing possibility to influence the supply side of energy. However as the EU is one of the main consumer areas it should do its utmost, notably on the demand side, to reduce the strong dependence on external suppliers.

The informal ECOFIN Council in its meeting on 9 September 2000 stressed the need for acceleration of the implementation of EU action plans in the field of energy savings measures and diversification in order to reduce the oil dependency of our economies.

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29 COM(2000)88 final. *Op. Cit.*

30 Commission Communication to the Council and the Parliament "Preparing for implementation of the Kyoto Protocol" COM(1999)230.

31 Green Paper 'Towards a European strategy for the security of energy supply", COM(2000) 769. *Op. Cit.*

In response to the Commission's Action Plan on Energy Efficiency, the Energy Council has adopted two Conclusions during the year 2000. One was adopted on 30 May 2000 and the other on 5 December 2000 [32] [33]. In both the Commission is invited to undertake initiatives, notably in the residential and tertiary sectors, including building certification, improved thermal insulation and improved installed equipment and other installations.

5.2 Additional impact of action at Community level

Under paragraph 4.3 above, the substantial differences which exist between the performance of Member States in the field of energy savings in the building sector have been displayed, along with the most promising measures.

Therefore, the proposal for a new legally binding instrument must be seen in the light of the objective of increasing energy performances of buildings in **all** Member States in the European Union. Reduction of Co2 emissions and security of energy supply are issues of common responsibility for the Member States and therefore a legal initiative at Community level is justified. In some Member States the current building standards date from the late seventies whilst others have recently made substantial improvements in this important sector. It should, therefore, be emphasised that as a first step one of the purposes of this proposal is to achieve a convergence of building standards, including thermal insulation standards towards those of Member States which already have relatively ambitious levels.

The target of improved energy efficiency in buildings has already been set out in earlier existing legal instruments. Among the main existing Community legislation for the building sector are the "Boilers Directive" (92/42/EEC), the "Construction Products Directive" (89/106/EEC) and the "buildings" articles in the "SAVE" Directive 93/76/EEC.

The latter Directive requires Member States to draw up and implement programmes in six specific fields in order to improve energy efficiency. These programmes can be in the form of laws, regulations, economic and administrative instruments, information, education and voluntary agreements.

However, it should be pointed out that this 93/76 Directive was agreed in another political context, before the conclusion of the Kyoto Protocol and before the recent new doubts about the growing dependence of the EU on supply from other global actors. Although this Directive has made a contribution, it has not proven to be completely adequate in reaching the important objective of improving the energy performance of buildings to the degree which is judged to be economically and technically feasible.

The above developments underline the Community dimension of energy efficiency and justify the establishment of more concrete action at Community level that can complement or reinforce existing national measures in this field. It also should be pointed out that a Community approach will create an economy of scale in the internal market for products, components and installations that will improve energy performance of buildings. Moreover, where market imperfections make it necessary

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[32] Council Conclusion 8835/00.

[33] Council Conclusion 14000/00.

to intervene with legal measures such as mandatory certification for the promotion of energy efficiency, a Community approach will give a better guarantee for a level playing field for consumers and industry that e.g. occupy, rent, construct or sell those buildings in the internal market.

5.3 Relevance of the initiative for the Accession Countries

In its 1999 survey of household energy consumption, EUROSTAT included many Central and Eastern European Countries[34]. In most of these CEE countries, more than two-thirds of the population live in urban areas. The share of owner-occupied dwellings is on average higher than in EU-15. It is often between 80 and 90 %, and only in Poland, the Czech Republic and Latvia is it lower than 55 %.

In most CEE countries the percentage of energy consumption used for space heating is more than 70 % of total household energy consumption. In most of these countries, central heating systems (either individual for each dwelling, collective for multi-family houses or district heating for blocks of buildings) are clearly the most common way of heating.

