

# **Towards Energy Efficient Buildings in Europe**

***Final Report***

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***With Update of Annexes  
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# **Towards Energy Efficient Buildings in Europe**

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## **Preface to July 2005 Update**

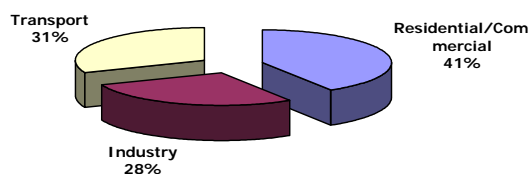
The five annexes have been revised in this report to reflect reported changes to policies related to the buildings sector. In particular, there are revisions to the annexes related to building regulations and energy certification of buildings because they represent a major element of the new EU Directive on the Energy Performance of Buildings. It is this Directive that is a major driver in this important end-use sector. Also, this Directive is to be implemented by January 2006. It will be noted that many member states have not provided much detailed information, a reflection on the state of implementation. This raises the concern that many member states will ask the Commission for a delay. This will have a serious impact on the expected results and the Directive's contribution towards meeting the EU's climate change obligations.

## **Executive Summary**

Promoting energy efficiency in buildings in the European Union<sup>1</sup> has gained prominence recently with the adoption of the Directive on Energy Performance of Buildings in 2002. This Directive builds on the policy framework that has been evolving since the early 1990s. If these measures live up to their expectations, they will make a major contribution to the Community's energy policy objectives and commitments to climate change obligations. Yet, some caution is necessary because improvements in energy efficiency since the early 1990s have been less than expected. Good future results depend on a major commitment by member states to implement these initiatives far more effectively than they have in the past.

The European Union is a region with over 454 million inhabitants, now that it has expanded by adding 10 new member states. Europeans occupy and use a wide array of building types and with an equally wide range of thermal qualities and each year the building stock increases significantly. The 25 member states have all publicly stated their priority to energy efficiency and buildings represent the largest share of energy consumption

### **Energy Demand in 2000 in the European Union**



From all indications, there is high cost-effective potential for energy savings in buildings. The Council Resolution of 7 December 1998 on energy efficiency (98/C 394/01) stated that meeting the indicative target of a 1 per cent improvement in energy intensity above the current trend would result in avoiding energy consumption of 55 Mtoe in buildings. This represents about 20 per cent of the Kyoto Protocol target. Most recent analysis is provided in the original proposal prepared by the EC on the Directive on the Energy Performance of Buildings. The global potential is about 22 per cent reduction of present consumption that can be realised by 2010. This consumption is for heating, hot water, air conditioning and lighting<sup>2</sup>.

Yet, much of that cost-effective potential will not be achieved, in part, because of various market barriers that government policy is trying to address. Achieving the economic potential for energy efficiency is complex. Market players have different approaches and different

<sup>1</sup> Note that Norway and Switzerland are included in this report. They participate in EU programmes.

<sup>2</sup> The proposal states that this is for investments in energy-efficient technology with a pay-back of eight years or less. It should be noted that this is only for EU-15 and not for the EU-25.

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priorities. Energy efficiency *per se* is usually not a major consideration in investment decisions, except during periods of crisis when it is often too late. In a crisis, demand can be reduced by restricting services virtually overnight. But, improved energy efficiency at a regional or national level has to occur through a thoughtful, planned approach over a fairly long period. Due consideration to the factors that are hindering the market from functioning properly need to be examined. And governments have to continually assess whether their measures are properly targeting those barriers.

### ***The Role of the European Union***

The European Union is the major catalyst driving energy efficiency policies and programmes throughout the region. While there are some individual countries that are playing an exemplary and leading role, most are following the lead of the Commission, the European Parliament and the Council of Ministers. This is highlighted by the new Directive on the Energy Performance of Buildings which, once in full implementation phase, will be the most powerful instrument developed to date for the buildings sector. Much is at stake because the Community's climate change strategy and energy strategy are depending on its achievement.

Success cannot be taken as a forgone result though. The steps to full implementation are complex and time consuming. Member states are almost half way through the 3-year period until full implementation and, by an analysis of progress to date, there is much to do – some would argue, too much to do. The Directive is pushing for harmonisation throughout the EU and this in itself is no simple task. The Commission and member states are aided by the major standards body in Europe, CEN, which is making a major effort to expedite its standards development process.

But the Directive on Energy Performance of Buildings is not the only EU-wide legislation affecting energy efficiency in buildings. There is a wide array of directives including one on boiler efficiency. There is also a proposal for a new directive on energy services, which, once adopted, will have energy companies play a more active role in all countries.

The European Union also has some major technical and non-technical programmes to help further promote energy efficiency. These programmes play an important facilitation role and have helped bring experts from around the EU together to find common solutions.

The European Union has set the process in motion but it too has to play an important supportive and monitoring role to ensure that all directives are implemented effectively. It also has to support greater analysis and ensure regular evaluation of all its programmes and directives to provide better guidance for the future development of policies and programmes.

### ***Implementing Energy Efficiency Policies***

Policies are relatively easy to design but they are not always easy to implement. Member states are implementing a good range of policy instruments for the buildings sector including information, financial incentives, regulations and standards, voluntary measures and R&D. The 10 new member states have core programmes that are generally less well developed and more poorly resourced (human and financial) than the EU-15. Understandably, the priority now is on preparing for the implementation of the Directive on Energy Performance of

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Buildings. Member states are supported by the Energy Demand Management Committee, which was set up under the Directive, to monitor the progress.

Both policy development and implementation are helped by many government actors at the national, regional and international levels. These ministries, energy agencies and other institutions play an increasingly major role in ensuring that energy efficiency in buildings is promoted as effectively as possible.

### ***Conclusions and Recommendations***

There are several conclusions and recommendations that derive from this report. There is much to commend in Europe but there is also a need to avoid self-satisfaction. There are difficult tasks ahead and priority has to be given for the long term, not just until directives are finally set in motion at the national and regional levels.

#### ***Major Conclusions***

- While the buildings sector is receiving important attention in the development of overall energy efficiency policies, there is significant potential for cost-effective energy efficiency improvements to warrant the building sector receiving an even higher policy priority.
- There is a good mix of measures between regulations & standards, information, training and financial incentives. The legislative framework provided through the European Union is an important foundation for national efforts.
- The new member states are starting from a difficult position, with fewer human and financial resources than other member states. They also are burdened with the legacy of a large stock of poorly built housing and poor grid-based heat supply.
- There are important networks of experts – both within and outside government – that have evolved in Europe over the past decade or more. These are important in transferring know-how and exchanging experiences.

#### ***Recommendations***

- There is a need for strong monitoring of the implementation period of the Directive on Energy Performance of Buildings. Once in force in 2006 the Commission needs to take a more pro-active role in ensuring that ms achieve their stated objectives and where there are problems, the Commission needs to take a more active role in finding remedies and where necessary to provide chastisement in order to reinforce Community-wide priorities.
- A network of experts (government and non-government) from the 25 member states should meet at regular intervals to discuss implementation issues related, not only to the Directive on Energy Performance of Buildings, but to the broader approaches to energy efficiency in buildings. The limited terms of reference given to the Energy Demand Management Committee would need to be widened if it is to be the vehicle to carry out this role.

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- Directives such as boiler efficiency directive of 1992 need to be evaluated regularly to provide feedback on what progress has been made over the past 12 years and to help policymakers decide whether new initiatives or modifications to existing directives and their implementation are needed.
- Energy certification of buildings has to be seen, not as an end in itself but as a means to an end. Certification needs to be implemented in parallel with effective information campaigns to explain to the wider public (particularly those buying or looking) and should be promoted through real estate agencies and possibly the insurance industry.
- Governments need to find appropriate incentives (not only financial) in order to encourage building owners and users to implement the recommendations provided in the building energy certificates.
- Government-private sector partnerships in promoting energy efficiency in buildings should be promoted and expanded as per Article 12 of the Directive on Energy Performance of Buildings.
- Better end-use analysis needs to be undertaken in order to know what progress is being made on improving the energy efficiency of buildings. The energy certification programme should be designed to help construct and maintain end-use databases to help in the policy analysis.
- There is a need for a long-term commitment from the EC and member states to promote energy efficiency in buildings.
- Governments need to set an example in their own buildings by making sure that they not only meet the minimum requirements under the various buildings-related directives but also implement best-practice measures and set targets that are both achievable and ambitious for their own building stock.
- The new member states need to be closely monitored and supported to ensure that timetables are met and that they have the necessary capacity – human and financial – in order to meet the challenging obligations of membership in the EU. Analysis of remaining potential that was undertaken for the Directive on Energy Performance of Buildings should be expanded to include the 10 new member states.

## **Chapter 1**

### **Buildings in the European Union**

#### ***Introduction***

Everybody is affected in one way or another by buildings – we are born in them, live in them, work in them, and more often than not die in them, yet the layman probably knows less about them than almost anything else that affects his life.

Richard Reid, *The Book of Buildings*, Peerage Books,  
London, 1984, p. 8.

1. Energy policy has been dealing with buildings ever since the first oil crisis in the 1970s. One of the main concerns is that, unlike automobiles or washing machines, buildings last decades, sometimes centuries. Policy generally followed three main approaches. First, there was a need to upgrade existing buildings to reduce energy consumption, because, for the most part, older buildings tend to be less energy-efficient than modern best practice. Second, there was a need to ensure new buildings would be built according to higher standards of thermal quality because building energy efficiency into the design and construction is cheaper than through retrofit. Third, there was a need to ensure that occupants modified their behaviour to promote the rational use of energy through being aware of how energy is used and through encouraging the elimination of wasteful practice. Total energy consumption in buildings is highly affected by occupants.
2. This leads us to Europe, a continent with some of the most beautiful and well-known buildings in the world and yet a region where over 454 million live and work – in buildings. There is a wide array of building types. Many are hundreds of years old and yet, there is strong growth in new buildings in all sectors. While there are many with good thermal quality there is a very large share that are sub-standard. That share has increased with the recent accession of countries from Central and Eastern Europe that had a high share of poor quality, multi-family apartment buildings. Europe is also the region where energy policy is rapidly evolving.
3. This report assesses energy efficiency policies and programmes in the European Union with respect to buildings<sup>3</sup>. There are many dynamics at play. First, the EU has just expanded from 15 to 25 member states. The new members bring new concerns regarding buildings, because of the high share of poor quality pre-fabricated buildings, because of the high share of often sub-standard district heating and because of the difficulties in financing the necessary refurbishments to bring the buildings up to a relatively energy-efficient condition. The new members, to their credit and often through bilateral and multilateral support, have been investing in refurbishing their buildings and heating systems, even given their limited resources but it is a long, expensive process. Second,

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<sup>3</sup> This report 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. In the services sector, installed lighting is included.



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the EU member states are implementing new measures to promote energy efficiency in buildings. These are ambitious, more comprehensive and wide-ranging; if successful, they will provide many benefits to the energy, environment and housing objectives.

4. The report addresses buildings in all sectors – residential, services (commercial and public)<sup>4</sup> and industrial. It focuses on policies and programmes to promote energy efficiency in both new and existing buildings in the 25 member states, as well as Norway and Switzerland, two countries that are using the EU policy framework for their own domestic programmes.

### ***Energy and the Evolving Context in the European Union***

5. The 25 member states of the European Union are actively developing and implementing energy efficiency policies in a more systematic and co-ordinated manner. In large part, the national initiatives are supported or expanded by the framework provided through the EU. As will be shown in later chapters, the EU is increasingly involved in energy efficiency policies and programmes. This is justified in part because of the policy objectives of energy security, liberalisation and the development of the internal energy market, and environmental protection, especially global climate change.
6. The European Union may well be the region that will establish best practice for efficient energy use in the future, partly because of its recent past. The region is rich in coal. But when oil replaced coal as the dominant fuel earlier last century, Europe became heavily dependent on imports. Over 80 per cent of the EU's oil requirements are imported, and similar levels of natural gas are imported, with over 51 per cent of total energy requirements in Europe coming from abroad. Europe, like most of the industrialised world, got a harsh lesson in the dangers of that dependence during the 1973 and 1979 oil shocks when supplies from OPEC were curtailed. Europe has never recovered from the psychological blow of the crises when there was near-panic reaction to skyrocketing prices and fear of shortages. Still, more than three decades later, security of supply drives energy policy in Europe. The oil shocks sparked moves to create more flexible energy systems through specially created institutions such as the International Energy Agency (IEA), which grew around the fundamental purpose of operating an energy-sharing mechanism in times of crisis. European countries have diversified supplies, reduced dependence on OPEC, developed a broader mix of energy sources and maximised the use of domestic sources, which includes renewable energy. In tandem, policy focused on improving efficiency to reduce energy demand at all phases of the energy cycle. Despite an eased geopolitical and supply situation today, policymakers retain a reflex to find new safe sources, and increasingly those sources are “clean”.
7. Pollution has become a problem that worries people and governments. Today, urban pollution is bringing a new chorus of calls for action, and municipal governments have become new partners in finding solutions. And the global concern about climate change has forced action, through the yet to be ratified Kyoto Protocol, to reduce carbon dioxide emissions, as well as five other greenhouses gases (GHG). Many EU member states

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<sup>4</sup> This sector is also known as the tertiary sector. Throughout this report, the expression services sector will be used.

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know that they will not achieve the first round of Kyoto<sup>5</sup> objectives in 2008-12 without accelerated and serious concerted efforts.

8. To the extent that there is the will in Europe for more efficient energy use, there is also the way, in a system of governance that lends itself to the transnational solutions needed to solve global problems. Commitment to attack the global problem of climate change, combined with a more regional goal of sustainable development that overtly implies sustainable energy development, provide a political setting in Europe that favours more energy efficiency. Partly in response to the demands of the single European market, the Union has developed Europe-wide strategies and targets for energy efficiency that aim to create synergies between national policies and supranational – or Union-wide – goals. The collective aims are driven to some extent by a few progressive, even aggressive, member states, such as Denmark and the United Kingdom, two of several member states that have been willing to experiment with innovative policy instruments to demonstrate that energy efficiency can be improved cost effectively. And for the Union as a whole, there is a generally high awareness and acceptance of cost-effective opportunities because of high end-use energy prices. An energy efficiency service sector has been growing over the years in response to both the cost incentive and the newer concern for the environment. And they have been growing because there is money to be made.
9. The setting is promising. European consumers have become accustomed to being encouraged by governments to use energy efficiently and there are many market actors that are providing valuable services and technologies to consumers. But the picture that is now unfolding is one that is more of opportunity than achievement. Regardless what happened in the past three decades more can and must be done.
10. The potential is enormous. This is a period of change – in how businesses operate, governments manage, and people live. In the 25 member states of the European Union, a flexible, balanced energy system has been evolving throughout the past two decades, including in the new member states. End-use issues are already entrenched in mainstream energy policy in parts of the Union; and the internal market and regional competition are fostering Europe-wide joint action and approaches. The energy scene is being transformed by deregulation of the electricity and gas markets in Europe, and full competition is enshrined long-term policy. Deregulation will undoubtedly initially introduce lower prices that are a disincentive to improved energy efficiency. But it will also be likely to enhance energy efficiency in the medium to long-term because commodity suppliers will need to diversify into new services that will almost certainly be led by energy efficiency services.
11. Technology, too, will accelerate improved energy efficiency, both directly through efficiency-enhancing products and indirectly in the higher standards that are being introduced.
12. This report considers the potential of this unique setting. It analyses the interaction of the many players that will determine whether the wealth of opportunities does, in fact, combine to deliver improved energy efficiency in the buildings sector. At one end of the spectrum is the range of energy supply industries – from providers of fossil fuels and electricity generators to installers of renewable technologies – that cover exploration,

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<sup>5</sup> The Kyoto Protocol, negotiated in December 1997, is under the United Nations Framework Convention on Climate Change. The Protocol will come into force after 55 countries ratified it.

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transformation and distribution to consumers. At the other end is an equally diverse set of end-users supported by providers of energy efficient services and technologies. Both ends of the spectrum are profit-motivated.

13. Perched in the middle are various forms and levels of government with a role that has gained importance with increasing dependence on largely imported fossil fuels. In the interests of security and economic stability, governments have regulated or monitored the energy supply industries – especially the natural monopolies such as electricity and gas distribution. Indeed, governments have, themselves, been suppliers as owners of oil and gas companies and electricity and gas utilities. But governments answer to a constituency that is heavily composed of consumers. The government response in Europe has been to placate both sides of the equation, encouraging the expansion of supply options while also promoting reduced energy consumption.
14. Indeed in the European context, the role of government – national and super-national – offers some of the most interesting clues to the future of energy efficiency. While consumers, energy service companies, equipment manufacturers and distributors, energy companies, trade and business groups and non-governmental organisations are all linked and critical to the outcome, governments will be central in promoting efficiency, identifying the opportunities and the obstacles in taking energy efficiency measures. The European Commission has played an increasingly important, and sometimes controversial, role and will be perhaps the main force in removing the impediments to energy efficiency in a way that will send a clear signal to market players that their financial interests will be served by adopting efficient practices.

## **Chapter 2**

### **The Case for Improved Energy Efficiency in Buildings**

While many experts and the energy service industry have made the arguments for improved energy efficiency in buildings at both the national and international levels, there has often been some misunderstanding about what is energy efficiency and what it means in day-to-day activities. While there are many definitions of energy efficiency, this one is representative<sup>6</sup>:

An improvement in energy efficiency is regarded as any action undertaken by a producer or a consumer of energy products that reduces energy use per unit of output, without affecting the level of service provided. Energy efficiency improvements can therefore be considered at all stages of the various fuel cycles. Greater energy efficiency can be brought about through hardware improvements, such as technological enhancements; software changes, such as improved energy management and better operational practices; or a combination of both.

