ENPER-EXIST

Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings – ENPER-EXIST

WP4: **Roadmap for energy efficiency measures/policies in the existing building sector**

Annexes to the WP4 report

Intelligent Energy Europe

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ENPER-EXIST project information

The ENPER-EXIST project was initiated and is coordinated by the Centre Scientifique et Technique du Bâtiment (CSTB) in the frame of the Intelligent Energy Europe (EIE) programme in the part SAVE of the European Commission, DG TREN. It involves partners from 7 countries on the topic of energy performance standardization and regulation. Contract EIE/04/096/S07.38645. Duration: 01/01/2005 - 30/07/2007.

The Energy Performance of Buildings Directive (EPBD) sets a series of requirements specifically dedicated to existing buildings but the member states are facing difficulties to implement these requirements. The main goal of the ENPER-EXIST project is to support the take off of the Energy performance of buildings directive (EPBD) in the field of existing buildings.

ENPER-EXIST has 4 main objectives:

1. To de-fragment technical work performed on existing buildings. Indeed actions already launched in CEN to apply the EPBD are de-fragmented but mainly focus on new buildings. On the other hand different projects on certification procedures are going on at the European level but are not coordinated.
2. To de-fragment work on legal, economical and organisational problems such as the analysis of certification on the market, the human capital and the national administrations.
3. To achieve a better knowledge of the European building stock.
4. To define a roadmap for future actions regarding existing buildings.

ENPER-EXIST uses an intensive networking of existing national and international projects to reinforce efforts to solve these issues. It works in close coordination with the Concerted Action set up by Member States to support the application of EPBD. The work program is split in 4 technical work packages in addition to dissemination and management activities.

WP1: Tools application
WP1 analyses how existing buildings are taken into account in technical tools such as CEN standards, national calculation procedures. Recommendations on how to improve the consideration of existing building are be defined.

WP2: Legal economical and organisational impact
WP2 analyses the impact of the certification procedures and regulations of existing buildings on the market, on the human capital and on the national administration. Surveys are carried out in the different member states and recommendations are drawn up.

WP3: Building stock knowledge
WP3 analyses the level of information available in each country regarding the existing building stock. A procedure enabling to refine this information and ways to use the certification procedure as a tool to collect data regarding this stock is developed.

WP4: Roadmap
An overview of possible legal measures for existing buildings is written. Indications are given about alternative strategies to improve on a wide scale the energy efficiency of existing buildings. Possibilities (including pro's and cons) to widen the scope of the EPBD in case of a future revision of the requirements of the directive are described.

A website, newsletters and workshops enable a strong interaction between ENPER-EXIST and different interest groups and a wide dissemination of ENPER-EXIST results. The workshops are organised with the different actors involved in the application of the EPBD. More information on the project website: www.enper-exist.com

Table of contents

Introduction

This document contains the annexes to the ENPER EXIST WP4 report. The national annexes are available for 7 European countries participating to the project. The structure of the document is the following:

Overview of existing instruments aiming to improve the energy efficiency of existing buildings – situation in 7 european countries

- Situation in Belgium
- Situation in Denmark
- Situation in France
- Situation in Germany
- Situation in Greece
- Situation in The Netherlands
- Situation in The United Kingdom

Long term vision of European countries regarding the energy efficiency in the existing building stock

- Long term vision in Belgium
- Long term vision in Denmark
- Long term vision in France
- Long term vision in Germany
- Long term vision in The Netherlands
- Long term vision in The United Kingdom

Analysis of the situation of 8 specific building market sectors

- Social housing managed by public bodies
- Residential sector - lack of enthusiasm and invisibility of energy saving measures
- Residential sector – owners with no financial possibilities
- Apartment buildings – the problematic of the co-ownership and decision making within apartments
- Apartment buildings – importance of the way heating costs are charged
- Rented office buildings
- Educational buildings
- Public buildings

1. Overview of existing instruments aiming to improve the energy efficiency of existing buildings – situation in 7 European countries

Many measures and policies have been developed and are implemented to encourage the improvement of the energy efficiency of existing buildings. These measures may differ from one member state to the other and may be originated either by the different authority levels or by other market parties.

In this section the measures and instruments existing in the 7 participating countries to the project (Belgium; Denmark, France, Germany, Greece, The Netherlands and The United Kingdom) are presented.