Especially buildings in large-panel construction, which were mostly constructed from the late 60's up to the 90's, are characterised by a very high heat demand, which is 2 to 3 times higher per square meter than that of the EU, mostly due to poor insulation standards.

The transformation of the economies of the CEECs has already led to a considerable increase in energy prices for households, especially for district heating. The realisation of the energy savings potentials in the building sector in these countries, in addition to environmental and security of supply benefits, is also important in reducíng the negative economic impact on household economies of price increases.

6. Contents of the proposal

Article 1 defines the purpose and scope of the proposal.

Article 2 defines the terms and concepts used in the proposal.

Article 3 lays down the requirements for Member States to establish a methodology for an integrated calculation of the energy performance of buildings . A framework for such a methodology has been outlined in the annex to the proposed Directive.

Article 4 obliges Member States to set minimum standards for the energy performance of new buildings and to update them regularly; and to assess the feasibility of installing alternative energy supply systems for large new buildings.

Article 5 obliges Member States to apply the appropriate standards for energy performance to large existing buildings when these buildings undergo major renovations, provided certain cost and cost-effectiveness criteria are met.

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[34] "Energy Consumption in Households 1999" EUROSTAT 1999. *Op.cit*. The investigated CEE countries have been Albania, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovak Republic, Slovenia and Poland.

Article 6 provides for an energy certificate not older than 5 years to be made available for buyers and renters of new and existing buildings at the point of construction, sale or rental. For public authority buildings and buildings frequented by the public such a certification should take place at least every 5 years and the energy certificate must be placed in a prominent place and made clearly visible to the general public In addition, for such public buildings, recommended indoor temperatures and, when appropriate other climatic conditions, should be clearly displayed along with indications of the actual current indoor temperature and climatic conditions.

Article 7 lays down specific requirements for a regular inspection of boilers connected to a one-off inspection and assessment of the total heating installation when these boilers have been installed more than 15 years.

Article 8 requires that central air-conditioning systems shall be regularly inspected.

Article 9 requires Member States to put in place a system that ensures that certification and inspection are carried out by qualified and independent personnel.

Articles 10 & 11 concern the comitology procedure for adapting the annex of the proposed Directive to technical progress or incorporating future agreed standards.

Articles 12& 13 concern the administrative provisions of the proposal.

The Annex to the proposal contains the main aspects to be taken into account when calculating the energy performance of buildings and requirements for inspection of boilers and central air conditioning systems.

2001/0098 (COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the energy performance of buildings

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175 thereof,

Having regard to the proposal from the Commission[35],

Having regard to the opinion of the Economic and Social Committee[36],

Having regard to the opinion of the Committee of the Regions[37],

Acting in accordance with the procedure laid down in Article 251 of the Treaty[38],

Whereas:

(1) Article 6 of the Treaty requires environmental protection requirements to be integrated into the definition and implementation of Community policies and actions.

(2) The natural resources, to whose prudent and rational utilisation Article 174 of the Treaty refers, include oil products, natural gas and solid fuels, which are essential sources of energy but also the leading sources of carbon dioxide emissions.

(3) Increased energy efficiency constitutes an important part of the package of policies and measures needed to comply with the Kyoto Protocol, and should appear in any policy package to meet further commitments.

(4) Demand management of energy is an important tool enabling the Community to influence the global energy market and hence the security of energy supply in the medium and long term.

(5) The Council in its Conclusions of 30 May 2000 and of 5 December 2000[39] endorsed the Commission's Action Plan on Energy Efficiency and requested specific measures in the building sector.

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39 Council Conclusion 8835/00 (30 May 2000) and Council Conclusion 14000/00 (5 December 2000).

(6) The residential and tertiary sector, the major part of which is buildings, accounts for more than 40 % of final energy consumption in the Community and is expanding, a trend which is bound to increase its energy consumption and hence also its carbon dioxide emissions.