Energy efficiency is a stated energy policy objective in all European countries. It is now and has been for many years, even decades. These policies are described more below in Chapter 4.

The arguments for improved energy efficiency in buildings focus on:

- Reduced energy costs to consumers, which for many the reduction is important in avoiding “fuel poverty” (where energy costs represent a disproportionate and unsustainable share of disposable income);
- Security of energy supply;
- Cheaper than investing in increased energy capacity;
- Improved comfort;
- Lower GHG emissions, which means a major contribution to climate change strategies and helping to achieve the Kyoto Protocol targets;
- Contribution to the rehabilitation of certain building types in the new member states of Central and Eastern Europe;
- A major contribution to the objective of sustainable development, which all European countries have committed themselves toward; and
- Improving energy efficiency in buildings is important to the buildings energy service industries that are important employers in Europe.

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<sup>6</sup> IEA, *Energy Efficiency and the Environment*, OECD, Paris, 1991.



### *Assessing the Potential for Energy Efficiency*

Energy efficiency potential is a concept that needs clarification. Energy efficiency can be measured according to different criteria, each with different potentials<sup>7</sup>.

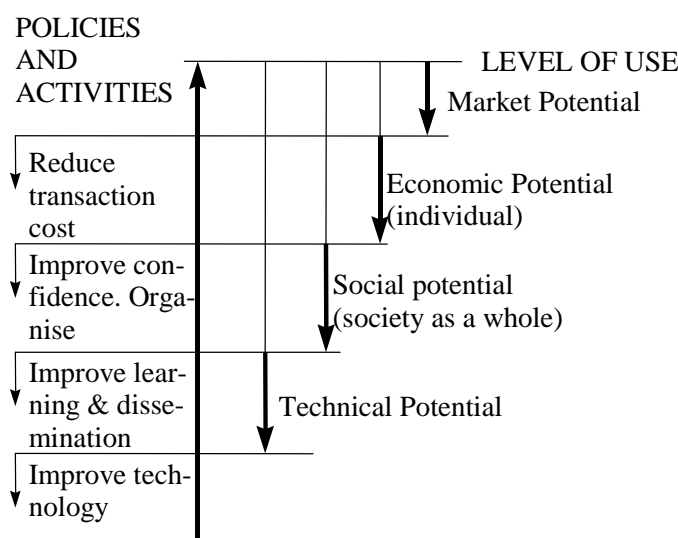
- *Theoretical potential* corresponds to an ideal. It is the lowest amount of energy needed to perform a service if all energy losses, frictions and other inefficiencies could be eliminated. The theoretical potential is difficult to assess and will always remain a remote benchmark.
- *Technical potential* is where the same service would be provided using the best commercially available technology available at the time regardless of cost.
- *Economic potential* depends on energy costs and how technologies are costed. The economic potential is achievable in a fair and perfectly functioning market economy, where externalities are accounted for and prices send the right signal.
- *Social potential* is the saving that can be achieved at a net positive economic effect to society as a whole. It is higher than the economic potential. The social potential is a form of economic potential but seen from the society's point of view, not the individual's.
- *Market potential* is the potential that is expected to be achieved under the “business as usual” case, with all the current obstacles, as well as institutional and market imperfections, and expected energy prices.

The various types of potential are shown in the following diagram, along with the types of policies and measures that are needed at the various stages of potential.

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<sup>7</sup> For a more complete discussion see IEA, Danish Energy Agency and Energy Charter Secretariat, *Energy Efficiency Initiative*, OECD, Paris, 1997.

**Figure 1**  
**Energy Efficiency: Different Types of Potentials and Policies for Improvements**



Source: Lena Neij, adapted from *Dynamics of Energy Systems*, Lund University, (Lund, Sweden 1999) in IEA, Energy Efficiency in the Baltic Sea Region, an IEA report to the Baltic Energy Efficiency Group, 1999/09-23

## Economic potential of energy efficiency improvements in buildings

Assessing the economic potential for energy efficiency in buildings is largely theoretical, based on discount rates and current or expected energy prices. There is no widely accepted view on discount rates, meaning that what is considered economic by one may not be considered economic by another. But, as a rule of thumb, technologies are considered economic if they optimise costs relative to best practice.

An issue related to the economic potential is whether consumers value energy efficiency. The energy efficiency is often a minor consideration, especially if energy costs are seen as a relatively small share of total costs. Consumer decisions are based on factors ranging from initial price to reliability to colour to ease of use. Decisions vary by culture and by end-use sector. This is a complex area that requires significant monitoring and analysis.

Most recent analysis is provided in the original proposal prepared by the EC on the Directive on energy performance of buildings [COM (2001) 226 final, 11.5.2001]. The global potential is about 22 per cent reduction of present consumption that can be realised by 2010. This consumption is for heating, hot water, air conditioning and lighting<sup>8</sup> and it should be remembered that this is only for EU-15 and not EU-25. This analysis was undertaken several years ago but many analysts believe that the level of the potential is still valid today.

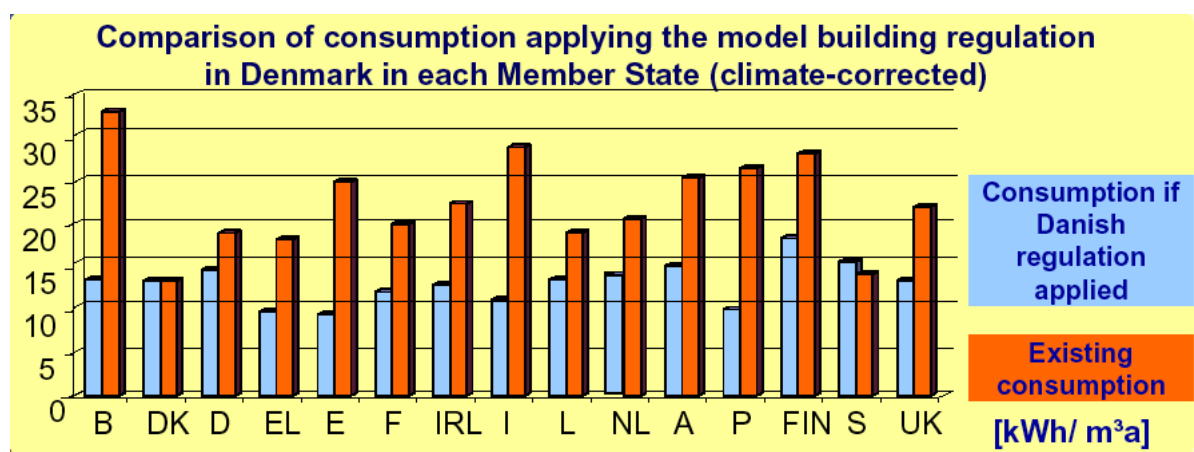
The Council Resolution of 7 December 1998 on energy efficiency (98/C 394/01) stated that meeting the indicative target of a 1 per cent improvement in energy intensity above the

<sup>8</sup> The proposal states that this is for investments in energy-efficient technology with a pay-back of eight years or less.

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current trend would result in avoiding energy consumption of 55 Mtoe in buildings. This represents about 20 per cent of the Kyoto Protocol target.

The Communication on the then proposed directive on energy performance of buildings, described above, stated that there is significant potential in improvements of the building envelope. Total energy consumed in new buildings is 60 per cent of that used in existing buildings. The following diagram illustrates the broad potential that is possible, if member states were to achieve the level already attained by Denmark.



Replacing old boilers could reduce energy consumption by over 10 Mtoe or 5 per cent of energy used in heating in the residential sector, according to analysis undertaken for the Communication. New boilers have an efficiency of approximately 35 per cent more than existing ones. To better understand the importance of boilers, In the EU, space heating represents about 57 per cent of total consumption in residential buildings and 52 per cent in service sector buildings. Unfortunately, there has not been any official examination of the boiler efficiency directive from 1992 to have a better appreciation whether the estimated savings are achievable.

The Communication further estimated that there could be savings in lighting of between 6 Mtoe and 9 Mtoe, with savings in the range of 30-60 per cent. In the services sector, most of the lighting is permanently installed and thus considered part of buildings policy. Lighting represents about 14 per cent of total energy consumption in the services sector.

### ***The Major Barriers to Achieving the Economic Potential***

Achieving the economic potential for energy efficiency is complex. Market players have different approaches and different priorities. Energy efficiency per se is usually not a major consideration in investment decisions, except during periods of crisis when it is often too late. In a crisis, demand can be reduced by restricting services virtually overnight. But, improved energy efficiency at a regional or national level has to occur through a thoughtful, planned approach over a fairly long period.

For the past decade, every study on energy efficiency has dwelt on the market barriers that hinder the realisation of the economic potential for energy efficiency. Old entrenched values



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and philosophies that result in part from long-term market signals are hard to change. For example, cars are bigger in the United States than in Europe because gasoline has traditionally been much cheaper and distances are greater. This may be an oversimplification, but it is clear that market signals over time do affect consumer behaviour.

Before the first oil crisis in 1973, energy was relatively cheap and shortages were virtually unheard of, except possibly in wartime conditions. Environmental concerns related to energy use were not understood or publicly discussed as they are now. Only when improved energy efficiency became a priority did it become obvious that the market was not functioning in a manner that encouraged improved energy efficiency.

### *The Major Barriers*

#### **Obstacles to economic pricing of energy**

Since the 1980s, there have been virtually no regulations on pricing in the European Union. The market is the determining factor, except in areas where there are monopolies. But, with liberalisation of both the electricity and gas markets in Europe, the market is even more central in determining price. This, however, is causing some problems because prices in some countries are falling dramatically. Cogeneration, renewable energy and energy efficiency are all particularly vulnerable and there is the need for some countervailing policies, if they are to remain policy priorities.

#### **Externalities such as environment, energy security, social policy and employment**

There is still a major issue concerning how to internalise the costs of externalities such as environmental damage. Some EU member states impose environmental taxes to finance measures to protect the environment (such as investments in energy efficiency) as well as to introduce price signals that will influence consumers. Several of these taxes are directed towards reducing carbon dioxide and other GHG emissions. The taxes have mainly been in the northern regions of the EU, with the United Kingdom the latest to implement a new climate change levy for business alone. Back in 1991, the EC proposed an EU-wide energy/carbon tax, which was rejected by Council, but remains on the table.

With the high dependence on imports, energy security remains an important policy objective of the European Union. Energy efficiency has been identified as one of the major policy options to reduce risk.

As a secondary benefit, energy efficiency programmes create employment and the EC recently funded a study showing the employment effects of the various policy measures. Energy efficiency is generally more labour intensive than many other energy policy options and policymakers in Europe are interested in implementing new energy efficiency measures if they increase employment. Such jobs are frequently local, semi-skilled and cost-effective.

#### **Lack of information and technical skills**

Each end-use sector has its own requirements for information and skills, both technical and general. Consumers need good information and so do the energy service sector, architects, distributors, decision-makers. The IEA study noted particular problems for small and medium sized companies in obtaining standardised information. There were problems also in

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the residential sector because of the great diversity of building types, heating and lighting systems and so on.

Sources of information include distributors, utilities and governments via newspapers, internet, and points of sale. Sometimes information can be conflicting and confuse consumers. The credibility and reliability of information is essential, but difficult to guarantee. Therefore, labelling programmes for appliances need to rely on rigorous measurements in order to ensure accuracy.

There have been major efforts to improve the quality of information and the information flow. According to most analysts, there is still a great need for more information on cost-effective opportunities such as: how improved energy efficiency can contribute to reducing greenhouse gas emissions, the impact of new emerging technologies and innovative financing approaches (such as third-party financing).

Many countries have improved their training schemes and introduced energy management into higher education. However, there are not many examples where EU-wide funds for training are being used to improve the quality of the energy service sector.

### **Invisibility of energy consumption and conservation**

One of the problems with energy efficiency is that it is often hard to appreciate its effects. Adding insulation to a building does not immediately translate into reduced heating bills if energy prices are rising or if residents change their behaviour (for example, increase the thermostat setting). Also, often the energy bill is received weeks or months after consumption and the feedback is too distant to motivate consumers. This is improving somewhat by direct debit mechanisms, but feedback is still often poor.

There has been some progress but the problem generally persists. The increased usage of energy management systems improves feedback but they are only starting to increase market penetration in the residential sector. Labelling programmes are helpful in informing purchasers of the expected consumption. The new Directive on Energy Performance of Buildings has a requirement for energy certification to allow consumers or potential buyers of buildings to better visualise the state of the building's energy consumption.

### **Confidence**

There has traditionally been scepticism about predictions on the benefits of new technology. Some sceptics are concerned that new technologies would lack performance and reliability. In some cases, early equipment was substandard and bad reports travelled from consumer to consumer quickly.

Consumers are understandably wary of any new products, not just energy-using equipment. They often look for guarantees or assurance that the products they buy will achieve the promised results. Demonstration projects, grant programmes and a variety of other measures have been used to gain experience to show that the equipment lives up to its promises.

Despite significant progress, the confidence problem is an on-going concern when any new technology comes to the marketplace. Solutions depend on the maturity of the market. Governments can support industry, or industry can do it alone. Often, the public looks for independent advice, and this may mean government needs to develop measures accordingly.

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The best approach is often government working in partnership with industry or utilities to gain the trust of consumers. Involvement of consumers' groups should also not be overlooked.

### **Separation of expenditure and benefit**

Frequently the person who uses energy is not the one who pays directly for the energy uses, or in other cases, such as tenants, the consumer pays for his energy but does not own the equipment to invest in better efficiency. Many governments have tried to address the problem of separation between the user and the energy-use decision-maker.

There are now rental agreements where the consumer directly pays for energy consumption. Billing of consumption according to energy consumption is now officially required in the EU where cost-effective, although member states have interpreted how to do this differently. The individual separation of expenditure and benefit has also been a problem in the public sector and many governments have revised their procedures to allow for, for example, third-party financing of projects. EU governments are currently obliged by Directive 93/76 to draw up and implement programmes to permit third-party financing for energy efficiency investments in the public sector.

### **Access to capital**

Availability of capital was a major constraint one to two decades ago but is less so now, except in the new member states from Central and Eastern Europe. First, financial institutions have more experience with energy efficient equipment and are more willing to provide financing. Second, innovative ways of financing have been introduced, such as third-party financing and energy service companies. There are, though, still some problems with financing because many energy efficiency investments are relatively small and financial institutions are reluctant to provide funding, due to high transaction costs relative to the total cost of the investments.

There is still a problem for certain segments of society (aged, poor) and those countries with such problems are trying to address them. In other cases, investment support is provided, not because of a lack of capital, but to improve the financial viability of a project, to make it more appealing to the consumer.

### **Barriers to technology development**

There were two major technology concerns in the 1980s. There was industrial fragmentation that meant that no single company was large enough to undertake significant research, development and demonstration. Fragmentation was particularly a problem in the building sector and there was little incentive for innovation. Secondly, the private sector was not willing to undertake the risk associated with long-term research.

In both cases, some governments have been active, increasingly through public/private partnerships.

Technology development related to energy efficiency is now seldom seen as a discrete activity but integrated into other such development. More and more, an integrated approach is evolving to ensure that energy efficiency concepts are incorporated throughout the entire product cycle.

### **Institutional barriers**

Too often, existing laws or practices hinder improvements in energy efficiency. Often this is a result of bias in favour of increased energy supply, rather than improved energy efficiency, particularly by industry. Governments generally take a more "hands off" approach to energy supply.

The literature and players involved in energy efficiency indicate a consensus that institutional barriers remain a major concern. For example, several institutional barriers have been identified in the deployment of combined heat and power systems, such as the negative attitude of utilities, problems of access to the grid in the absence of interconnections standards, unfair charges for back-up power, the need for new codes since cogeneration is fairly new, need for more simplified permitting, transparency of transport tariffs, and so on.

In Europe there is particular concern about the effect of the electricity and gas liberalisation directives on energy efficiency improvements. Some studies funded by the EC and the Energy Charter are underway but it will probably take several years of experience to assess the long-term effects. The general hope is that, while there will be an initial detrimental effect because of decreasing end-use prices, in the long run, energy efficiency services will be needed. The Commission has stated in a Communication that it will monitor implementation progress to ensure that combined heat and power is not unduly penalised by liberalisation of the energy markets. Such monitoring should also cover all aspects of energy efficiency. One industry association<sup>9</sup> stated in March 2000 that liberalisation is already having an impact with one-third of installed systems in the Netherlands under threat of closure and 15 per cent of the plants in Germany closed or partially closed. In Germany, end-use electricity prices dropped about 30 per cent in the first year of liberalisation, making combined heat and power less economic. In the United Kingdom, gas prices dropped 44 per cent and electricity 25 per cent, following liberalisation.

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<sup>9</sup> Personal correspondence with COGEN-Europe.

## Chapter 3

### The Growing EU Role in Energy Efficiency

The role of the EU in terms of energy efficiency policies and programmes has evolved since the first oil crisis, in part because the EU, itself, has evolved politically and institutionally. Going back to the 1970s, there were a number of directives (for example, on appliance labelling) that were poorly implemented by member states. There were also programmes to develop new technologies, through both research and demonstrations, starting in the late 1970s. There was a major change in 1989 with the creation of the THERMIE programme, a high profile, high budget demonstration programme that put a high priority on energy efficiency. THERMIE's goal was to promote energy technologies (not only related to energy efficiency) and over the years it has become a part of the Commission's research programme. The original SAVE programme, which became the Community's main programme for energy efficiency, was not approved until October 1991. SAVE was designed to focus on the non-technical measures needed to promote energy efficiency, complementing the earlier technology focus, and was the only EU programme solely dedicated to energy efficiency. It has evolved since 1991, now integrated within a larger framework programme, but remains the Community's focal point on energy efficiency.