The structure adopted for these contributions is the same as for the presentation of the possible measures presented in the WP4 main report. This report contains a generic description of the measures and an overview of the countries in which each of these measures is implemented. The toolbox accompanying the report gives a synthetic overview of the measures implemented in the different countries.

Each country contribution has been compiled by the national partner.

The common structure of the presentation of the measures is the following (see also §4 of the WP4 main report):

1 The regulation tool

1.1 Legal requirements (technical)

1.1.1 Adopt and/or reinforce requirements

a. At the building level - overall energy performance

b. At the building level - subset performance

c. At the component level

d. Enlargements of the application field of the requirements

Adaptation of energy and environment standards

1.1.2 Visible meters in the building

1.1.3 Requirements compliance check

1.1.4 Public governmental buildings

a. Stricter requirements to governmental buildings

b. Integration of the energy performance of buildings in public procurement procedures

c. Retrofitting of public buildings

1.2 Other legal supporting measures

1.2.1 Energy certification scheme

a. Way certificates are communicated/displayed

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

d. Linking incentives to energy performance certification

1.2.2 Encourage reconstruction instead of heavy renovation works

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

1.2.4 Legislation concerning co-ownership

a. Reduced majority level to decide to implement measure proven to be energy efficient

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

1.2.5 Legal status of the co-ownership for bank credits for energy refurbishments

1.2.6 Energy-friendly urban regulations

1.2.7 Minimum energy requirements for renting

1.2.8 Environmental permit

1.2.9 Adoption of annual energy efficiency plans

1.2.10 Mandatory energy efficiency impact assessment of new regulations

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

b. Taxation stimuli of energy efficient buildings and penalties for others

c. No increase of the building taxes in case of energy efficient refurbishment

2.2 The taxation tool

a. Reduced VAT

i. On energy saving products

ii. On energy supply

b. Energy tax

c. Buildings included in the CO2 taxation market

2.3 Subsidies for energy efficient technologies

2.4 Granting soft loans

a. Higher amount possible if more energy efficient

b. Lower interest rate with credits

c. Specific loans for energy efficient retrofitting / pre-financing of the works

2.5 Third party financing (PPP)
2.6 European structural funds
2.7 Higher energy price paid for electricity from PV or CHP
2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings
2.9 Energy tariffs
a. Adapted energy tariff according to the level of energy performance certificate
b. Increasing tariff with the energy consumption

3 Non-governmental activities
3.1 Sector agreements
a. Components
b. Installers
c. Regional / municipal
3.2 Energy market mechanisms
a. Require utilities to realise energy efficient measures
b. System of the white certificates

4 Research, demonstration and development projects
4.1 Demonstration projects / good examples
4.2 Research and development project/ fundamental research

5 Promotional measures/ increase of public awareness
5.1 Campaign on related advantages to energy savings
5.2 Voluntary labelling/ certification initiatives
5.3 Information on cost-efficient measures

Situation in Belgium

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N.B. Belgium is a federal state with three regions: the Brussels Capital Region (B), Flanders (F) and Wallonia (W). Most of the legislation concerning Energy Performance of buildings is situated at the regional level; nevertheless some elements concerning energy use, production and distribution are situated at the federal level (fed). This report tries to give an overview of the elements in all regions.

Each region has a portal website where most of the information can be found in detail.

(B) www.ibgebim.be

(F) www.energiesparen.be

(W) http://energie.wallonie.be

Federal information can be found at www.fgov.be.

More details on the legislation applicable in the three Belgian regions and at the federal state level can be found on www.normes.be (in French and Dutch).

Most sites are only available in Dutch and/or French.

1 The regulatory measures

1.1 Legal requirements (technical)

1.1.1 Adoption and/or reinforcement of requirements

a. At the building level - overall energy performance

Brussels. The government is still preparing the legal framework for an overall energy performance regulation. The current legislation imposes a maximum overall insulation level of the building envelope to new and renovated residential, office and school buildings.

Flanders. The EPB decree sets a maximum level for the annual primary energy use for new residential buildings (according to the EPW calculation procedure) and for office and school buildings (according to the EPU calculation procedure). For residential buildings, the maximum allowable annual primary characteristic energy use is a function of the volume, the envelope surface and the ventilation needs. The calculation method takes into account both the building and all fixed installations (for heating, cooling, ventilation, hot water production, pumps etc). For new office and school buildings the maximum allowable annual primary characteristic energy use takes account for the lighting level as well. All other types of new buildings are subject to minimal insulation and ventilation requirements.