(7) Directive 93/76/EEC of 13 September 1993 to limit carbon dioxide emissions by improving energy efficiency (SAVE)[40], which requires Member States to develop, implement and report on programmes in the field of energy efficiency in the building sector, is now starting to show some important benefits. However, a complementary legal instrument is needed to lay down more concrete actions with a view to achieving the great unrealised potential for energy savings and reducing the large differences between Member States' results in this sector.

(8) Directive 89/106/EEC[41] on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products requires that the construction works and its heating, cooling and ventilation installations must be designed and built in such a way that the amount of energy required in use shall be low, having regard to the climatic conditions of the location and the occupants.

(9) The energy performance of buildings should be calculated on the basis of a methodology that integrates, in addition to thermal insulation also other factors that play an increasingly important role such as heating/air-conditioning installations, application of renewable energy sources and design of the building. A common approach to this process, carried out by qualified personnel, will contribute to a level playing field as regards efforts made in Member States to energy saving in the buildings sector and would introduce transparency for prospective owners or users with regard to the energy performance in the Community property market.

(10) Buildings will have an impact on long-term energy consumption and new buildings should therefore meet minimum energy performance standards tailored to the local climate. As the application of alternative energy supply systems is generally not explored to its full potential, a systematic assessment of the feasibility of such systems for new buildings above a certain size is appropriate.

(11) Major renovations of existing buildings above a certain size should be regarded as an opportunity to take cost effective measures to enhance energy performance.

(12) By providing objective information on the energy performance of buildings when they are constructed, sold or rented out, energy certification will help to improve transparency of the property market and thus encourage investment in energy savings. It should also facilitate the use of incentive systems. Public authority buildings and buildings frequently visited by the public should set an example by taking environmental and energy considerations into account and therefore, should be subject to energy certification on a regular basis. The dissemination to the public of this information on energy performance should be enhanced by clearly displaying these energy certificates. Moreover, the displaying of officially recommended indoor temperatures, together with the actual measured temperature, should discourage the misuse of heating, air-conditioning and ventilation systems. This will contribute to

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40 OJ L 237, 22.09.1993, p. 28.

41 OJ L 40, 11.02.1989, p. 12.

avoiding unnecessary use of energy and to safeguard comfortable indoor climatic conditions (thermal comfort) in relation to the outside temperature.

(13) Regular maintenance of boilers and of central air conditioning systems by qualified personnel contributes to maintaining their correct adjustment in accordance with the product specification and in that way will ensure optimal performance from an environmental, safety and energy point of view. An independent assessment of the total heating installation is appropriate whenever replacement could be considered on the basis of cost effectiveness.

(14) In accordance with the principles of subsidiarity and proportionality as set out in Article 5 of the Treaty, general principles providing for a system of energy performance standards and its objectives should be established at Community level, but the detailed implementation should be left to Member States, thus allowing each Member State to choose the regime which corresponds best to its particular situation. This Directive confines itself to the minimum required in order to achieve those objectives and does not go beyond what is necessary for that purpose.

(15) Provision should be made for the possibility of rapidly adapting the methodology of calculation in the field of energy performance of buildings to technical progress and to future developments in standardisation.

(16) Since the measures necessary for the implementation of this Directive are measures of general scope within the meaning of Article 2 of Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission[42], they should be adopted by use of the regulatory procedure provided for in Article 5 of that Decision,

HAVE ADOPTED THIS DIRECTIVE:

Article 1

A common framework is hereby created to promote the improvement of the energy performance of buildings within the Community, taking into account climatic and local conditions.
This Directive lays down requirements as regards :

(a) the general framework of a common methodology for calculating the integrated energy performance of buildings,

(b) the application of minimum standards on the energy performance of new buildings,

(c) the application of minimum standards on the energy performance of large existing buildings that are subject to major renovation,

(d) energy certification of buildings, and for public buildings, prominent display of this certification and other relevant information, and

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42 OJ L 184, 17.07.1999, p. 23.