Energy efficiency is a priority area within energy policy because of its potential contribution to meeting energy security objectives<sup>10</sup> and meeting Kyoto Protocol targets. Reduced energy demand has to be good for energy security and improved energy efficiency means lower GHG emissions. This does not mean that energy efficiency policy has had a free run. Energy policy in the past decade has been dominated by the liberalisation of the electricity and gas markets to improve the internal market. By striving to reduce the cost of electricity and gas to consumers, this has potentially proven a disincentive to improved energy efficiency. The Commission has sought ways of addressing some of those concerns and has come up with a proposal that will be described later.

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.

Source: Preamble of Directive 2002/91/EC of 16 December 2002 on the energy performance of buildings

### *Policy Development Related to Buildings Energy Efficiency*

Energy efficiency policies and programmes at the Community level have significantly evolved over recent years. In 1998 a *Communication on Energy Efficiency* set out the broad objectives of a European energy efficiency strategy<sup>11</sup>. It called for an objective of an improvement in energy intensity of 1 per cent per year above that which was already

<sup>10</sup> See the Commission's Green Paper, *Towards a European Strategy for Energy Supply*, COM(2000)769, 29 November 2000.

<sup>11</sup> [European Commission, \*Energy Efficiency in the European Community – Towards a Strategy for the Rational Use of Energy\*, Communication from the Commission, Brussels, 29.04.1998 \[COM \(1998\)246 final\].](#)

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occurring. An Action Plan followed the Communication in 2000<sup>12</sup>. The *Action Plan* stated that if energy intensity of final consumption can be improved by an additional 1per cent per year above the baseline expectations, then two-thirds of the available cost-effective savings potential would be achieved by 2010. If it achieved its objectives, this would contribute about 40 per cent of the Community's commitment to meeting the Kyoto GHG emission target.

The *Action Plan* focused on three types of energy efficiency measures:

- measures to enhance the integration of energy efficiency into other Community non-energy policy and programme areas (e.g. regional and urban policy);
- measures for re-focusing and reinforcing existing successful Community energy efficiency measures; and
- new common and co-ordinated policies and measures.

The 2000 *European Climate Change Programme* identified the most environmentally and cost-effective measures to help the EU meet its Kyoto Protocol obligations, and included giving considerable emphasis to energy efficiency. The programme recommended measures in all end-use sectors: increased use of combined heat and power generation; improvement of energy efficiency standards for electrical equipment; improvement of efficiency standards for industrial process; improved energy efficiency limiting carbon dioxide emissions (for boilers, construction products, etc.); increased energy services for small and medium enterprises (SMEs); development of a framework for voluntary agreements; public procurement of energy-efficient end-use technologies; energy audits and heating performance certificates; improvement of building/lighting performances; building design and infrastructure planning; transport pricing; and a European campaign for more fuel-efficient driver behaviour. These measures have all been introduced before, but clearly now they are broadly accepted in the climate change strategy.

Most recently the Energy Intelligent Europe (EIE) Programme, which is discussed again below, was approved in June 2003. The EIE has SAVE as a sub-programme within it.

The EU is also involved in technology development through the 6<sup>th</sup> Framework Programme, which covers all EU-funded research between 2002-2006. Energy efficiency is funded through one of the priority areas of sustainable development, global change and ecosystems.

The Communication on Energy Efficiency and the Action Plan, together with the European Climate Change Programme, Energy Intelligent Europe and the 6<sup>th</sup> Framework Programme, represent the main components of the Community's approach to energy efficiency for its member states. The new member states also had – and continue to have – funding for energy efficiency through the PHARE and SYNERGY programmes. It is important to review the main approach, together with the major proposals currently under consideration.

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<sup>12</sup>EC, Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, *Action Plan to Improve Energy Efficiency in the European Community*, Brussels, 26.04.2000, COM (2000)247 final.

### ***Legislative Actions Related to Buildings***

There is a growing body of legal obligations on member states that directly relate to buildings energy efficiency. Directives cover:

- Appliance labelling for a wide range of products;
- Appliance efficiency standards;
- Boiler efficiency;
- Measures to limit carbon dioxide emissions by improving energy efficiency (Council Directive 93/76) (in six areas including energy certification of buildings; the billing of heating, air-conditioning and hot water costs on the basis of actual consumption; third-party financing in the public sector; thermal insulation of new buildings; regular inspection of boilers; and energy audits of undertakings with high energy consumption); and
- Energy performance of buildings.

The first two categories are not discussed in this report but it is useful to see how they fit into the full range of legal instruments. The box below provides a complete listing of related directives.

**The full range of legislative measures related to energy efficiency in buildings energy use that have been adopted by the European Union since 1992\*:**

- Council Directive 92/42/EEC on "efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels."
- Council Directive 92/75/EEC on "the indication by labelling and standard product information of the consumption of energy and other resources by household appliances."
- Council Directive 93/76/EEC on "to limit carbon dioxide emissions by improving energy efficiency (SAVE)."
- Commission Directive 94/2/EEC implementing Council Directive 92/75/EEC "with regard to energy labelling of domestic electric refrigerators, freezers and their combinations."
- Commission Directive 95/12/EC implementing Council Directive 92/75/EEC concerning energy labelling of clothes washers.
- Commission Directive 95/13/EC implementing Council Directive 92/75/EEC concerning energy labelling of clothes dryers.
- Council Directive 96/57/EC on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof.
- Commission Directive 96/6/EC implementing Council Directive 92/75/EEC concerning energy labelling of household dishwashers.
- Commission Directive 97/17/EC of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers.
- Commission Directive 98/11/EC implementing Council Directive 92/75/EEC concerning energy labelling of household lamps.
- Directive 2000/55/EC of the European Parliament and of the Council of 18 September 2000 on energy efficiency requirements for ballasts for fluorescent lighting.
- Commission Directive 2002/31/EC of 22 March 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household air-conditioners.
- Commission Directive 2002/40/EC of 8 May 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric ovens.
- Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

\*Note that many of these directives are not directly related to this report but are included to show the full range of measures that impact on energy use in buildings.

The directives that directly pertain to buildings in the context of this report are those on boiler efficiency, on measures to limit carbon dioxide emissions by improving energy efficiency and on energy performance of buildings.

### *The Directive on the Energy Performance of Buildings*

The main legislative instrument affecting the buildings sector is the Directive on the Energy Performance of Buildings. The directive is designed to promote the energy performance of buildings in member states by introducing a framework for an integrated methodology for measuring energy performance; application of minimum standards in new buildings and certain renovated buildings, and regular updating of these; energy certification and advice for new and existing buildings; and inspection and assessment of boilers and heating/cooling systems. The directive entered into force on January 4, 2003 and compliance is foreseen at the latest by January 4, 2006. This directive effectively replaces three of the obligations under Council Directive 93/76.

The benefit of this directive is that it provides an integrated approach to different aspects of buildings energy use, which until this directive, only a few member states were doing. The communication on the proposal stated that the largest potential for impact of the directive was on the renovation of existing buildings. For that, the proposal stated that “the most appropriate measure seems to be to introduce certification of buildings.”<sup>13</sup> This was to have been done under Council Directive 93/76 but the last evaluation of that directive showed that this was not very successful. With more experience on certification, the mood appears to have shifted and there seems to be more political will to undertake certification for existing buildings.

A committee was established under the Directive (from Article 14), made up of representatives of member states, with representatives of accession countries allowed to attend (and now they are formal members) and members of the EEA (European Economic Area) are invited to attend. A limited number of experts and stakeholders are invited according to the agenda. The role of the committee is to assist the Commission. One of the major roles of the Commission is to evaluate the Directive in light of experience gained during its application (Article 11). The Commission and Committee are taking an active role in ensuring that member states are going to meet the obligation to bring into force the laws, regulations and administrative provisions necessary to comply with the Directive at the latest by January 4, 2006 (Article 15). While this is a realistic timetable it does not leave any room for complacency.

Standards bodies and others are involved in the implementation process. While member states are free to implement on their own, there has been greater emphasis on Community-wide collaboration.

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<sup>13</sup> COM (2001)226 final, 11.5.2001, p. 14.



## ***Towards Energy Efficient Buildings in Europe***

*From the EU Directive on Energy Performance of Buildings (Directive 2002/91/EC)*

From Article 1:

This Directive lays down requirements as regards:

- the general framework for a methodology of calculation of the integrated energy performance of buildings;
- the application of minimum requirements on the energy performance of new buildings;
- the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;
- energy certification of buildings; and
- regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old.

It is useful to refer to the specific requirements as outlined in the Directive.

### **Adoption of a methodology**

Article 3 states that member states shall apply a methodology at either the national or regional level to calculate the energy performance of buildings on the basis of a general framework outlined in the annex of the Directive.

*From Directive Annex*

**General framework for the calculation of energy performance of buildings (Article 3)**

1. The methodology of calculation of energy performances of buildings shall include at least the following aspects:

- (a) thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air-tightness;
- (b) heating installation and hot water supply, including their insulation characteristics;
- (c) air-conditioning installation;
- (d) ventilation;
- (e) built-in lighting installation (mainly the non-residential sector);
- (f) position and orientation of buildings, including outdoor climate;
- (g) passive solar systems and solar protection;
- (h) natural ventilation; and
- (i) indoor climatic conditions, including the designed indoor climate.

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

- (a) active solar systems and other heating and electricity systems based on renewable energy sources;
- (b) electricity produced by CHP;
- (c) district or block heating and cooling systems;
- (d) natural lighting.

3. For the purpose of this calculation buildings should be adequately classified into categories such as:

- (a) single-family houses of different types;
- (b) apartment blocks;
- (c) offices;
- (d) education buildings;
- (e) hospitals;
- (f) hotels and restaurants;
- (g) sports facilities;
- (h) wholesale and retail trade services buildings;
- (i) other types of energy-consuming buildings.

**Setting of energy performance requirements**

Using the methodology established in Article 3, Article 4 requires member states to ensure that minimum energy performance requirements for buildings are set. It is allowed to differentiate between new and existing buildings and different building types. The Article also requires member states to review these requirements at regular intervals (not longer than five years) “to reflect technical progress . . .”

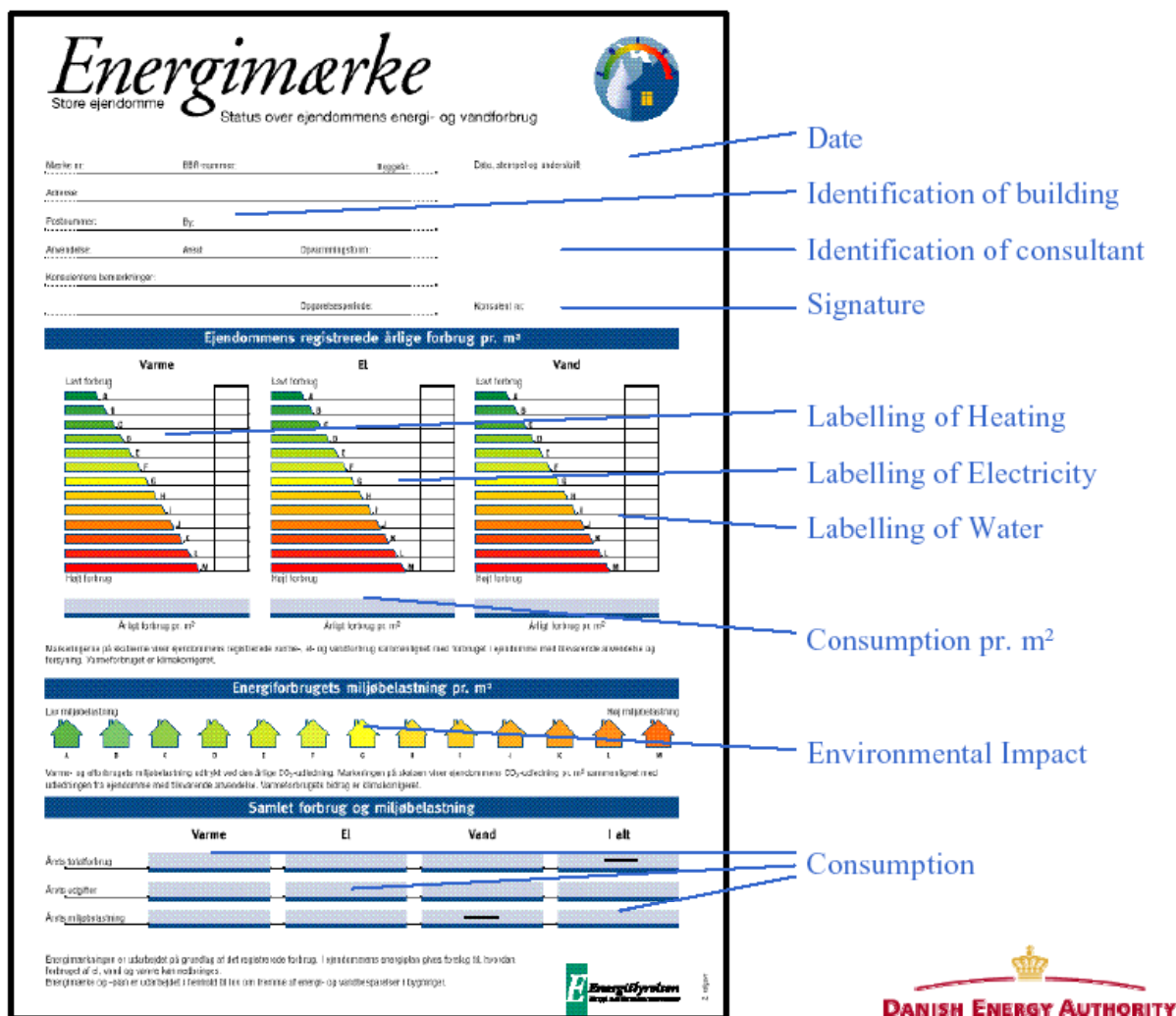
Articles 5 and 6 discuss new and existing buildings respectively in terms of the necessary measures that shall be taken to meet the minimum energy performance requirements. For new buildings, it is applicable to buildings over 1000 square metres and the technical, environmental and economic feasibility of decentralised energy supply systems based on renewables, CHP, district or block heating or cooling and heat pumps shall be taken into account before construction. For existing buildings, the requirements also apply to buildings

over 1000 square metres and can be set for either the entire renovated building or for renovated systems or components.

### Energy performance certificate

Energy performance certificates, according to Article 7, are required when buildings are constructed, sold or rented out and must be made available to the owner or by the owner to the prospective buyer or tenant. The validity of a certificate cannot exceed 10 years.

The article further states: "Member States shall take measures to ensure that for buildings with a total useful floor area over 1 000 m<sup>2</sup> occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons an energy certificate, not older than 10 years, is placed in a prominent place clearly visible to the public." There has been some debate, which is not totally resolved, on the definition of institutions providing public services to a large number of persons, whether this includes private buildings.



### **Inspection of boilers**

A choice is given to member states in Article 8 to either “lay down the necessary measures to establish a regular inspection of boilers fired by non-renewable liquid or solid fuel of an effective rated output of 20 kW to 100 kW” or to “take steps to ensure the provision of advice to the users on the replacement of boilers, other modifications to the heating system and on alternative solutions which may include inspections to assess the efficiency and appropriate size of the boiler.” The impact of the second option has to be “broadly equivalent” to the first one.

A boiler inspection requirement was already part of Council Directive 93/76.

### **Inspection of air-conditioning systems**

Article 9 states that member states “shall lay down the necessary measures to establish a regular inspection of air-conditioning systems of an effective rated output of more than 12 kW.

### **Independent experts**

According to Article 10, drafting of recommendations on the inspection of boilers and air-conditioning systems for the certification of buildings, member states are required to ensure that the work is undertaken by independent qualified and/or accredited experts.

## ***Directive on the Promotion of Cogeneration based on a useful heat demand in the internal energy market***

Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC came into force February 21, 2004. The objective of the directive is to increase energy efficiency and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration of heat and power based on useful heat demand and primary energy savings in the internal energy market, taking into account the specific national circumstances especially concerning climatic and economic conditions.

The directive provides harmonised definitions of cogeneration, particularly for micro/small scale CHP, and it establishes a framework for a scheme for a guarantee of origin of electricity from CHP. The Directive requires member states to ensure objective, transparent and non-discriminatory rules and procedures for grid access, tariff criteria and administration.

High-efficiency cogeneration is taken into consideration whenever new capacity is planned. Through the directive, a number of criteria are to be used when analysing the national potential for high-efficiency cogeneration (including small-scale CHP) in each member state. Support schemes are to be based on useful heat demand and primary energy savings and promotion/support mechanisms put in place are to act effectively.

### *Programmes Related to Buildings*

As stated, the main programme for EU member states is the SAVE programme, part of the new programme, Intelligent Energy - Europe.

"Intelligent Energy - Europe" (EIE) is the Community's **support programme for non-technological actions** in the field of energy, precisely in the field of energy efficiency and renewable energy sources. The duration of the programme is from 2003-2006.

The programme was adopted by the European Parliament and the Council on 26 June 2003. It was published in the Official Journal of the European Union on 15 July 2003 (OJ, L 176, p 29-36) and entered into force on 4 August 2003.