For residential buildings, the primary energy use for space heating and cooling, ventilation (both intended and unintended), hot tap water, fans and auxiliaries (pumps, ...), heat produced by thermal solar systems and the primary energy gains from PV or CHP are taken into account.. In addition, for offices and schools, the primary energy use for lighting and humidification is taken into account as well.

The EPB decree also imposes minimum requirements to the ventilation system. Essential elements are the procedures for compliance check and the fines in case of not compliance to the requirements (the penalties are higher than the investment needed to meet the requirements).

For all other types of new buildings a minimum K-level, which expresses the overall insulation level of the envelope as a function of the compactness of the building, is required. For renovation cases (up to a volume of 800 m³) no overall energy performance level is imposed. For larger buildings (above 3000 m³) a feasibility study about the use of renewable energy or CHP is obligatory.

Wallonia. The government is preparing an overall energy performance legislation. The current legislation has requirements on a minimum overall insulation quality for the building envelope. For residential buildings, the overall insulation quality requirement may be replaced by a maximum net energy demand for space heating requirement. Ventilation guidelines are imposed for residential buildings as well as for offices and schools. The legislation applies to all new residential, office and school buildings and to some extent also in case of renovation.

b. At the building level - subset performance

There are requirements on the insulation level (K) of the building envelope (averaged insulation level as a function of the compactness, calculated according NBN B62-301, for new buildings (in all 3 regions) and in case of renovation (only in B).

c. At the component level

Brussels. Maximum U-values or minimum R-values are imposed to the individual envelope components (e.g. windows, roofs, walls, floors, etc.) of new constructions and in case of renovation of residential, school and office buildings.

Flanders. The EPB legislation imposes maximum U-values or minimal R-values for all envelope components. The requirements are less strict for renovation than for new constructions. The maximum allowed U-value depends on the type of building (residential, schools + offices, industrial, buildings with another destination) and the type of work (new, renovation, reconstruction, …).

Wallonia. Maximum U-values or minimum R-values are imposed to the individual envelope components, for new constructions and renovation of residential, school and office buildings.

d. Enlarge the application field of the requirements

In the Walloon region and Brussels Capital Regions, the existing requirements on component level will be enlarged to bring them in line with the requirements of the EPBD.

The Flemish EPB Decree includes requirements on the indoor climate: minimal ventilation provisions for indoor air quality and a check on the risk of overheating in summer conditions.

1.1.2 Adaptation of energy and environment standards

National calculation standards are being adapted to take account for new European standards and for the purpose of the calculation and compliance check procedures for the EPB.

1.1.3 Visible meters in the building

There are no requirements on exposing the energy meters in the building. For billing purposes however, most buildings have separate meters (for electricity and gas) per dwelling unit. In apartment buildings it may occur that only one common meter is available and that the billing is done according to a distribution rule.

1.1.4 Efficient control mechanism

In the Flemish Region, the new energy performance regulation includes strict procedures and monitoring rules to check compliance with the energy performance requirements. A 'EPB rapporteur', who can be an architect or an engineer, must calculate and report (after the end of the works) in the 'EPBdeclaration' the energy performance of the building and its services as-built to the authorities. The calculation is done using the official EPB software tool and the report is electronically generated and sent to the EPB database at the Flemish Energy Agency. The rapporteur must be appointed before the start of the construction works, the start date of which has to be reported to the Flemish Energy Agency (VEA) to allow for on site verification.

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

Flanders: From 2007 on, new school buildings are subject to more severe EPB requirements (E70 compared to E100 for other buildings). Also for renovation works higher energy performan,ce requirements are imposed at subset or component level.

Rest homes and other subsidised people care buildings are subject to energy and sustainability requirements at subset or component level.

b. Integration of the energy performance of buildings in public procurement procedures

The Flemish building administration is developing a sustainability rating of all government buildings, either new built, or purchased or rented. This rating includes energy performance evaluation at the building level as well as at subset (envelope insulation level) and equipment level, with varying weighing.

c. Retrofitting of public buildings

An important renovation programme of school buildings is ongoing. Similar initiatives are also taken in the social housing sector. Energy performance requirements are imposed

1.2 Other legal supporting measures

1.2.1 Energy certification scheme

Brussels. An energy certification scheme is under development by the administration.

Flanders. The certification, still under development for existing buildings, contains a reference number expressing the energy efficiency of the building and measures to improve the energy efficiency. The energy certification is mandatory for all new and reconstructed buildings concerned in EPB legislation (cf. 1.1) from 01.01.2006 on. The certificate is generated automatically with the submission of the EPB declaration by the rapporteur at the end of the works.