(e) regular inspection, of boilers and of central air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are older than 15 years.

Article 2

For the purpose of this Directive, the following definitions shall apply :

(1) *building*: a building as a whole or, in the residential sector, parts of the building which have been designed to be used separately such as apartments or semi-detached houses;

(2) *energy performance of a building*: the total energy efficiency of a building, reflected in one or more numeric indicators which have been calculated, taking into account insulation, installation characteristics, design and positioning, own energy generation and other factors that influence the net energy demand;

(3) *minimum energy performance standard of a building*: a regulated minimum requirement as regards the energy performance of buildings;

(4) *energy performance certificate of a building*: an officially recognised certificate in which the result of the calculation of the energy performance of a building according to the methodology set out in the Annex has been laid down;

(5) *public buildings*: buildings occupied by public authorities or frequently visited and used by the general public, such as: schools, hospitals, public transport buildings, indoor sports centres, indoor swimming pools and retail trade services buildings larger than 1000 m2;

(6) *CHP (combined heat and power* :the simultaneous conversion of primary fuels into mechanical or electrical energy and heat;

(7) *air conditioning system*: installation designed to cool and condition the ambient air;

(8) *boiler*: the combined boiler body and burner-unit designed to transmit to water the heat released from burning;

(9) *effective rated output (expressed in kW)*: the maximum calorific output laid down and guaranteed by the manufacturer as being deliverable during continuous operation while complying with the useful efficiency indicated by the manufacturer;

(10) *useful efficiency (expressed in %)*: the ratio between the heat output transmitted to the boiler water and the product of the net calorific value at constant fuel pressure and the consumption expressed as a quantity of fuel per unit time;

(11) *heat pump*: installation that extracts heat from the surrounding environment and supplies it to the controlled environment.

Article 3

Member States shall adopt a methodology of calculation of the energy performance of buildings of which the general framework is set out in the Annex. This methodology shall be further developed and defined in accordance with the procedure referred to in article 11(2).

The energy performance of a building shall be expressed in a transparent and simple manner and may include a CO_2 emission indicator.

Article 4

Member States shall take the necessary measures to ensure that new buildings which are intended to be regularly used meet minimum energy performance standards, calculated according to the methodology framework set out in the Annex. These standards should include general indoor climate requirements in order to avoid possible negative effects such as inadequate ventilation. These energy performance standards shall be updated at least every five years in order to reflect technical progress in the building sector. Member States may exclude historic buildings, temporary buildings, industrial sites, workshops and residential buildings which are not used as normal residences.

For new buildings with a total surface area over 1000 m^2, Member States shall ensure that the technical, environmental and economic feasibility of installing decentralised energy supply systems based on renewable energy, CHP, district heating or, under certain conditions, heat pumps, is assessed before the building permit is granted. The result of such an assessment shall be available to all stakeholders for consultation.

Article 5

Member States shall take the necessary measures to ensure that the energy performance of existing buildings with a total surface area over 1000 m^2 which are being renovated, are upgraded in order to meet minimum energy performance standards in so far as these are technically feasible and involve additional costs that can on the basis of the current average mortgage rate be recovered within a period of 8 years by the accrued energy savings.

This principle shall apply in all those cases where the total cost of the renovation is higher than 25 % of the existing insured value of the building.

Article 6

1. Member States shall ensure that, when buildings are constructed, sold or rented out, an energy performance certificate, being not older than 5 years, is made available to the prospective buyer or tenant.

   Member States may exclude historic buildings, temporary buildings, industrial sites, workshops and residential buildings which are not used as normal residences

2. The energy performance certificate for buildings shall provide relevant information for prospective users. It shall include reference values such as current legal standards and best practice in order to make it possible for consumers to compare and assess

the energy performance of the building. The certificate shall be accompanied by recommendations for the improvement of the energy performance.

3. Member States shall require for public buildings an energy performance certificate, which is not older than 5 years, to be placed in a prominent place clearly visible to the general public.