Intelligent Energy - Europe (EIE) is intended to support the European Union's policies in the field of energy as laid down in the Green Paper on Security of Energy Supply, the White Paper on Transport and other related Community legislation (including the Directives on renewable electricity, energy performance of buildings and biofuels). Its aim is to support sustainable development in the energy context, making a balanced contribution to achieving the general objectives of security of energy supply, competitiveness, and environmental protection (Art. 1 of the programme Decision).

The programme is structured in four fields ranging from energy efficiency, promotion of renewables, initiatives for transport and support for energy efficiency and renewables in developing countries. The program dedicated to energy efficiency is:

**SAVE** – improvement of energy efficiency and rational use of energy, in particular in the building and industry sectors,

Source: [http://europa.eu.int/comm/energy/intelligent/index\\_en.html](http://europa.eu.int/comm/energy/intelligent/index_en.html)

One of the priority areas for the SAVE programme is buildings as shown by the excerpt from the current work programme.

### **From the 2003 Work Programme for SAVE\***

Buildings use about 40 % of total final energy consumption in the EU while their lower energy efficiency in Central and Eastern European Countries (CEEC) gives this sector a greater importance there. Increasing energy efficiency in the building sector is therefore a priority. Over a million new buildings will be erected during the next 15 years in the EU and about 1-2% of the building stock is renovated per year. Major energy efficiency gains can be achieved when a building is renovated or newly built. These factors led the Commission to propose a Directive on the energy performance of buildings including a set of measures to reduce their energy consumption, which was adopted by the European Parliament and the Council in December 2002<sup>14</sup>.

Europe is at the forefront of many aspects of building design such as the combination of architectural design and technology. Strengthening this lead and translating it into standard European practice is desirable as is transferring this knowledge into building rehabilitation.

This key action is intended to make a substantial contribution to developing and promoting tailored sets of measures to improve the performance of buildings, including measures to reduce the energy consumption as well as small-scale CHP and RES applications. It aims also to serve as a catalyst for the take-off of the buildings Directive and to prepare and accelerate its implementation. The main focus is on the retrofitting of buildings. The Target areas to be addressed are:

- Tools for the take-off of the buildings directive (partly via Calls for tenders)
- Schemes for the implementation of energy services in buildings (e.g. Energy Performance Contracting), in particular retrofitting
- Public buildings as shining examples
- Promotion of best practice examples of high energy performance buildings

Source: <http://europa.eu.int/comm/energy/intelligent>

\* It is the 2003 Work Programme but the closing date for proposals is in April 2004.

### ***Research Related to Buildings***

The Commission is also heavily involved in buildings research as part of its energy research activities. The current 6<sup>th</sup> framework research programme gives important attention to buildings. The objective for the buildings sector is to reduce EU energy requirements by 30 per cent by 2010; and in the longer term the research aims are for 50 per cent. Currently, the built environment in the EU accounts for about 40 per cent of the total energy requirements.

The current work programme under sustainable energy includes the following:

“The strategic and policy objectives of the programme of research into sustainable energy systems include reducing greenhouse gases and pollutant emissions (Kyoto), increasing the security of energy supplies, improving energy efficiency and increasing the use of renewable energy, as well as enhancing the competitiveness of European industry and improving quality of life both within the EU and globally (Johannesburg follow-up).

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<sup>14</sup> Directive 2002/91/EC of the European Parliament and of the Council of 16th December 2002 on the energy performance of buildings, Official Journal L 001, 04.01.2003, p. 65-70

## ***Towards Energy Efficient Buildings in Europe***

In the short to medium term, the goal is to pave the way for the introduction of innovative and cost competitive renewable and energy efficiency technologies into the market as quickly as possible through demonstration and other research actions aiming at the market, thus supporting the future development and implementation of the EU Directives on electricity from renewable energy sources and on the energy performance of buildings, as well as the proposed Directives on cogeneration (CHP) and the establishment of regulatory and fiscal measures for the promotion of liquid biofuels.”

### ***Current Commission Proposal Related to Buildings***

#### ***Energy Services***

Integrating energy supply and demand elements – known often as integrated resource planning (IRP) or demand-side management (DSM) – became an important energy efficiency policy concept, developed in the 1980s in the United States. Some countries and utilities in Europe adopted the basic concepts and there were many efforts to increase its usage. However, this concept was effectively sidelined in most of Europe, in part because of the trend towards liberalisation of electricity and gas markets, which were expected to drive down costs<sup>15</sup>. The Commission eventually developed a proposal on Rational Planning Techniques Directive in March 1997 that was never adopted, in part because it was designed before the development of the internal energy markets for electricity and natural gas. The Commission has recently come forward with a new energy services directive, which supersedes the 1997 proposal, focusing “on the promotion of end-use efficiency, should be regarded as a necessary instrument to complement the recently adopted legislation on the opening of the internal energy market, which mainly leads to efficiency improvements on the supply side<sup>16</sup>.” The new draft Directive is designed to remove barriers to allow market forces to allocate economic and natural resources effectively. Under the liberalisation process, there was no incentive or requirement for energy companies to promote energy efficiency. Under this Directive, energy companies would play a more direct role.

The objective of the proposed Directive is to save an additional fixed amount of energy every year equal to at least 1 per cent of previous consumption in each member state, leading in 2012 to an annual improvement in energy efficiency of around 6 per cent. A large part of this energy savings potential can be effectively realised through energy services and other energy end-use efficiency measures. The market for these services and measures is estimated to be worth €5-10 billion per year, not including the 10 new member states. The European Climate Change Programme estimates that this measure can save between 40-55 Mt of CO<sub>2</sub> per year by 2010.

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<sup>15</sup> As defined in the ECS publication, *Advice on Developing an Energy Efficiency Strategy*, an integrated resource plan is “a plan in which there is a socio-economic balance between the endeavours of the supply side as regards energy production and distribution on the one hand and on the other the investments made by the supply side and the consumers with a view to energy efficiency. The measures on the demand side can be information, campaigns, consultancy and other types of assistance - concerning energy conservation activities about more efficient use of energy and concerning private electricity production”. [Source: Integrated Resource Planning in the Danish Electricity Utilities, *Integrated Resource Planning: From Concept to Practice*, October 1994.]

<sup>16</sup> Proposal for a Directive of the European Parliament and of the Council on energy end-use efficiency and energy services, COM/2003/739 final, 10.12.2003

## *Towards Energy Efficient Buildings in Europe*

The Commission proposes that Member States be obliged to respect two energy efficiency targets and an obligation to offer energy services for the period 2006 to 2012.

- An overall energy savings target of 1 per cent a year. Member states would have to save each year 1 per cent more compared with the average amount of energy distributed and sold to the final consumers the previous five years. By 2012, this would lead to an annual reduction of around 6 per cent compared with 2006.
- A demand-side public sector target. The public sector in each Member State should set a good example. Member States should thus ensure that the annual improvement of total energy efficiency in the public sector, mainly through public procurement of energy services and efficiency measures, leads to 1.5 per cent energy savings.
- On the supply-side of the market for energy efficiency, the sales of energy services should be actively promoted. Member States shall ensure that retail suppliers or distributors of energy offer energy services to their customers or provide them with energy audits.

The draft proposal now goes through a lengthy approval process within the European Parliament and Council of Ministers.

### *How do these EU Actions add up?*

The EU framework has evolved and matured over the last decade. Council Directive 93/76 did not work effectively and the more comprehensive Directive on Energy Performance of Buildings is the mainstay for the buildings sector. At this point in time, there appears to be strong political commitment at both the Community and national levels to make this directive work well. The implementation can run into problems but there is an air of optimism. There is not much room, however, for slippage.

The 10 new member states have been tracking EU policies and programmes for several years, as they were obliged to start implementing the legislative programme under the *acquis communautaire*. The problems in the transition economies are not the same as for the 15 member states, but this framework should be sufficient to have them make significant progress.

The energy efficiency activities are closely linked with environmental policy, particularly climate change. It is also closely related to the Community's priority of sustainable development. The linkage with climate change policy is good, although the non-implementation of the Kyoto Protocol because of a lack of sufficient numbers of ratifications could slow the momentum. Emissions trading is becoming a reality in the EU. Studies undertaken recently by the Commission expect that the effects on the buildings sector for the foreseeable future will be minimal – other than through increased energy prices that will motivate consumers – since emissions trading will initially be restricted to large energy-consuming companies and utilities.

The EU has provided a strong policy, legislative and financial support framework that can have a significant impact on the buildings sector which in turn will have an important impact on meeting Community energy policy and climate change objectives. The emphasis now has to be on implementation and the next chapter will show how member states are performing.





## **Chapter 4**

### **Implementing Energy Efficiency Policies in Buildings**

Improving the energy efficiency of the buildings sector is a priority for EU member states and it has been since the first oil crisis in the 1970s. After almost three decades, one would think that most measures would have been done but that is far from true. As shown in Chapter 2, there is still significant potential for energy savings. While many dwellings have had investments to improve their thermal efficiency, most still have cost-effective potential remaining. Adding some insulation or installing double-glazed windows does not mean the job is complete. Also, energy use in buildings is largely affected by human behaviour, whether this is in the temperature levels set or the lighting used.

Member states have realised that the starting point is in new buildings because they last 50 to 100 years (and often much more) and retrofits are more expensive than achieving the highest economically-feasible standards from the beginning. But, the challenge is in existing buildings because of the size of the stock and because systems change and need replacement periodically. That goes for heating systems and it also goes for installed lighting systems, as well. The problem with existing buildings is particularly acute in the new member states of central and eastern Europe where the legacy of inefficient, deteriorating buildings and heating systems is all too evident.

#### ***Energy Efficiency Policies***

Annex 1 gives a summary of the main policy objectives of the member states. The annex shows that the 25 member states plus Norway and Switzerland claim to take energy efficiency seriously and most have energy efficiency policy as a major component of overall energy policy. Some of the countries give specific objectives for the buildings sector while many do not. Often the objectives for the sector are not directly articulated but expressed more through the policy instruments that are used. Objectives for buildings are often more pronounced in the new member states because of the poor state of prefabricated buildings, which often represent a high share of residential dwellings and because of the poor state of district heating.

#### ***Overview of National Programmes***

A range of policy instruments is used to achieve the energy efficiency policy objectives. There are five categories of energy efficiency measures used in this report: information, financial incentives, regulations and standards, voluntary measures and research & development. National or regional energy efficiency strategies normally use a combination of all the measures, although some countries tend to emphasise one over the other.

It is instructive to review these measures.

### ***Information***

Appropriate information to consumers, decision-makers, the energy service sector, architects, distributors and others in the energy efficiency field ensures that more of the cost-effective potential is achieved. There is a wide range of information programmes throughout the region and the number of programmes has expanded significantly in recent years. Information programmes cover a wide spectrum from mass media campaigns, information centres, training, technical manuals and brochures, labelling and energy audits. They can be used for awareness creation or for providing detailed information to various actors: consumers, equipment operators/technicians, managers of building complexes, engineers, architects and decision-makers.

Awareness creation is a key consideration because many consumers in all end-use sectors have little understanding of the cost-effective potential for improvements for energy efficiency or of the techniques to make such improvements. Awareness creation is also important for service providers (e.g. auditors) to show the market potential available. All member states are active in awareness creation.

Training is very important because it is necessary to ensure that specialists or would-be specialists in energy efficiency have access to the most recent material on techniques and technologies to improve energy efficiency. The speed of technology shifts is increasing and technologies are becoming more complex.

Countries also use existing (and sometimes specially-created) organisations to help disseminate information. These include, for example, professional organisations such as engineering societies, energy city networks or non-governmental organisations (NGOs). They can also include local energy agencies funded through the SAVE programme. In Hungary, for example, the Energy Efficiency Advisory Network, comprising 20 Energy Advice Centres, provides advice, counselling, lectures, organises exhibitions, facilitates small credits, meetings with neighbourhood organisations and so on.

### ***Financial Incentives***

Financial incentives have been developed to improve the access to capital but they have also been developed to break the inertia to motivate consumers to take energy efficiency actions and they have also been used to improve the cost-effectiveness of innovative energy-efficient technologies.

Financial incentives are well-established measures, although they are generally less used now than in the 1980s. The incentives are generally well targeted to meet specific objectives or to promote specific technologies (e.g. insulation). The financial instruments normally include subsidy/grant schemes, soft loans, and funds. Annex 5 summarises the use of financial measures in selected countries.

### ***Regulations and Standards***

Regulations and standards provide long-term signals and can be used in all end-use sectors. Regulations and standards can apply not only to specific technologies or systems (e.g.

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building codes or boilers) but also to regulate the availability and quality of information (e.g. for energy certification of buildings). They can also be used to require inspection of boilers and air conditioning systems, as is the case with the new Directive on Energy Performance of Buildings.

Most regulations and standards are within the EU framework as described in Chapter 3. This does not mean that member states waited for the EU to act. Some regulations and standards were in place in all countries before EU directives.

Building codes that include thermal requirements are available in every member state. For the latest status on building codes see Annex 3. Energy certification of buildings, as shown in Chapter 3, are required under Directive 93/76 and further strengthened under the new Directive on Energy Performance of Buildings. The current status is described in Annex 4.

### *Voluntary Agreements*

Voluntary agreements (VAs) began to be widely used in the 1970s. While several remained throughout the 1980s, they have increased in popularity since the early 1990s. Voluntary agreements are an effective mechanism for encouraging energy efficiency and reductions in GHG emissions, particularly in the industrial sector and its sub-sectors, but increasingly in all end-use sectors. One of their main benefits is that they can be implemented at low cost and relatively quickly to achieve results.

There are several forms of VAs used, including covenants, negotiated agreements, self-regulation, codes of conduct and eco-contracts. There have been some creative approaches with participation encouraged through possible tax concessions or other forms of financial support, offers of audits, good public relations and assistance in obtaining environmental licenses.

The Netherlands was one of the pioneers in their recent use. While initially developing Long Term Agreements (LTAs) with industry associations, they are increasingly being used for the commercial, education and health care sectors.

### *Research & Development*

Promoting R&D and demonstrations of more energy-efficient technologies is important and widely undertaken. The research is generally conducted in government laboratories or is supported by governments through financial incentives or forms of partnerships. OECD countries have had comprehensive R&D programmes for which the IEA monitors the funding provided. In 2001, European countries reporting to the IEA on R&D expenditures, allocated US\$94.80 million (€17.55 million<sup>17</sup>) on energy conservation R&D. This compares poorly with US\$593 million (€735.32 million) in Japan and US\$581.6 million (€721.18 million) in the United States. Even Canada spent US\$40.2 million (€9.85). To be fair, however, some EU countries (Austria, Belgium, Czech Republic, Hungary, Ireland, Netherlands, Portugal and Sweden) did not report. Going on past performance, however, if those countries were added, it would bring the European level to about US\$120 million (€48.8 million).

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<sup>17</sup> \$1 = €1.24

Throughout the IEA, about 18 per cent of the energy conservation R&D budget was allocated to buildings R&D.

### *Will the Directive on Energy Performance of Buildings Live Up to its Billing?*

For significant energy efficiency improvements in the buildings sector, the focus has to be on the Directive on Energy Performance of Buildings. It covers the major end-uses in buildings: space heating and cooling and water heating in residential buildings, and space heating and cooling, water heating and lighting in other buildings. For the residential sector, these represent 89 per cent of total consumption and for other buildings they represent 79 per cent. These are shown in the following two diagrams from the original proposal for the Directive (COM (2001) 226 final).

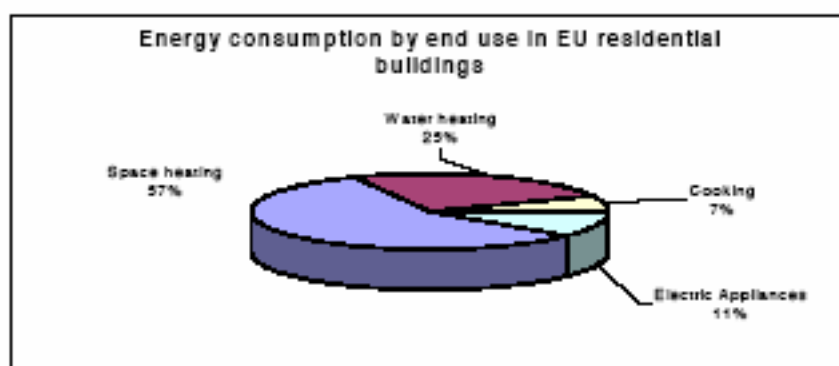


Figure 1: Energy consumption in the residential sector<sup>5</sup>

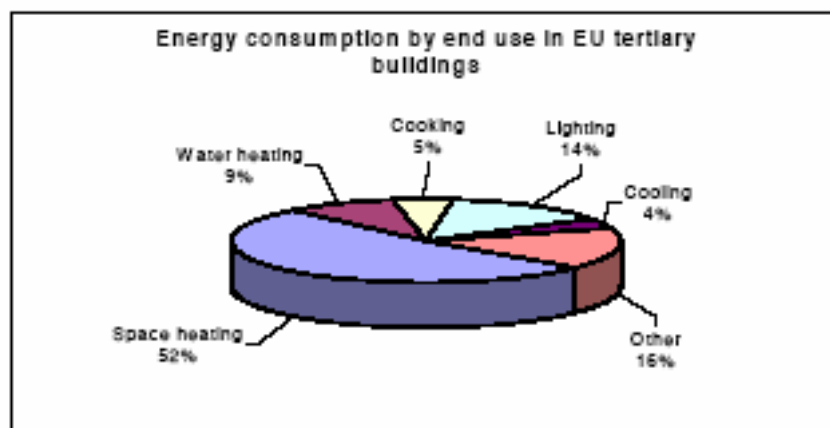


Figure 2: Energy consumption in the tertiary sector<sup>6</sup>

Member states are developing their plans to implement the EPB Directive and have until January 2006 to have the implementation in place. Unlike many other directives in the past, the Commission is taking a much more pro-active role in ensuring implementation. This is in part because of greater co-operation and harmonisation built into the directive and in part because the timetable for implementation is very tight.