For all existing public buildings the energy certification will be obligatory in 2007. In 2008 it will be obligatory for residential buildings which are sold and in 2009 for all existing buildings at the time of change of owner or tenant.

Wallonia. An energy certification scheme is still in preparation by the administration.

a. Way certificates are communicated/displayed

As in all European countries, energy certification is implemented. Apart from public buildings where the certificate has to be displayed, no specific actions are taken to make the results of the certificate available or visible at a large scale.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

Such requirements are not implemented in Belgium for the moment. Specific requirements exist in the legislation regarding the building undergoing major renovation works.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

Such a mechanism should be used in the future. Central databases collecting all the certificates are set up by the Flemish administration. These databases should allow oibtaining a better insight in the energy performance of the existing building stock. These tools should be used to develop new initiatives regarding the improvement of the existing building stock.

d. Linking public incentives to energy performance certification

Since the energy certification is not fully implemented yet, such initiatives do not exist in Belgium for the moment. However it is the intention to do so in the future. The availability of objective evaluation tools for the energy performance of buildings and building components allows shaping the incentives to meet policy goals.

1.2.2 Encourage reconstruction instead of heavy renovation works

Full reconstruction of older buildings in stead of partial renovation allows for far better energy performances of the building envelope with up to date technologies. This may be one of the more efficient ways to accelerate the improvement of the existing building stock towards energy efficiency. At this moment still the VAT rate on renovation works (6%) compared to new construction and reconstruction (21%) is a major barrier for reconstruction. Discussions are ongoing at the federal level to decrease the VAT rate for reconstruction works and to bring it at the same level as for renovation works.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

No specific legal measures exist in Belgium.

Private landlords may increase, taking into account some restrictions, the rental charges when the building has been substantially improved. But there is no specific legal support which links energy investments to the renting level.

Politically, this topic starts to find its way in discussions in order to obtain an objective relation price-quality taking into account the increasing renting levels and the importance of energy in the budget of low-income households.

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

No specific measures exist in Belgium.

1.2.4 Legislation concerning co-ownership

a. Reduced majority level to decide to implement measure proven to be energy efficient

No specific measures in Belgium.

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

No specific measures in Belgium.

c. Requirement regarding the constitution of a financial reserve in co-owned buildings

No specific measures in Belgium.

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No specific measures in Belgium.

1.2.5 Legal status of the co-ownership

No specific measures in Belgium.

1.2.6 Energy-friendly urban regulations

The urban regulations are governed at the local level (municipality and province), which gives the local authorities the possibility to create energy friendly urban regulations. This has been done in some projects concerning renovating industrial sites (brown fields) where the urban regulation did focus on sustainability, as well for the buildings, the transport concept as the business area of the companies situated at these sites. E.g. www.kampc.be

As an example, an article of the decree (under development) of the Walloon region regarding the implementation of the EPBD foresees that all municipality rules must allow for the installation of solar collectors on the roofs. Local rules that would forbid such panels are declared not valid.

1.2.7 Minimum conditions for renting

Each region has its 'housing code' which implies a certain number of minimum requirements on hygiene, safety, sanitary equipment, dimensions of rooms and other living conditions for

dwellings. No specific energy performance restrictions or requirements are mentioned in these codes.

1.2.8 Environmental permit

An environmental permit has to be delivered on a regular basis for specific buildings. In the Brussels region, where the environmental permit has to be renewed every 15 years, it has been suggested to include energy requirements in the conditions for the environmental permit for industrial and office buildings. Up to now, no such regulation has been published.

1.2.9 Adoption of annual energy efficiency plans

The public and private-public grid distribution companies (gas and electricity) must submit for approval by the regional authorities each year an energy efficiency plan to reduce the energy consumption of their clients by 1 %. These measures may include incentives for the installation of energy efficient equipment, renewable energy systems, energy audits etc. in existing buildings.

1.2.10 Mandatory energy efficiency impact assessment of new regulations

New regulations have to be assessed before introduction. In Flanders, the EPB regulation has to be regularly updated to take account for the evolution in the energy use and the technology. Thereto at this moment, a study is going on to compare the actual requirements in Flanders with those in the neighbouring countries France, Germany and the Netherlands

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

RESIDENTIAL

Federal State. Since 2003 a set of 8 measures allowing a reduction of energy consumption in dwellings may benefit of tax reduction. Up to 2005 this mechanism was only reserved to home-owners; in 2006, it has been extended to tenants. This reduction is limited to a yearly maximum amount of 2600 € (2007).