In addition, for public buildings the following information shall be clearly displayed:

(a) the range of indoor temperatures and, when appropriate, other relevant climatic factors such as relative humidity, that are recommended by the authorities for that specific type of building.

(b) the current indoor temperature and other relevant climatic factors indicated by means of a reliable device or devices.

Article 7

Member States shall lay down the necessary measures to establish a regular inspection of boilers of an effective output of more than 10 kW of which the requirements are set out in the Annex. These requirements shall be further developed and defined in accordance with the procedure referred to in article 11(2).

Article 8

Member States shall lay down the necessary measures to establish a regular inspection of central air conditioning systems of an effective output of more than 12 kW of which the requirements are set out in the Annex. These requirements shall be further developed and defined in accordance with the procedure referred to in article 11(2).

Article 9

Member States shall ensure that the certification of buildings and inspection of heating and air-conditioning systems are carried out by qualified and independent personnel.

Article 10

Any amendments necessary in order to adapt the Annex to technical progress shall be adopted in accordance with the procedure referred to in Article 11(2).

Article 11

1. The Commission shall be assisted by the committee established by Article 10 of Council Directive 92/75/EEC[43], hereinafter referred to as the "committee", composed of representatives of the Member States and chaired by the representative of the Commission.

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43 OJ L 297, 13.10.1992, p. 16.

2. Where reference is made to this paragraph, the regulatory procedure laid down in Article 5 of Decision 1999/468/EC shall apply, in compliance with Article 7 and Article 8 thereof.

3. The period provided for in Article 5(6) of Decision 1999/468/EC shall be three months.

Article 12

1. Member States shall bring into force the laws, regulations and administrative provisions to comply with this Directive by 31 December 2003 at the latest.

   When Member States adopt those provisions, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States shall communicate to the Commission the provisions of national law which they adopt in the field covered by this Directive.

Article 13

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Communities.*

Article 14

This Directive is addressed to the Member States.

Done at Brussels,

For the European Parliament	*For the Council*
The President	*The President*

ANNEX

A. Framework for the calculation of energy performances of buildings (Article 3)

1. The methodology of calculation of energy performances of buildings shall integrate the following aspects:

   a. thermal insulation (of building shell and installations)

   b. heating installation and hot water supply

   c. air-conditioning installation

   d. ventilation system

   e. lighting installation

   f. position and orientation of houses and apartments

2. The positive influence of the following aspects shall in this calculation be taken into account:

   a. solar systems and other heating and electricity systems based on renewable energy sources

   b. electricity produced by CHP and/or district heating systems

3. Buildings should for the purpose of this calculation at least be classified into the following categories:

   a. single family houses of different types

   b. apartment blocks

   c. offices

   d. education buildings

   e. hospitals

   f. hotels and restaurants

   g. wholesale and retail trade services buildings

   h. other types of energy consuming buildings

B. Requirements for the inspection of boilers (Article 7)

The inspection of boilers shall have regard to energy consumption and limiting carbon dioxide emissions.

Boilers of an effective output of more than 100 kW shall be inspected at least every 2 years

For heating installations with boilers of an effective rated output of more than 10 kW which are older than 15 years, Member States shall lay down the necessary measures to establish a one- off inspection of the whole heating installation. On the basis of this inspection, which shall include an assessment of the boiler efficiency at full and part load and the boiler sizing compared to the heating requirements of the building, the competent authorities shall provide advice to the users on the replacement of the boilers and on alternative solutions.

C. Requirements for the inspection of central air conditioning systems (Article 8)

The inspection of central air conditioning systems shall have regard to energy consumption and limiting carbon dioxide emissions.

On the basis of this inspection, which shall include an assessment of the air-conditioning efficiency at full and part load and the sizing compared to the cooling requirements of the building, the competent authorities shall provide advice to the users on possible improvement or replacement of the air-conditioning system and on alternative solutions.