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The Commission has organised some events to help focus attention on what steps are needed in developing appropriate methodology on setting energy performance requirements. It is also keeping close contact through the Energy Demand Management Committee (required under Article 14 of the Directive) with officials from member states to monitor progress.

Member states are coming into this implementation phase from different starting points. Unlike most directives in the past, all member states have some revisions or additions to make to their current national initiatives. In other words, even the “best” amongst the member states have implementation tasks to do in order to meet the conditions of the Directive.

By March 2004, specific tasks were identified by member states<sup>18</sup> for them to implement the directive. These can be summarised as following:

- 12 governments stated that primary legislation was needed to be created or needed to be amended from existing legislation in order to implement parts of the Directive.
- 4 governments stated that new regulations or changes to existing regulations were needed on energy certification
- 13 stated that building codes needed to be revised.
- Some stated that the calculation methodology for energy performance requirements would be ready as early as March 2004 while others stated they would have it by the end of 2005. Some specifically said they were waiting for European-wide calculation methodology.
- Only a couple of governments have energy certificates displayed now, while some governments have examples of energy certificates and several are requiring legislation to authorise the use of labels. In the material provided, no government has stated that energy certificates will be displayed for non-public sector buildings.

In general, the new member states have provided little information about their implementation plans. One will use a PHARE project to help with implementation. Another will use a task force to get into action. Most provided almost no details.

CEN is involved in standards development for the Directive, supported financially by the Commission. Committees that would be involved are:

TC 89 – Thermal performance of buildings and building components  
TC 156 – Ventilation in buildings  
TC 169 – Light and lighting  
TC 228 – Heating systems in buildings  
TC 247 – Building automation, controls and building management

The list of tasks does not do justice to the detailed analysis, organisation and legislative action that is required. Some of these tasks are highly technical and complex, often involving many agencies and ministries within each country. Some countries are also including experts of the buildings sector (including academics) to participate. The needed co-operation and co-

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<sup>18</sup> This loosely includes Norway and Switzerland, although information on Switzerland was not available. Luxembourg also did not provide information.

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ordination nationally and Community-wide requires each member state giving this directive the highest possible priority for an extended period.

While there have been improvements, there are concerns that the 10 new member states will lag behind in implementation of the Directive. The analysis undertaken so far by the Commission is primarily for the former 15 member states. New analysis of potential and of costs and expected savings are needed for the 10 new member states to help them in their policy development. This will help focus on the priority that needs to be given to the Directive.

For all member states, regular monitoring during both the planning and implementation stages is needed and not only by the Community's Energy Demand Management Committee. There is no guarantee of success but it will be enhanced if monitoring is enhanced. For example, in the 1990s Denmark completely revised its energy certification of buildings programme because of the lack of expected results. This would not have happened without good monitoring. Now Denmark is making more modifications to reflect the new Directive and monitoring is essential to ensure it is now on the right footing.

It is a cliché to say there is no room for complacency, but there isn't. The Community's energy efficiency strategy and the European Climate Change Programme are depending on this Directive to succeed. The credibility of the energy efficiency strategy is at stake. So far, the results on improving energy efficiency in the EU have been lacklustre. This Directive provides the best opportunity in many years to make amends.

2006 is looming. There is no need for panic but there is the need for a greater sustained effort on the part of all partners in this phase until full implementation.

## **Chapter 5**

### **Promoting Energy Efficiency in Buildings: the Key Government Players**

Promotion of energy efficiency is often identified with government initiatives, and governments at all levels are increasingly active. Most of these efforts are designed to remedy market failures through initiatives to overcome market barriers and by setting a framework that translates the policies and strategies into action. To be effective, strategies must build on these efforts and support all market players.

The role of players at the European level is evolving rapidly as the role of the European Union and the single market evolves. National government officials meet regularly, co-ordinating to some extent and learning from each other. They are also involved in the management of Community-wide programmes. National energy agencies formed their own network to facilitate information exchange and participate in common projects.

EU energy efficiency programmes have been important in bringing players together through, for example SAVE or the 6<sup>th</sup> Framework Programme, which requires partners from more than one member state. SAVE has regularly held contractors' meetings to discuss on-going projects and every four years there is a Europe-wide conference. The most recent was in Austria in November 1999, with over 400 participants.

It is useful to briefly review many of the key government players, including some of the international organisations and international networks that are influencing buildings' energy efficiency policies and programmes.

#### ***Major Government Players***

The main players for governments in promoting energy efficiency are the national and regional energy agencies. Each member state has at least one. In some cases, such as the United Kingdom, there are several agencies involved. The national energy agencies have combined their efforts into a loose association, called the ENR network<sup>19</sup>, through which the agencies share information and undertake joint projects. It has become an effective instrument for sharing experiences and the agencies have actively participated in the SAVE programme through the network.

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<sup>19</sup> See <http://www.enr-network.org>



EnR is a voluntary association of European organisations having a responsibility for the planning, management or review of national research, development, demonstration or dissemination programmes in the fields of energy efficiency and renewable energy. It is flexible in character, able to accommodate a range of working relationships from unanimous concerted effort through optional participation by any number of members to bilateral collaboration.

**Members** come from Austria, Bulgaria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom

There are important regional or state agencies as well, including in Austria, Belgium, the Czech Republic, France, Germany, Spain and the United Kingdom.

Collectively, the national and regional agencies serve to provide both general and technical information on energy efficient services and technologies as well as on the range of government measures that are in place and may be of benefit to consumers.

The ministries responsible for energy efficiency have roles that vary from policy analysis and development at the national levels through to participating in the

management of Community programmes such as SAVE. Each member state, for example, is represented on the committee that oversees the management of SAVE. There is a separate committee for the Directive on Energy Performance of Buildings, called the Energy Demand Management Committee, as described in Chapter 3, which meets regularly to monitor progress on the implementation of the Directive.

The relationship between the ministries and the agencies varies according to national administrative procedures. Many of the national agencies support the ministries' efforts in policy development, often by undertaking the initial analysis. In several cases, representatives of the agencies represent the ministries at international meetings. In several cases, the agencies have responsibilities in both energy and the environment, sometimes reporting to several ministries.

There are other players on the European stage, such as the European Parliament. The European Parliament has been instrumental in fighting the Council of Ministers, and sometimes even the Commission, for more resources for programmes such as SAVE. The European Parliament is also becoming more vocal and influential.

### ***International Players***

#### ***European Union***

There is another category of players, which have their base in international organisations and which largely provide information on a wide range of technical and non-technical areas related to energy efficiency.

The *European Commission's Directorate-General for Energy and Transport*<sup>20</sup> is responsible for developing and implementing European policies in the energy and transport field, including energy efficiency in buildings. The Directorate-General carries out these tasks using legislative proposals and programme management (e.g. the SAVE programme), including the financing of projects. There is separate Directorates-General for *Research* and for *Environment*. Research is responsible for the Framework Programme for R&D, and

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<sup>20</sup> See [http://europa.eu.int/comm/dgs/energy\\_transport/](http://europa.eu.int/comm/dgs/energy_transport/)

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Environment is responsible for environment policy, including the European Climate Change Programme and the Emissions Trading Scheme.

The *European Parliament* plays a vocal and fundamental role in promoting energy efficiency in buildings and climate change initiatives. The European Parliament reviews all upcoming legislation and programme proposals and provides valuable input before proposals go before the Council of Ministers for final adoption. There is an effective cadre of Members of the European Parliament (MEPs) who both monitor and promote programmes on energy efficiency. For instance, they have been instrumental in promoting the initiative that became Intelligent Energy for Europe.

Funded through the Commission are *Organisations for the Promotion of Energy Technologies* (OPETs) that aim to disseminate information on, and promote the benefits of, new innovative energy technologies. In 2002 (at the end of the 5th framework programme for research & development) the old OPET network was reorganised, using sectoral approach. There are currently six OPET projects identified, all which started to function in April 2003:

- CO-OPET, which is to create a corporate image, developed a web-portal and OPET Newsletter and arranges an annual conference. It includes also OPET-activities in the transport area, in the Mediterranean countries and in the ASEAN region.
- OPET EMINENT, which identifies and maps the latest trends in energy-related technologies.
- OPET CFF, the OPET in the area of clean fossil fuels.
- OPET CHP, the OPET in the area of combined heat and power.
- OPET RES-e, the OPET in the area of electricity from renewable energy sources.
- OPET BUILDING, the OPET in the buildings area.

OPET Building has 36 partners from 22 countries (19 EU member states, the candidate countries Bulgaria and Romania as well as Israel), all with a mandate to promote energy technologies co-operate in this project<sup>21</sup>.

Through the earlier SAVE II programme, about 150 SAVE agencies were created to introduce good energy management practices and the concept of sustainability at the regional and local levels. The agencies decide their own needs and priorities as much as possible. Most focus on energy efficiency, although some specialise in renewable energy. The agencies provide both general and technical information to a range of audiences. Some provide services such as energy audits. Today, ManagEnergy promotes co-operation between local and regional energy actors in Europe through workshops, study tours and online events on energy saving and renewable energy<sup>22</sup>.

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<sup>21</sup> For further information, see <http://www.opet-building.net/>

<sup>22</sup> See <http://www.managEnergy.net> for the full range of initiatives in this area.

### *International Energy Agency*

The Paris-based International Energy Agency, which has 26 member countries including 17 member states of the European Union<sup>23</sup>, is active in the area of energy efficiency. The IEA has a policy group on energy efficiency that meets regularly, it has a number of implementing agreements related to various aspects of energy efficiency<sup>24</sup> together with a Working Party on End-Use Technologies, it undertakes studies on energy efficiency policies, it monitors progress of its member countries with respect to energy efficiency policies and programmes, it develops energy indicators to quantitatively monitor progress. The IEA also maintains a comprehensive database on energy production, use and end-use prices.

The implementing agreements include several information clearinghouses. These include promotion of heat pumps through the Heat Pump Centre<sup>25</sup> (managed by NOVEM, the energy and environment agency of the Netherlands); CADDET Energy Efficiency<sup>26</sup>; and GREENTIE<sup>27</sup>.

CADDET was created in 1988 as an information centre sponsored by twelve member countries. In 1993, CADDET split into two units: CADDET Energy Efficiency and CADDET Renewable Energy. CADDET Energy Efficiency's objective is to enhance the exchange of information on new, cost-effective, energy-saving technologies that have been demonstrated in applications in industry, buildings, transport, utilities, and agriculture.

The Greenhouse Gas Technologies Information Exchange (GREENTIE) disseminates technical information on technologies related to climate change by providing worldwide access to information on suppliers of technologies, services, research, data and literature relevant to greenhouse gas mitigation. The on-line search facilities of GREENTIE are integrated with those of CADDET.

### *Energy Charter*

The European Energy Charter was formed to support energy security following the collapse of the command economies of Central and Eastern Europe and the former Soviet Union. Under the Charter is the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA), which came into force in April 1998. All Community member states ratified the Charter Treaty and the Protocol. The Protocol places certain obligations on the Contracting Parties, including:

- having energy efficiency strategies;
- establishing energy efficiency policies;
- developing, implementing and updating programmes;
- creating the legal, regulatory, institutional environment necessary; and
- co-operating and assisting internationally.

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<sup>23</sup> Of the 10 new member states only the Czech Republic and Hungary are currently members of the IEA.

<sup>24</sup> There are implementing agreements on: Buildings and Community Systems, Demand-side management, District Heating and Cooling, Energy and Environmental Information Centres (which includes the information centres), Energy Conservation and Emissions Reduction in Combustion and Heat Pumping Technologies. There are also others related to renewables that deal with aspects of energy efficiency.

<sup>25</sup> <http://www.heatpumpcentre.org>

<sup>26</sup> <http://www.caddet-ee.org>

<sup>27</sup> <http://www.greentie.org>

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The Charter is developing a process to ensure compliance of the Protocol. While the main aim is to support the restructuring of Central and Eastern Europe and the former Soviet Union, the process binds all signatories.

### *European Committee for Standardisation (CEN)*

CEN<sup>28</sup> was founded in 1961 by the national standards bodies in the then-named European Economic Community and EFTA countries. CEN contributes to the objectives of the European Union and European Economic Area with voluntary technical standards which promote free trade, the safety of workers and consumers, interoperability of networks, environmental protection, exploitation of research and development programmes, and public procurement. On behalf of governments, the European Commission or EFTA Secretariat may request the European Standards organisations to develop standards in support of their policies by issuing formal 'mandates'.

CEN is playing a pivotal role in the standards development for the Directive on Energy Performance of Buildings. It is accelerating the standards development process to ensure that the standards can be in place before implementation is due in January 2006.

### *Energie-Cités*

Energie-Cités<sup>29</sup> is an association of European local authorities, mainly municipalities. One of the aims of the association is to provide its members with information on the promotion of sustainable local energy policies. The network extends over 20 European countries and includes about 100 municipalities, the majority having between 100,000 and 300,000 inhabitants.

The Energie-Cités database included more than 300 European good practice cases in the field of sustainable local energy policies. The cases are grouped together in 4 fields: sustainable urban development, energy efficiency, renewable energy/CHP and urban mobility. The database is regularly updated.

### *European Network of Buildings Research Institutes (ENBRI)*

The European Network of Building Research Institutes (ENBRI)<sup>30</sup> was founded in 1988 with the signing of a Memorandum of Understanding. It includes the principal building research institutes of Member States of the European Union and of the European Economic Space. In 2000 its membership extended to European candidate members.

The objectives of the ENBRI are:

- Combining the technical skills and resources of the individual institutes in a network of building research facilities and information sources;

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<sup>28</sup> <http://www.cenorm.be/cenorm/index.htm>

<sup>29</sup> <http://www.energie-cites.org>

<sup>30</sup> <http://www.enbri.org>

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- Co-operating in advising the European Commission, companies and consultants, and users and clients of the building industry throughout Europe. ENBRI's advice covers all technical aspects of building materials, components, systems and services;
- Providing advice on the free movement of construction products within the single European market and on the development of innovative products and/or services. ENBRI's services range from short term actions for individual clients, to the development and execution of long term research projects for major European institutions;
- Sharing the resources of their most outstanding test and research facilities to offer a large range of services to companies, to consultants, and to users and clients of the building;
- Encouraging the exchange of information between Member-Institutes and the collaboration in common research projects. Each Member-Institute can involve other relevant organisations in the preparation of advice and in supporting research programmes, as appropriate; and
- Co-operating through the European Economic Interest Grouping "ENBRI Development" to develop and execute for clients special testing programmes and research and development programme.

### ***European Investment Bank (EIB)<sup>31</sup>***

The task of the European Investment Bank, the European Union's financing institution, is to contribute towards the integration, balanced development and economic and social cohesion of the member states.

Examples of funding for energy efficiency in buildings include:

- Construction of social housing, rehabilitation of old housing and, in particular, improvements to their energy efficiency in a housing fund in Finland with EIB funding of about €300 million.
- Financing of energy efficiency projects through Barclays Bank plc under the Government's Affordable Warmth Programme (AWP) for improving the quality of household heating in the UK with the EIB's contribution over €160 million over 6 years from December 2001.

### ***European Bank for Reconstruction and Development (EBRD)<sup>32</sup>***

The EBRD was founded in 1991 as an international financial institution to help create market economies in the former communist region of Central and Eastern Europe and the former Soviet Union. This includes eight of the new member states of the EU. The EBRD created an energy efficiency unit because it sees investing in energy efficiency as a high priority. Also, investing in energy efficiency is important in promoting environmentally sound and sustainable development, one of its core objectives. Areas of financing related to buildings include support for district heating systems, public sector energy efficiency and supporting the development of energy service companies.

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<sup>31</sup> see [www.eib.org](http://www.eib.org)

<sup>32</sup> see [www.ebrd.com](http://www.ebrd.com)

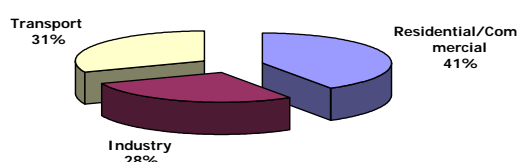
## Chapter 6

### Opportunities for the Future

The buildings sector in Europe is complex because it includes a wide range of buildings types for a wide range of uses. Thus, understanding how energy is used in buildings is complex. Buildings are not simply the sum of a lot of parts but they are a system, with the different parts interacting. Energy use is affected by human behaviour but that has not been the focus of this report. Instead, it has been important to look at the efforts the European Commission and member states to see if and how best practice is being implemented to promote energy efficiency.

The European Union through the efforts of the Commission, the European Parliament and the Council of Ministers has taken a strong leadership role in promoting energy efficiency in buildings. The buildings sector -- which cuts through the residential, services (commercial and public) and industrial sectors -- is effectively the largest of the end-use sectors. Any Europe-wide or national effort to improve energy efficiency, to meet climate change targets or energy security objectives cannot overlook buildings. Not only are they the largest energy-consuming sector but also the savings are highly cost-effective. And because so many of the energy efficient technologies -- insulating materials, control systems, etc. -- are sold across borders, there is a good rationale for a European-wide effort.