- 15% tax reduction when :
  - Changing the old boiler by an efficient one or maintenance of the boiler,
  - Installing a solar hot water production system,
  - Installing a PV system,
  - Installing a geothermal heat pump.
- 40% tax reduction when :
  - Installing high efficiency glazing
  - Installing roof insulation
  - Installing thermostatic control valves and thermostat on the heating system
  - Realization of an energy audit.

There is a general VAT reduction to 6% in stead of 21% for renovation works on buildings which are more than 5 years old.

In well defined (poorer) areas of the larger cities there is a special investment fund subsidising improvement works to multi-family residences of more than 15 years old. (More information on http://mineco.fgov.be)

NON-RESIDENTIAL

Federal State. Investments which improve the efficiency of existing installations (in the large sense) or which stimulate the use of renewable energy profit from a higher fiscal deduction.

b. Taxation stimuli of energy efficient buildings and penalties for others

No taxation stimuli or penalties are existing. Other mechanisms as subsidy are existing.

c. No increase of the building taxes in case of energy efficient refurbishment

This mechanism is not implemented in Belgium.

2.2 The taxation tool

a. Reduced VAT

i. on energy saving products

No reduced VAT is applicable for such products, excepted in the case of works realised in existing buildings older that 5 years.

ii. on energy supply

Such mechanism doesn't exist in Belgium

b. Energy tax

RESIDENTIAL

There is no energy tax, other than VAT, for residential consumers in Belgium.

NON-RESIDENTIAL

Brussels. No specific measures in Brussels are known.

Flanders. The government distinguishes big energy-intensive, small energy-intensive and non energy-intensive companies, with which energy covenants are agreed. A benchmarking covenant is an agreement between a big energy-intensive company or umbrella organization and the government in which the companies subscribe a commitment to improve continuously the energy efficiency of especially the production process by comparison with the best practices and competitors. Companies who signed a benchmarking covenant are free of additional CO_2 or energy taxes. For small energy-intensive companies, there are audit covenants by which the company commits to implement those energy efficiency measures defined through an audit as the economically most efficient ones, in order to be exempted from additional CO_2 or energy taxes. For non energy consuming companies, there are no covenants, but only information campaigns. These covenants may have a link for example to the energy consumption of the building or the re-use of heat, although they mostly focus on the energy used in the production process.

Wallonia. The industrial sector has the possibility to sign an agreement with the government, in which the sector declares which efforts will be made concerning CO_2 emission reduction in order to have administrative dispenses or subsidies from the government. For the tertiary sector the government promotes and subsidises the audit principle. Also here, the audits

and agreements mostly focus on the energy consumption of the processes but in some sectors the building or installation is a factor of the process energy consumption.

c. Buildings included in the CO_2 taxation market

There is no CO_2 taxation in Belgium for buildings.

2.3 Subsidies for energy efficient technologies

RESIDENTIAL

Federal

Although it is not really a subsidy of energy efficiency, it is worth mentioning that the Federal government distributed in 2005 (1-year measure) a 'heating subsidy' (75€) to each household heating with gas or oil. The aim was to convert this subsidy in a more structural energy-saving subsidy in order to reduce the energy bill for households by stimulating energy efficiency. Up to now this structural measure is not taken. For low income households there is a structural subsidy for oil and gas as soon as the energy prices pass a certain threshold.

Green certificates are also obtainable for residential buildings (cf 3.2. non-residential)

Brussels. For dwellings constructed before 1945 a subsidy scheme is available which intervenes a.o. for insulating the building, installing efficient heating and hot water system. For all dwellings subsidies are available for:

- Energy efficient domestic appliances (fridge, freezer, washing machine),
- Low temperature and condensing high efficiency boiler and regulation systems,
- Insulation of the roof,
- Solar collector and PV.

There are energy consultancy offices (ABEA, the Brussels energy agency, www.curbain.be) which advise on questions dealing with energy and energy efficiency. Information about renewable energies can be obtained from APERe (www.apere.org) or ODE (www.ode.be). Audits by professionals are offered at subsidized prices.