#### Energy Demand in 2000 in the European Union



Source: DG TREN

As shown throughout this report, there are many different approaches taken by member states. This is healthy and needs to be encouraged. While this report is not an evaluation of such efforts, it is however obvious that not all countries are giving the buildings sector the same priority. Equally, not all countries are giving energy efficiency the same priority. The potential for improving the thermal characteristics of buildings is high and it is uncertain whether the initiatives in place and being phased in will be sufficient to effectively tackle more than a small portion of the remaining potential and help achieve EU-wide and global targets.

There is a growing tendency towards greater co-operation amongst member states, in large part because of EU-wide policies. The benefits of EU-wide initiatives are that all member

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states and participating countries can take advantage of best practice at a fairly low cost if need be. This has to be a big advantage to the new member states.

While there is anticipation about what the new directive on energy performance of buildings can achieve, that enthusiasm has to be tempered with the lack of hard information about how effective past directives have been. And so, understandably, the jury is still out about the new Directive on Energy Performance of Buildings. Hopefully it will not fade into the bureaucratic mire, as have previous directives. The two evaluations of Council Directive 93/76 showed great disappointment in implementation of the components and a third one, which had been planned, is long overdue. Even still, member states gave it a low priority even though it had the potential to effect important savings. The boiler efficiency directive, which is now 12 years old, needs to be thoroughly evaluated to determine both what it has achieved to date and how much more can be expected from it in the future. Both of these examples also reflect a Commission that has been too passive in monitoring implementation and taking corrective measures when it is shown that results are sub-optimal.

The indicative target for the Community as a whole of a one percentage point per year improvement in energy intensity<sup>33</sup> to the year 2010 over and above that which would otherwise be attained, as expressed by the Communication on Energy Efficiency [COM (1998)246 final] have never been seriously attempted.

The IEA in a totally separate analysis shows poor recent energy efficiency improvements in a newly published study<sup>34</sup>. The Executive Director of the IEA, Mr. Claude Mandil, stated in a February 2004 press release for the study: "We are concerned that despite the major improvements in energy efficiency, recent trends indicate that stronger efforts are needed to avoid an increasing dependency on oil and to reduce the environmental impacts from growing energy demand. It is still possible to obtain at low cost, a dramatic increase in energy efficiency in our economies."

Nevertheless, the current framework for buildings energy efficiency (essentially the Directive on Energy Performance in Buildings) developed through the European Union can and should succeed. The elements are there. It will now take a sizeable effort by the various partners in the buildings "community" to make them work and there has to be a long-term commitment to the process. Yet, there is one overriding concern: whether there is enough time between now and January 2006 to get the Directive fully operational. There are some who already feel that an extension would be appropriate to get it right and comply "on more sound engineering principles."<sup>35</sup>

This report has given considerable attention to EU-wide efforts, particularly relating to the Directive on Energy Performance of Buildings. There is a lot of activity at all levels but it has to be proven that it will be effective in achieving meaningful results.

There are some conclusions and recommendations that derive from this report:

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<sup>33</sup> Changes in energy intensity for final energy consumption are a first and rough estimate indicator for changes in energy efficiency. This is due to the fact that energy intensity can also include temperature effects and the weighting effects of economic restructuring. A more definitive indicator is the bottom-up aggregation of the energy consumption of all end users, corrected for temperature and structural effects. A set of Priority Indicators was prepared by Eurostat in 2000. These indicators are based on regular Eurostat statistics, supplemented with data from the SAVE-sponsored ODYSSEE indicator project.

<sup>34</sup> IEA, *Oil Crises & Climate Challenges: 30 years of Energy Use in IEA Countries*, OECD, Paris, 2004.

<sup>35</sup> See Danny Clark of Prudential Property Investment Managers Limited, "Time running out to implement directive," *Energy in Buildings & Industry*, February 2004, pp. 28-29.

### Major Conclusions

- While the buildings sector is receiving important attention in the development of overall energy efficiency policies, there is significant potential for cost-effective energy efficiency improvements to warrant the building sector receiving an even higher policy priority.
- There is a good mix of measures between regulations & standards, information, training and financial incentives. The legislative framework provided through the European Union is an important foundation for national efforts.
- The new member states are starting from a difficult position, with fewer human and financial resources than other member states. They also are burdened with the legacy of a large stock of poorly built housing and poor grid-based heat supply.
- There are important networks of experts – both within and outside government – that have evolved in Europe over the past decade or more. These are important in transferring know-how and exchanging experiences.

### Recommendations

- There is a need for strong monitoring of the implementation period of the Directive on Energy Performance of Buildings. Once in force in 2006 the Commission needs to take a more pro-active role in ensuring that ms achieve their stated objectives and where there are problems, the Commission needs to take a more active role in finding remedies and where necessary to provide chastisement in order to reinforce Community-wide priorities.
- A network of experts (government and non-government) from the 25 member states should meet at regular intervals to discuss implementation issues related, not only to the Directive on Energy Performance of Buildings, but to the broader approaches to energy efficiency in buildings. The limited terms of reference given to the Energy Demand Management Committee would need to be widened if it is to be the vehicle to carry out this role.
- Directives such as boiler efficiency directive of 1992 need to be evaluated regularly to provide feedback on what progress has been made over the past 12 years and to help policymakers decide whether new initiatives or modifications to existing directives and their implementation are needed.
- Energy certification of buildings has to be seen, not as an end in itself but as a means to an end. Certification needs to be implemented in parallel with effective information campaigns to explain to the wider public (particularly those buying or looking) and should be promoted through real estate agencies and possibly the insurance industry.
- Governments need to find appropriate incentives (not only financial) in order to encourage building owners and users to implement the recommendations provided in the building energy certificates.



## *Towards Energy Efficient Buildings in Europe*

- Government-private sector partnerships in promoting energy efficiency in buildings should be promoted and expanded as per Article 12 of the Directive on Energy Performance of Buildings.
- Better end-use analysis needs to be undertaken in order to know what progress is being made on improving the energy efficiency of buildings. The energy certification programme should be designed to help construct and maintain end-use databases to help in the policy analysis.
- There is a need for a long-term commitment from the EC and member states to promote energy efficiency in buildings.
- Governments need to set an example in their own buildings by making sure that they not only meet the minimum requirements under the various buildings-related directives but also implement best-practice measures and set targets that are both achievable and ambitious for their own building stock.
- The new member states need to be closely monitored and supported to ensure that timetables are met and that they have the necessary capacity – human and financial – in order to meet the challenging obligations of membership in the EU. Analysis of remaining potential that was undertaken for the Directive on Energy Performance of Buildings should be expanded to include the 10 new member states.

Finally, there is no room for complacency. After years of implementation, often the momentum and interest wanes. For the buildings sector this cannot be allowed to happen. It is a dynamic sector in that many houses are built and renovated each year. But it is also a somewhat stable sector in that there is a large stock of existing houses that cannot be made more efficient overnight. Long-term signals are needed. They are needed by the buildings supply industries, they are needed by the energy supply companies and most importantly they are needed by the owners and consumers.

**Annexes**

## *Towards Energy Efficient Buildings in Europe*

### **Annex 1: Energy Efficiency Policy in Buildings Monitoring: Status of Energy Efficiency Strategies**

<b>Austria</b>	<p>The Energy Action Programme was created in 1993. Goals were re-affirmed in the 1996 Energy Report. An agreement between the Federal Government and the Länder, came into force on 15 June 1995. Such an agreement was necessary to ensure a common approach because the Länder are responsible for energy efficiency measures. The constitutional basis for agreements of this type (between the federal and the Länder levels) is Article 15a of the Federal Constitution.</p> <p>In April 2002, the government published the Austrian Strategy for Sustainable Development that establishes goals for the further reduction of the country's energy intensity.</p> <p>The strategy to reduce GHG emissions from space heating is based on the following pillars: Thermal improvement of existing building stock, enhanced technical standards for new buildings, increasing share of renewable energy sources and district heating, increasing boiler efficiency, switching to fuels with lower (fossil) carbon content.</p>
<b>Belgium</b>	<p>In 1994, a national programme for reducing carbon dioxide emissions was approved by the Council of Ministers and the regional governments. The programme includes measures in 14 categories, primarily related to improving energy efficiency. In its decision of 14 June 2001, the Council of Ministers reaffirmed its commitment to implement the necessary measures to meet the greenhouse gas emission reduction target of 7.5 per cent from the 1990 level in 2008-2012 and pledged to draft a <i>National Climate Plan</i>. The new National Climate Plan was published in 2002. The new plan includes three new areas, one relating to energy demand.</p>
<b>Cyprus</b>	<p>Energy efficiency is a major component of energy policy. The main objective is the reduction in energy consumption in all sectors.</p>
<b>Czech Republic</b>	<p>Energy efficiency policy is outlined in the National Energy Policy which was approved in 2000. The Energy Management Act sets out the obligation to formulate the state's energy policy as well as the elaboration of the National Programme for Energy Efficiency and the Use of Renewable and Secondary Energy Sources. Objectives on energy efficiency are outlined in the National Programme for Energy Efficiency and the Use of Renewable and Secondary Energy Resources to 2005.</p> <p>Buildings are a priority in part because of the poor condition of a large share of existing dwellings.</p> <p>The new State Energy Concept was approved in March 2004. Maximising energy efficiency is one of the major priorities.</p>
<b>Denmark</b>	<p><i>Energy 21</i>, the Danish Government's Action Plan for Energy, was published in 1996. In May 2001, there was the Natural Gas Supply and Energy Savings Agreement that set out a new action plan for promoting energy savings to 2005.</p> <p>The new action plan the action plan on energy efficiency was approved by the government in December 2004 and released in early 2005. The energy</p>

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	<p>conservation action plan is a forward-looking, market-based path.</p> <p>Basic principles for reorientation of the energy conservation drive are:</p> <ul style="list-style-type: none"> <li>• Cost-efficiency.</li> <li>• Promote competitiveness and welfare through low energy bills for companies and consumers.</li> <li>• Focus on realisation of large, profitable savings potentials with low-cost measures</li> <li>• A balanced approach in relation to the various sectors and energy applications.</li> <li>• A market-based approach that promotes well-functioning and efficient markets for energy-efficient, profitable products and solutions.</li> <li>• Prioritisation of international, and especially EU, initiatives.</li> <li>• Promote the development of more efficient products that can help business development and exports, i.a. through research &amp; development.</li> </ul> <p>In June 2005, the Danish Parliament approved a new law on Energy Savings in Buildings which has an impact on the implementation of the Energy Performance in Buildings Directive.</p>
<b>Estonia</b>	<p>Energy efficiency policies are not stated explicitly but are incorporated within energy policy. In 2000, Energy Efficiency Target Programme was approved. Implementation Plan for Energy Efficiency Target programme was approved in March 2001.</p>
<b>Finland</b>	<p>Energy policy was sent to the Finnish Parliament in June 1997. There was the Government Decision on December 21, 1995 on the Implementation of Energy Conservation. The third energy efficiency programme was made in 2000 and is a part of the National Climate Strategy. The most recent National Climate Strategy was passed by Parliament in June 2001.</p> <p>The plan focuses on domestic measures that could reduce overall energy consumption by nearly 5 per cent by 2010. This is roughly a quarter of Finland's target for reducing GHG emissions.</p>
<b>France</b>	<p>In December 2000, a new national energy efficiency plan was announced. Its goal is to reduce GHG emissions, reduce consumers' energy bills and develop renewable energy. It comprises regulatory measures to promote energy efficiency. These provisions consist of a set of thermal energy regulations for new buildings adopted in November 2000 which considerably reinforce the requirements previously in force. The new requirements ensure a 15 per cent increase in the energy efficiency requirement for residential buildings, as compared with the 1988 regulations, and a 40 per cent increase for non-residential buildings.</p> <p>Energy efficiency is a major component of the national climate plan published in 2004.</p>
<b>Germany</b>	<p>Energy efficiency is a priority of the German energy policy published in the Energy Report of the Federal Ministry of Economics and Technology, published in October 2001 and in the Report of the Federal Government on a</p>

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	National Strategy for Sustainable Development, published in April 2002.
<b>Greece</b>	Energy efficiency is being promoted through the Global Action Plan, entitled Energy 2001, and the energy conservation sub-programme of the National Environmental and Energy Programme submitted to and approved by the European Union. Energy 2001, which came into force in 1998, is the national action plan for energy conservation in the built environment.
<b>Hungary</b>	<p>In October 1999, a Government act [1107/1999(X.8)] was approved. It concerns energy saving and energy efficiency strategy until 2010. It sets a target limiting energy consumption growth to 1.5 per cent p.a., assuming GDP grows 5 per cent p.a. The Energy Conservation and Energy Efficiency Improvement Action Programme was developed in 2000, following the legislation.</p> <p>The household sector was an eminent priority between 2000-2004, but in mid 2004 this programme stopped, because of the situation of the state budget.</p>
<b>Ireland</b>	<p>In April 1997, the government published its sustainable development strategy that considers sustainability in all sectors, including energy and transport. A Green Paper on Sustainable Energy was launched September 1999. Its implementation is a priority for the government. In October 2000, the Government published its National Climate Change Strategy which includes measures to improve energy efficiency in all sectors. Energy efficiency is not treated independently but, rather, is integrated into energy and climate change policies.</p> <p>The Sustainable Energy Act of 2002 created the Sustainable Energy Authority which, inter alia, promotes energy efficiency.</p>
<b>Italy</b>	The 1988 National Energy Plan (NEP'88) includes the improvement of energy efficiency and conservation as a primary objective of general energy policy. CIPE Deliberation 137/98 published in February 1999 provides guidelines and actions for containment and reductions of GHG emissions. It includes increased energy efficiency in the productive sectors and among consumers.
<b>Latvia</b>	<p>The National Energy Efficiency Strategy was approved in November 2000. Energy policy stresses energy efficiency as a priority.</p> <p>The National Programme on Construction sets out a series of activities to promote improved construction of residential and public houses as well as the production of building materials. One of the sub-programmes is <i>Improvement of Heat Efficiency in Buildings</i>. It includes characterisation of the current situation, more accurate specification of opportunities to save energy resources in buildings, including public buildings and residential houses, and analyses of the necessary financial resources for raising energy efficiency in buildings and pay-off period of the investment.</p>
<b>Lithuania</b>	The National Energy Efficiency Programme 2001-2005 was revised and updated taking into account the requirements of the EU directives, other international obligations, as well as the state and development forecasts of the national economy and its individual branches, and changes in economy and energy consumption.

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	<p>Energy efficiency policy includes priority of refurbishing existing buildings and to reorganise the construction materials industry in order to ensure the manufacturing of energy-efficient construction materials.</p> <p>The National Energy Efficiency Programme 2001-2005 is being implemented in the following main areas:</p> <ul style="list-style-type: none"> <li>• Drafting of legal acts and regulatory, technical documents intended for the implementation of the National Energy Efficiency Programme;</li> <li>• Renovation of buildings, modernization of their heat economy;</li> <li>• Use of renewable, local and waste energy sources;</li> <li>• Efficient energy use in production processes;</li> <li>• Information, education and consultation activities.</li> </ul> <p>By its Resolution of 21 January 2004, the Government approved the Lithuanian Housing Strategy. One of the key objectives of the Strategy is to ensure efficient use, maintenance and modernisation of the existing housing stock, and rational use of energy resources.</p>
<b>Luxembourg</b>	<p>Parliament adopted the general Energy Efficiency Law of August 5, 1993. The law authorises implementation of several energy efficiency measures.</p>
<b>Malta</b>	<p>There is no specific energy efficiency policy and is considered one of the horizontal measures within the National Energy Policy. Strategies and recommendations on energy efficiency have not been approved by the government.</p> <p>Energy efficiency in buildings is considered one of the priorities for energy efficiency policy since heating and cooling of buildings represent 40 per cent of total primary energy consumption in the country.</p>
<b>Netherlands</b>	<p>There have been the Second Memorandum on Energy Conservation (1993), the White Paper on Energy (1995) and the Action Programme on Energy Conservation (1998). The most recent Energy Report was published in 2002 and energy efficiency was given a high priority.</p>
<b>Norway</b>	<p>The energy efficiency objectives are: to limit energy use considerably more than would be the case if developments were allowed to continue unchecked; to increase annual use of central heating based on new renewable energy sources, heat pumps and waste heat by 4 TWh by the year 2010; and to construct wind generators with a production capacity of 3 TWh/year by the year 2010. There is no separate energy efficiency law.</p>
<b>Poland</b>	<p>“Assumptions of Poland’s Energy Policy until year 2020” prepared by Ministry of Economy and approved by Council of Ministers in February 2000.</p> <p>The energy efficiency policy document “Energy Use Rationalisation Policy in Municipal-Living Sector” was announced in 1995. This policy supports the thermo-modernisation of the housing stock in Poland. This was followed in 1998 by a Thermo-modernisation investment in buildings programme.</p> <p>The new energy policy until 2025 was adopted in January 2005. It includes an energy efficiency scenario which is the only scenario that fulfils the EU regulations and other energy efficiency projects and bilateral areas of commitment.</p>

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<b>Portugal</b>	For the period 2000-2006 is in force the Operational Economy Programme (POE) that includes measures regarding the improvement of the energy domestic potential and the rationalisation of energy consumption. In May 2001 the Government approved the “Strategy for Climate Change” under which a national programme for climate change should be established. The Climate Change National Programme started in 2001 and it contained many elements relating to energy efficiency. In September 2001 the Government also approved a major programme called “E4 Programme, Energy Efficiency and Domestic Sources of Energy,” which is a set of measures to improve energy efficiency
<b>Slovak Republic</b>	The government prepared a programme for reduction of energy intensity. A high priority is in meeting its obligations in the European Union, including the legislative components. The housing retrofit programme for the worst housing stock in the country includes improving the thermal qualities.
<b>Slovenia</b>	<p>An Energy Act of September 16, 1999 sets out the legal, regulatory and institutional framework of the power, heat and gas sector. It also has provisions on energy efficiency and renewable energy, giving a role to the state and other actors and presenting a legal basis for secondary legislation, like demand side management, labelling and minimum efficiency standards. A Resolution on a National Energy Programme was adopted by the Parliament in April 2004. It sets also a target of overall increase of energy end-use efficiency by 10 % in the period 2004 – 2010, of doubling of electricity produced by cogeneration, and of increase of RES share in the primary energy from 8.8% up to 12.0% in the period 2001 – 2010.</p> <p>The building sector is a priority in energy efficiency policy because cost-effective potential of energy savings through energy efficiency investments is some 20 to 25 per cent of the actual consumption in buildings. The retrofitting of existing building stock is the programme planned.</p>
<b>Spain</b>	Energy Efficiency and Saving Plan is within the National Energy Plan (1991-2000). In the 2000/2001 in-depth review of the energy policies of Spain, the IEA stated that the Government of Spain should establish a new, coherent and comprehensive energy efficiency programme to help slow growth in energy demand in all sectors; ensure that the measures are cost-effective and consistent with their objectives, and that the programme sets priorities, on both the supply and demand sides.
<b>Sweden</b>	<p>The 1997 Bill on Sustainable Energy Supply placed a strong emphasis on energy efficiency. In June 2002 the Energy Policy Bill <i>Co-operation for a Secure, Efficient and environment Friendly Energy Supply</i> (2001/02:143) was approved. It includes measures designed to encourage more efficient energy consumption through the rationalisation of existing policy measures and the dissemination of knowledge both nationally and regionally.</p> <p>In 2002 the climate change strategy was approved by Parliament and in 2004 a follow-up “checkpoint” was published. Energy efficiency is a major component, including emphasis on the Energy Performance in Buildings Directive.</p>
<b>Switzerland</b>	The SwissEnergy Action Programme, launched in January 2001, replaced the Energy 2000 Action Plan which came into effect in 1991. The Energy 2000

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	<p>Action Plan gave high priority to energy efficiency and the new programme has continued with that emphasis. There is more emphasis on incentives and regulations to strengthen the voluntary measures from the Energy 2000 Action Plan.</p>
<b>United Kingdom</b>	<p>The latest White Paper on energy was published in February 2003, with four main objectives, including the ambition of reducing carbon dioxide emissions by 60 per cent by 2050. Energy efficiency is considered the cheapest, safest way of meeting all four objectives.</p> <p>In April 2004, the government published the energy efficiency action plan that sets out how the government aims to cut carbon emissions by an extra 12 million tonnes through energy efficiency over the next 6 years. It includes savings of 4.2 Mt in households. Separately, the government published a CHP strategy in April 2004. This includes support for community heating schemes.</p>



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### **Annex 2: Targets for EE Improvements in Buildings**

<b>Austria</b>	<p>The country is aiming for an average improvement of energy intensity of 1per cent per year beyond the normal improvements in this area that can be expected without any explicit policy initiatives.</p> <p>Measures in buildings under the climate change strategy are expected to reduce CO<sub>2</sub> emissions by 4 million tonnes per annum once fully implemented.</p>
<b>Belgium</b>	The Flemish government has issued an energy policy document for the period 2000 to 2004 which stated the objective of reducing energy consumption in the residential sector in 2004 to the 1998 level.
<b>Cyprus</b>	No specific target for energy efficiency.
<b>Czech Republic</b>	No specific target for energy efficiency.
<b>Denmark</b>	<p>20 per cent improvement in energy intensity between 1994 and 2005. The Kyoto commitment is to reduce GHG emissions by 21per cent in the first budget period 2008-2012, compared to 1990. The new energy conservation action plan states that there are no CO<sub>2</sub> objectives set for individual sectors or areas.</p> <p>The new action plan calls for tightening the energy requirements in the building code by 25-30 % from 2006 and a further 25 % from 2010. The new action plan calls for a general target for reducing energy consumption in all sectors (not transport) of 1.7 per cent per year until 2013.</p>
<b>Estonia</b>	The current Energy Efficiency Target Programme aims for energy consumption growth to be no more than half GDP growth and CO <sub>2</sub> emissions to be reduced by 8per cent against 1990 levels, through energy efficiency and fuel switching.
<b>Finland</b>	The energy efficiency target in Finland is to bring down total energy consumption by 4 to 5per cent, which corresponds to a reduction of about 1.5 Mtoe in 2010 compared to a situation in which new energy efficiency activities would not be implemented. CO <sub>2</sub> emissions would be reduced by around 4 million tonnes. The energy efficiency targets for the end-use sectors in 2010 are: industry 3per cent, transport 6per cent, heating of buildings 9per cent, electricity for residences 2per cent and electricity for services 3per cent.
<b>France</b>	No specific target for energy efficiency.
<b>Germany</b>	There are no quantitative targets within the national energy strategy.
<b>Greece</b>	No specific target for energy efficiency.
<b>Hungary</b>	Increase energy efficiency by 3.5 per cent per year; achieve energy savings at end of 2010 of 75 PJ per year.
<b>Ireland</b>	Targets are linked to the Kyoto Protocol obligation for GHG emissions reductions. Under the climate change strategy, there is to be a reduction of 0.25 Mt of CO <sub>2</sub> for increased CHP capacity and a further 0.25 Mt of CO <sub>2</sub> emissions due to tightened building regulation standards. There are separate targets for fuel switching, including to renewables.

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<b>Italy</b>	No specific target for energy efficiency.
<b>Latvia</b>	The objective of the strategy is to achieve a 25per cent decrease of the primary energy consumption per gross national product unit by 2010, reaching the average level in OECD in 1997.
<b>Lithuania</b>	No specific target for energy efficiency.
<b>Luxembourg</b>	No specific target for energy efficiency.
<b>Malta</b>	No specific target for energy efficiency.
<b>Netherlands</b>	<p>Action Programme calls for increasing the energy conservation from 1.6per cent to 2.0 per cent improvements per annum. There is no specific target for buildings.</p> <p>The new energy strategy in 2005 includes an improvement in energy efficiency of 1.3 per cent per year</p>
<b>Norway</b>	<p>There is a target to increase annual use of central heating based on new renewable energy sources, heat pumps and waste heat by 4 TWh by 2010.</p> <p>There is goal to reduce level of energy use in large commercial buildings by 100 GWh/year, aimed at buildings with total floor area over 20000 sq.m.. In small commercial buildings there is a goal to reduce need for energy by 70 GWh/year. There is no specific target for residential buildings.</p>
<b>Poland</b>	No specific target for energy efficiency.
<b>Portugal</b>	No specific target for energy efficiency. The new programme to meet the Energy Performance in Buildings Directive is expected to reduce carbon emissions by 34-45 Mt per year.
<b>Slovak Republic</b>	No specific target for energy efficiency.
<b>Slovenia</b>	Target to improve overall energy efficiency by 2 per cent per year over the next 10-15 years. The target is to increase energy efficiency in households by 10 per cent by 2010, as well as 10 per cent for industry and services and 15 per cent in the public sector.
<b>Spain</b>	No specific target for energy efficiency.
<b>Sweden</b>	There are no specific targets set by government but the administration has in its implementation of the five-year energy programme a target of increased energy efficiency of 1 TWh between 1997 and 2002. There is no specific target for buildings.
<b>Switzerland</b>	The SwissEnergy Programme calls for a reduction of fossil fuels and carbon dioxide emissions by 10 per cent between 2001 and 2010. The increase in electricity should not exceed 5 per cent for that period. There is no specific target for buildings.
<b>United Kingdom</b>	There is a target for carbon dioxide emissions reduction. There are no national energy efficiency targets although there is a target for the Government Estate, hospitals and schools. Local authorities also have a target.

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	The Energy White Paper calls for a reduction of carbon dioxide emissions of 10 Mt to come from energy efficiency improvements. 5 Mt are to come from households.
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### **Annex 3: Status of Building Codes before Implementation of Directive on Energy Performance of Buildings**

<b>Austria</b>	Almost all länder have improved U-values over the past years and in some cases have also gone well beyond minimum standards within the existing "Agreement on Energy Saving" of 1995 on the basis of Article 15a of the Federal Constitution Act between the federation and the nine länder. Special requirements for subsidised residential buildings will be revised before 2006.
<b>Belgium</b>	<p>Revise: The Flemish region adopted the K55 insulation standard on 18 September 1991, with amendments made on 30 July 1992. The Walloon region approved the K55 standard at the beginning of 1997. Until then, the Walloon region had required the K70 standard since 1984</p> <p>New minimum requirements for thermal insulation, heating energy, standard ventilation will be adopted in 2006 for Wallonia. On April 30, 2004, the Flemish Parliament approved the decree on the Energy Performance of Buildings. A first order for establishing the requirements on the Energy Performance and the Indoor Climate of buildings has been approved by the Flemish Government in March 2005.</p>
<b>Cyprus</b>	<p>There are currently no minimum requirements. Harmonised legislation is being prepared laying down the requirements regarding:</p> <ul style="list-style-type: none"> <li>• the general framework of a common methodology for calculating the integrated energy performance of buildings;</li> <li>• the application of minimum standards on the energy performance of new buildings;</li> <li>• energy certification of buildings;</li> <li>• regular inspection of boilers and of central air-conditioning systems in buildings.</li> </ul> <p>Cyprus has chosen the Portuguese Energy Agency to provide technical assistance to meet its EPBD obligations. This is to start in June 2005.</p>
<b>Czech Republic</b>	Revised in 1994. The building code is not mandatory unless government money is invested. Thermal insulation is stipulated by the Energy Management Act of 2001. Plans are underway for revising the building standards to comply with the Energy Performance in Buildings Directive.
<b>Denmark</b>	<p>In June 2005 new energy requirements for the building regulations of small houses and for the general building regulations were published. These fulfil requirements for articles 3,4, 5 and 6 of the EPBD. The new requirements come into force January 1, 2006. The new requirements will reduce energy consumption by 25-30 % in new buildings.</p> <p>A new law on Energy Savings in Buildings was approved in June 2005. it will require energy labelling of all public buildings every five years, regular energy labelling of all large buildings (over 1000 sq. m. gross area) for trade and services as well as for apartment blocks. For building and apartments for sale or rent, the energy label is only valid 5 years. Energy labelling includes inspection, certification and advising.</p>
<b>Estonia</b>	The specification of thermal characteristics for buildings and insulation is on-going.
<b>Finland</b>	The new building code came into effect in 2003. It is to improve energy

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	efficiency by about 30 per cent in new buildings.
<b>France</b>	<p>Energy regulations for new buildings were updated in 2001. In the residential sector, energy consumption in new buildings should be reduced by 15% with respect to the 1989 regulations. In the commercial and public sector, a performance improvement of 40% is expected. The new regulation "RT 2000" incorporates a general objective for the energy performance of the buildings and not merely constraints on particular aspects such as thermal insulation, thermal bridges, infiltration, etc. Space heating, ventilation, air-conditioning and domestic hot water are concerned (as is lighting in commercial and administrative buildings). The optimal combination can be chosen by building designers from among all possible solutions -- thermal insulation, use of solar energy, high-performance space heating and cooling systems, etc. -- taking into account the practical constraints of the project and economic aspects.</p> <p>2005 should be the year when a stricter thermal building code should be reinforced (called RT 2005 for Réglementation Thermique).</p>
<b>Germany</b>	<p>On 1 February 2002, the new <i>Energy Conservation Ordinance</i> came into force which aims at reducing the amount of energy consumed in heating, climate control, and hot-water provision in new buildings by roughly 25 to 30 per cent. It unifies the previously separate thermal insulation and the heating installation ordinances. The Energy Conservation Ordinance means that, for the first time, an overall optimisation of measures for thermal insulation on the one hand, and heat unit efficiency on the other hand, is possible and specifically supported by statutes.</p> <p>The Energy Conservation Ordinance also encourages energy efficiency improvements in existing buildings. The Ordinance requires that all boilers installed before October 1978 must be replaced. There were about 2 million such boilers in 2001. The ordinance sets stricter energy requirements when modernisation or retrofitting measures are undertaken than did the 1995 Thermal Insulation Ordinance. In some specific cases the ordinance requires retroactive improvement of insulation of floors, ceilings and piping.</p> <p>The federal government set new standards for the energy-efficient construction of administrative buildings. The new buildings, constructed for the relocation of parts of the federal government to Berlin in 1999, use 20 per cent to 50 per cent less energy than is required by the recent Thermal Insulation Ordinance. The figures are 44 per cent for the Federal Chancellery, 34 per cent for the Federal Ministry of Economics and 29 per cent for the Office of the Federal President.</p> <p>Elections expected in the second half of 2005 could affect the implementation of the EPBD.</p>
<b>Greece</b>	<p>The joint Ministerial Decision of August 1998 provides for the replacement of the old Thermal Insulation Regulation with the issue of minimum energy efficiency standards for new buildings and the establishment of a new integrated energy study for the energy requirements of new buildings (comprising the contribution of both thermal insulation and bioclimatic and passive/active energy systems and including also cooling, lighting and hot water energy consumption). Specifications, necessary for the application of the above measures, are now underway. New regulations were drafted but have not been approved. There is a committee to oversee the implementation</p>

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	of the EPBD. A conference is to be held in the autumn of 2005 to exchange ideas and provide information.
<b>Hungary</b>	<p>The Hungarian Insulation Standard MSZ 04-110-2-1992 regulates buildings walls, floors, doors and windows, and defines the k insulation ratio. This standard been in force since 1992. The government made the standards voluntary in 1994. The architect has to include in his report a statement that the design of the building is correct in this respect.</p> <p>A new building regulation will be in force from 4 January 2006.</p>
<b>Ireland</b>	<p>On 6 June 2002 the Minister signed into law Regulations amending Part L of the Building Regulations. The new Regulations require new dwellings to be much better insulated. New thermal performance standards for replacement external doors, windows and roof lights in existing dwellings where work started on or after 1 July 2003 were also set. These Regulations are projected to reduce CO<sub>2</sub> emissions by 400,000 tonnes per annum by the year 2012.</p> <p>New standards for non-residential buildings were published in 2004 for comment. Promulgation was expected in the first half of 2005. In April 2005, the Draft Action Plan for Implementation of the EU Energy Performance of Buildings Directive was published and open for public consultation until 29 July 2005.</p> <p>Implementation will be from January 2007 to January 2009, depending on the type of building.</p>
<b>Italy</b>	<p>The mandatory efficiency codes for new and renovated buildings was introduced in October 1993. Additional non-mandatory codes are being developed.</p> <p>The codes are to be updated before January 2006. Energy policy has been delegated to the regions and some have already produced legislation on EBPB (Emilia-Romagna and Tuscany).</p>
<b>Latvia</b>	Determining of energy savings requirements and execution of a control over public and residential houses: thermotechnics for Buildings Separation Constructions; Heating and Ventilation of Buildings: buildings and Construction Energy Audit.
<b>Lithuania</b>	Thermal insulation standards, under the responsibility of the Ministry of Environment, were established in 1992.
<b>Luxembourg</b>	New regulations came into effect on January 1, 1996, following the Grand Ducal regulation of 22 November 1995. The long-term energy savings are estimated to be in the range of 30-50 per cent. Monitoring is undertaken by certified architects or engineers attesting that the insulation standards have been taken into consideration. Penalties are imposed in cases of non-compliance. There are no plans for further revisions.
<b>Malta</b>	<p>Discussions are underway on thermal performance values for the exterior envelope of buildings together with control measures for artificial lighting, and for use of stored rain water.</p> <p>There are no plans for revisions before January 2006.</p>

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<b>Netherlands</b>	<p>New regulations for the construction industry officially come into force on 1 January 2003. They include a new Buildings Decree and the amended Housing Act, containing an updated list of structures for which planning permission is not required.</p> <p>New minimum energy performance requirements will be set for new buildings and major renovations. The new requirements will come into effect by 2006.</p>
<b>Norway</b>	<p>The new building code came into force on 1 July 1997. It calls for a 25 per cent reduction of energy use in new buildings. Authorities are considering revising the code in line with the provisions under the EU directive on energy performance of buildings.</p>
<b>Poland</b>	<p>Technical requirements for buildings and their locations was approved in September, 1997.</p> <p>Poland is in the middle of work on secondary legislation. There will be new levels of requirements: on losses and performance. There will be new performance requirements for heating and cooling and on delivered energy for lighting and hot water. Work is under the co-ordination of ZAE (the Association of Energy Auditors). Implementation could be affected because of problems arising after parliamentary elections.</p>
<b>Portugal</b>	<p>The Decree Law 40/90, which came into effect in January 1991, is a regulation on the characteristics of the thermal behaviour of buildings. There are three climatic regions for winter conditions and three different climatic regions for summer. New regulations are to come into force in 2005, which will comply with the Energy Performance in Buildings Directive. The new standards will show about a 50 per cent improvement compared to the old ones.</p>
<b>Slovak Republic</b>	<p>Building standards were revised in 1997. The Building Act and Act on Building Construction Products were revised in 1998. Further, a new national thermal-technical standard for existing and new buildings has been in place since 2002.</p>
<b>Slovenia</b>	<p>The new technical regulation "Rules on thermal insulation and efficient energy use in buildings" (OJ RS, No. 42/02) based on EN 832 calculation method was promulgated in May 2002. In order to fulfil the requirements of the new regulation savings of 30 per cent compared to previous regulation are expected. The order enables energy certification of buildings.</p> <p>There is also "Rules on the ventilation and air-conditioning of buildings" (OJ RS, No. 42/02, 105/2002) was promulgated in May 2002. The regulation includes also energy efficiency requirements (e.g., waste heat recovery systems).</p>
<b>Spain</b>	<p>Royal decree 2429/1979, of 6 July (Annex 5), approved the Basic Building Code NBE-CT-79 regarding the thermal insulation of buildings.</p> <p>These codes require that the thickness of the thermal insulation be calculated according to the geographical location of the building and the economic conditions over the medium and long term. For this purpose, among other</p>

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	<p>considerations, code NBE-CT-79 divides Spain into five climatic zones for determining the overall thermal coefficient appropriate for the building. Revisions are currently being worked on.</p> <p>Today's standards for energy savings in buildings were established by Royal Decree 2429 of 1979, which sets mandatory minimum requirements (NBE-CT-79) for thermal insulation. New more strict mandatory standards, in compliance with the "SAVE Directive" will be introduced in 2002. The autonomous regions will be responsible for the enforcement of these standards. They will be based on an evaluation of the building project at the planning phase and on random check-ups of new buildings.</p>
<b>Sweden</b>	<p>Thermal insulation requirements as an element of energy efficiency policy were first enacted after the first oil crisis in 1975 and most recently revised in 1998. The regulations are now based on performance requirements.</p> <p>There is a special Commission of Inquiry (the Energy Performance in Buildings Commission) with the task of submitting proposals on how to implement the Directive. The final report of the Commission is due January 2005. An official inquiry on the process will be delivered to the Ministry of Sustainable Development in July 2005.</p>
<b>Switzerland</b>	<p>New standards for the improved insulation of buildings (SIA 380/1, etc) is based on the new energy law. Since January 1, 1999, these national recommendations are to be implemented by cantons. Most of the cantons have already adopted and introduced this model decree and the aim now is to work together with the cantons to adapt it to the latest status of technology. The focus here is to be on lowering the U-values and tightening up threshold parameters for heating energy requirements, as well as on the promotion of renewable energies.</p> <p>There are voluntary standards for new buildings and renovations (Minergiestandard, Passivhausstandard) to determine the maximum energy consumption.</p>
<b>United Kingdom</b>	<p>Most recent changes to the Building Regulations took effect in April 2002. Part L of the Building Regulations (Conservation of Fuel and Power) set out the requirements for energy efficiency and thermal insulation for the conservation of fuel and power.</p> <p>New revisions to Part L of the Building Regulations came into force in 2005.</p>



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### **Annex 4: Status of Energy Certification of Buildings**

<b>Austria</b>	The elaboration of a national standard for an energy certificate is well advanced. A draft was expected by mid-1999, followed by public discussion. The energy certificate will be designed to provide information to consumers on the thermal and energetic characteristics of buildings and parts of buildings, to provide information on the quality of buildings and parts of buildings, to give evidence of the fulfilment of legal requirements concerning thermal insulation, to serve as the basis for renovation of buildings and to serve as the basis for granting subsidies in the context of building promotion (for new buildings) and housing improvement (for existing buildings). Once the standard is finalised, it can be included as reference in the laws on housing promotion and housing improvement or in the building codes.
<b>Belgium</b>	There is currently no requirement. Discussions are underway as to the use of energy certificates for public buildings.
<b>Cyprus</b>	Harmonised legislation is being prepared laying down the requirements regarding the energy certification of buildings.
<b>Czech Republic</b>	There are energy labels for new buildings and modernisation of existing buildings, as required under EU Council Directive 93/76/EEC. It is obligatory in accordance with Regulation No. 137/1998 Coll. There is an energy "passport" defined by Regulation No. 291/2001 Coll. It is part of the project documentation for the building permit procedure. The "passport" includes relevant data on thermal quality for new buildings and for modernised buildings. The energy "passport" is not part of the Government programme.
<b>Denmark</b>	<p>From 1997, a new energy-labelling scheme for large and small buildings took effect.</p> <p>In June 2005 new energy requirements for the building regulations of small houses and for the general building regulations were published. These fulfil requirements for articles 3,4, 5 and 6 of the EPBD. The new requirements come into force January 1, 2006. All new building have to be labelled to ensure fulfilment of the requirements..</p>
<b>Estonia</b>	There has been the elaboration of energy certification methodology for different types of buildings, training of building auditors, and the creation of the organisation system of certification. This plan is for the period 2001-2005.
<b>Finland</b>	There is currently no requirement. It is currently under discussion if and how energy certificates will be used for public buildings.
<b>France</b>	<p>A set of regulations should soon be adopted requiring a standardised assessment of annual costs of energy to be notified on the occasion of the sale or rental of a building for residential or tertiary use. The regulations are now being designed and should be adopted along with the new thermal regulation.</p> <p>There will be two labels: "haute performance énergétique -HPE-" and the label 'très haute performance énergétique -THPE-' l'arrêté du 18 décembre 2003 relatif au contenu et aux conditions d'attribution du label « haute performance énergétique » est publié au J.O n° 302 du 31 décembre 2003.</p>

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	<p>The law for energy certificates was adopted in 2004. Further laws for implementation are being discussed in parliament.</p> <p>It is expected that the energy certificates at the point of sale of the dwelling will come into force in mid-2006, with the certificate for rentals in 2007.</p>
<b>Germany</b>	Certification is required for existing buildings only if large renovation is undertaken.
<b>Greece</b>	1998 -- Framework Ministerial Decision. Regulations are being prepared.
<b>Hungary</b>	<p>In order to introduce the building's certification system required by the Energy Saving Action Plan, two feasibility studies have been undertaken to work out the data sheet related to energy consumption, heat supply, heating, hot water production, gas and electricity supply. The introduction of such certification should increase the energy performance of each building.</p> <p>After June 2006, no building can be commissioned without a building certificate. From January 1, 2007, the certificate is compulsory at point of sale. This date may be delayed for small buildings for social reasons.</p>
<b>Ireland</b>	<p>The Irish government is incorporating a system of energy rating as an amendment to the Technical Guidance Document L, <i>Fuel and Energy Conservation</i>, of the Irish Building Regulation. The revised document, published in the fall of 1996, is mandatory. Since 1992, energy rating has been on a voluntary basis through the Irish Gas Board and the National Irish Centre for Energy Rating (NICER), established to offer energy certification on a commercial basis. Being part of the Building Regulations, the programme targets builders, architects, engineers, local authorities and utilities.</p> <p>The building control package, which came into effect on 1 July 1998, includes the use of the heat energy rating as an optional method of demonstrating compliance with the Technical Guidance Document L.</p> <p>In April 2005, the Draft Action Plan for Implementation of the EU Energy Performance of Buildings Directive was published and open for public consultation until 29 July 2005.</p>
<b>Italy</b>	<p>Law No. 10, Jan. 9, 1991 requires mandatory building energy certification. At the national level, there is a pre-regulation working group, organised by the Italian Thermo-technical Committee (CTI) and co-ordinated by the national energy agency, ENEA.</p> <p>There is voluntary certification in some regions. There is no provision for having energy certificates for public buildings. Energy policy has been delegated to the regions and some have already produced legislation on EBPB (Emilia-Romagna and Tuscany). Emilia-Romagna has reduced the certificate time validity to 5 years.</p>
<b>Latvia</b>	<p>There is energy certification of different types of buildings and enterprises. The main goal of energy certification is to reflect the real situation of energy consumption in buildings and to show the ways to save energy. Currently the use of energy certificates for public buildings is under discussion.</p>

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<b>Lithuania</b>	There is no energy certification programme. A scheme will be in place because of the Energy Performance of Buildings Directive. It will require certificates for governmental, municipal and renovated buildings (public and housing stock) that are provided State support.
<b>Luxembourg</b>	2000 -- Certificate will be required after major retrofits. It is under discussion whether the certificates will be required for public buildings.
<b>Malta</b>	There is no energy certification programme but it is being developed. It will almost certainly be required for offices, schools, hospitals and institutional buildings.
<b>Netherlands</b>	For new houses, they are required by the building code. A quality control scheme certifies the process of assessment for existing buildings.  All building owners will have to produce an Energy Performance Certificate that is no more than 10 years old, at the construction, sale or rent of a building. There are special arrangements for houses built since 1997.
<b>Norway</b>	There is a voluntary scheme.
<b>Poland</b>	There is no energy certification programme yet.
<b>Portugal</b>	Specific legislation to approve a certification programme under preparation. Every non-residential building will be required to display the energy certificate.
<b>Slovak Republic</b>	There is no energy certification programme.
<b>Slovenia</b>	The new technical regulation "Rules on thermal insulation and efficient energy use in buildings" (OJ RS, No. 42/02) based on EN 832 calculation method was promulgated in May 2002. The order enables energy certification of buildings.
<b>Spain</b>	1996 -- Mandatory for new buildings under public authorities.
<b>Sweden</b>	There is no requirement. There is a special Commission of Inquiry (the Energy Performance in Buildings Commission) with the task of submitting proposals on how to implement the Directive, including the energy certificate. The final report of the Commission is due January 2005.
<b>Switzerland</b>	There is no energy certification programme.
<b>United Kingdom</b>	The Standard Assessment Procedure (SAP) produces an energy cost rating for space and water heating and a carbon index for dwellings. It is legally required for new housing.  The Housing Act of 2004 the UK Government introduced a requirement for a Home Information Pack that anyone putting their home on the market in England and Wales will be obliged to complete. Part of this pack will be an Energy Report identifying the energy efficiency of the property being sold, and cost-effective steps which the owner can take to reduce the home's energy use.

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**Annex 5: Summary of Financial Incentives<sup>36</sup>**

<b>Generic Measure</b>	<b>Sector</b>	<b>Country</b>	<b>Description</b>
<b>Tax Allowances and exemptions</b>	Households	Belgium	Tax reductions are provided for the replacement of old boilers, solar energy, double glazing, roof insulation, central heating controls and energy audits.
	General	Czech Republic	A lower rate of VAT is charged on the purchase of “Environmentally Friendly” technologies. This includes energy efficient technologies.
	Households	France	Income tax credits are given for installing insulation, heating regulation, and efficient boilers. The Finance Law for 2003 extended the tax credit on the acquisition of large collective equipment, renewable energy equipment and thermal insulation and heating-regulation material.
	Households	Slovenia	Income tax reduction for energy efficient appliances expenditures.
<b>Grants</b>	District Heating	Austria	A subsidy is paid to operators of district heating plants to encourage continued deployment, and focus the fuel choice on renewable sources. The subsidy is raised by a levy of EURO 0.044/m <sup>3</sup> on natural gas, and EURO 0.0073 / m <sup>3</sup> on electricity
	Households	Austria	The Dwelling Improvement Act and Housing Promotion Subsidies were redesigned in 2003. Energy efficiency and the use of renewables are criteria in the level of subsidies in most provinces.
	Households	Austria	All provinces offer subsidies for insulation as part of housing promotion and housing improvement laws. The Burges Forderunskbank, a specialised bank in charge of administration of ERP funds, provides financial support inter alia, for energy efficiency measures.
	Households	Belgium	Walloon region has subsidy for low income households to improve energy efficiency.
	Services	Belgium	The Brussels-Capital Region provides subsidies to municipalities, local public bodies, schools and hospitals for energy efficiency investments and energy audits.
	General	Denmark	Grant provisions totalling € 135 million are

<sup>36</sup> Adapted from Energy Charter, The Road Towards an Energy-Efficient Future, Brussels, May 2003, p. 151.

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			made each year to improve energy efficiency. There are subsidies for pensioners with low income. There are other grants to promote central heating.
	Households	Finland	The repair grant scheme of the Ministry of the Environment provides grants of 10 % for the repair of houses. The grant goes to 20 % for energy conservation measures.
	Industry, Services	Finland	Energy audit programme subsidised by MTI by 40-50 per cent. Since 1992, with a new phase that started in 1997.
	Households	France	Energy efficiency subsidies given to: <ul style="list-style-type: none"> <li>• low income dwellers whose houses are older than 20 years;</li> <li>• rented accommodation dwellers, whose houses are older than 15 years;</li> <li>• rental and social housing improvement to assist organisations in improving their rental housing units, over 15 years old.</li> </ul>
	CHP	Germany	Subsidy offered to improve CHP plants. Investments are particularly directed at modernising district heating plants, local heat distribution networks, and deploying energy measurement technologies. Subsidies covered up to 35per cent of eligible costs.
	Households	Germany	Householders can receive a payment of EURO 255.65 per year for eight years for the installation of certain heat pumps, solar systems or heat recovery boilers, or by purchasing a low energy home. Further support can be given if energy requirements are 25per cent lower than the standards established by the Heat Insulation Ordinance.
	Households	Hungary	Grant for additional insulation of the residential buildings, EE reconstruction of the heating system, changing the windows, started in 2000.
	Households	Hungary	grant for reconstruction of the consumer side district heating
	Households, Industry, Services	Hungary	grant for using renewable energy sources e.g. solar collectors.
	General	Hungary	Grant for reconstruction of the District heating as well as for consumer-side of district heating.

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	Households	Ireland	Energy action programme provided grants to low income and elderly households to insulate homes.
	Industry, Services	Ireland	The Energy Audit Grant Scheme for industrial, commercial and institutional sector. Audits undertaken by consultants are subsidised by 40per cent up to a maximum of IR£ 5000.
	Industry	Ireland	Support to the competitive development of Combined Heat and Power.
	Household	Netherlands	Subsidies are provided for households that apply for listed energy efficient household equipment and building improvement. The energy distribution companies provide the subsidy and partially recover the cost as a tax allowance.
	Households	Netherlands	The Energy Premium Scheme (EPR) is a subsidy scheme for households and social housing corporations investing in energy efficiency.
	Households	Poland	A programme on Energy Efficiency and Thermo-refurbishment of Buildings in communal housing sector covering 2.4 million flats. This Act was approved by Parliament on 28 December 1998.
	Household	Portugal	Incentive scheme for the promotion and deployment of energy efficient technologies. Grant includes energy measurement, investments and demonstration of prototypes.
	Households	Slovak Republic	Financial assistance for the investment in energy efficiency in apartments (M and R and renewables).
	Households	Slovenia	Energy advice free of charge. Grants for replacement of windows and loft insulation. Energy audit programme for multi apartment buildings subsidised up to 50per cent.
	Industry, Public Sector	Slovenia	Energy audits and feasibility studies subsidies up to 50per cent.
	Households	Sweden	Grants for reduced use of electricity for heating and grants for enlargement of district heating networks. There are 165 million dollars (for a five-year period).
	General	Sweden	The Technology Procurement Programme aims to improve the energy efficiency of

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			products by using companies' competitive abilities to make better products. The process brings together the requirements of potential buyers that are prepared to place an order if specified conditions are met. Suppliers then compete on the basis of design and price.
	CHP	Sweden	Investment support is given to CHP fired using biomass. A grant of EURO 460.56 per kW of capacity is given to new plants, a grant of 35per cent of the rebuild costs are given to existing plant or where plant are converted from fossil fuels.
	Household	UK	<p>The Affordable Warmth Scheme provides grants to assist low income households install basic insulation. This grant includes payment for draught proofing, loft insulation, and other energy advice.</p> <p>Under the Energy Efficiency Commitment, electricity and gas suppliers must meet targets for the promotion of improvements in energy efficiency. They contribute to the cost of energy efficiency measures taken up by consumers.</p>
	Household	UK	The Community Energy Programme provides grants to promote community heating (district heating). The current programme has been extended to 2007-08.
<b>Loan Support</b>	Households	Austria	Some provinces and utilities offer soft loans for thermal improvement of houses.
	General	Finland	Loan credits given to Finnish companies investing in plants and technologies in neighbouring countries to improve finish environment. Examples include energy efficiency and power generation plant refurbishment.
	Public sector, SMEs, Households	Germany	A range of low interest rate loans for investment in municipal infrastructure, SMEs and households, including energy efficient technologies. Support is provided up to 50 per cent of total project costs. Loans are disbursed through a range of private banks.
	Households	Lithuania	Long term loans for energy efficiency improvements
	Households	Netherlands	Green mortgages under the Green Investment Scheme can be given to house owners and building projects, if these are sustainable



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			buildings (including energy savings). The interest is lower (about 1.5 per cent) than normal, as the banks use for this mortgage money from green funds. People invest in green funds, as the interests from these funds are excluded from the income taxes.
	Households	Slovak Republic	Subsidy for insulation of flats and houses with a subsidy of up to 70 per cent of the interest charges, short term three-year loans or 75 per cent of the loan value as bank guarantee.
	Households/ Commercial	Spain	Under the Plan for the Promotion of Renewable Energy, loans are provided for renewable energy and improving energy efficiency in industry and buildings.

**Acronyms**

CHP	Combined heat and power or cogeneration
DSM	Demand side management
EC	European Commission
ECS	Energy Charter Secretariat
EU	European Union
GHG	Greenhouse gases
IEA	International Energy Agency
IRP	Integrated resource planning
KWh	Kilowatt-hour
toe	Tonnes of oil equivalent