Flanders. A 10% investment subsidy is accorded when installing PV. In addition, green certificates are given at a rate of 450 € peer MWh. Several subsidies can be obtained for 'upgrading' a dwelling, but these are limited to low income classes and not necessarily restricted to energy efficiency improving measures. The Flemish government also introduced a campaign in which every household obtained an energy efficient CFL lamp or shower head. The government subsidizes non profit organizations in order to give information to builders or renovators.

Wallonia. In the framework of the Energy Fund 2005-07, which aims to reduce the energy consumption with 6% in 2010 compared to 2000, there are subsidies for renovation of existing dwellings (insulation, installation of an efficient boiler and regulation of the heating system) and for new dwellings which are highly insulated. Also energy audits, infrared imaging, installing a mechanical ventilation system with heat recovery are subsidized. The region also has several 'guichets de l'énergie' where free technical and economical advice on energy efficiency measures can be obtained. The Soltherm program promotes and subsidizes solar boilers. For low incomes, a special subsidy program is foreseen in order to intervene in the investments made.

Communes. The subsidies for energy efficient technologies vary between municipalities. Subsidies can be obtained when installing roof insulation, low-e double glazing, solar collectors, etc. These subsidies can be linked to the income level. Some municipalities subsidize dwellings with a voluntary energy label and/or passive houses.

NON-RESIDENTIAL

Federal. A system of green and CHP certificates is introduced: a certificate proves that 1000kWh has been produced or saved by using PV or CHP. These certificates are delivered by the regional governments. These certificates can be sold either on the market to energy distributors, which are obliged to have a certain percentage of renewable electricity in their total energy matrix, either at a fixed price to the high tension transmission grid authority ELIA. The fixed price e.g. is determined at 150€ per MWh for installations dating from before 01.01.2006 and 450 €for PV-installations installed after 01.01.2006 in Flanders and 100€ in Wallonia.

Brussels. The Brussels government gives subsidies up to 20% of the investment when the energy efficiency of buildings or equipment is improved. A list of 16 possible investment areas is published: reduction of the energy consumption, heat recovery projects, relighting projects, energy audits, valorisation of biomass, use of renewable energy, enhancing the energy efficiency of buildings and equipment, etc.

Flanders. A broad scale of subsidies is available focusing especially on the use of renewable energy (PV, CHP, biomass, etc.). For schools a special program is foreseen since 2006 with extras subsidies for energy audits, for investments in rational energy use and in energy metering and acounting.

Wallonia. A broad scale of subsidies is foreseen for the non-residential sector. These subsidies concern several levels:

- Heating system: regulation, installation of new efficient systems, heat pumps, wood pellet systems
- Hot water production: installation of efficient systems, solar collectors
- Electricity and lighting : installation of a new efficient lighting system, green electricity certificates (cf. Flanders), pumps with variable rotation speed, installation of a electricity control and regulation system, …
- Insulation : insulating existing buildings
- Ventilation : installation of a mechanical system with heat recovery
- Energy audits
- Renewable energy : solar, geothermal, wind, hydro and biomass energy systems are subsidized
- Installing high efficiency greenhouses.

Communes: The subsidies for energy efficient technologies vary by municipality. Subsidies may be obtained when installing roof insulation, low-e double glazing, solar collectors, passive houses, etc.

2.4 Granting soft loans

A commercial bank (Fortis bank) introduced a credit with a fixed low interest rate for energy efficiency investments in the residential sector: changing the heating system, insulating, installing a new boiler or thermostatic valves, changing the glazing.

The ‘ethical finance’ bank Triodos is subsidizing and investing in energy efficiency and sustainability, e.g. by investing capital in energy consulting companies dealing with renewable energy. Other commercial banks offer the possibility to subscribe to investment programs in renewable energy.

A measure linked to the insurance and banking world is the yearly obligation of maintenance of the boiler to obtain fire insurance.

a. Higher amount possible if more energy efficient

This possibility is one of the options that the bank sector can follow (see above).

b. Lower interest rate with credits

In general there are no such lower interest rates. Low incomes can profit lower interest rates when they take up a credit to renovate a dwelling, but there are no specific energy restrictions.

c. Specific loans for energy efficient retrofitting / pre-financing of the works

The bank sector starts initiatives in this field. Discussions are also ongoing about the possibility to pre-finance the works with specific guarantee from the public sector.

2.5 Third party financing (TPF)

Such mechanisms are under development. An important programme to build new schools is launched in 2007, based on a DBFM scheme (Design, Build, Finance, Maintain) in which the private investor guarantees the building condition over 30 years. It receives a yearly remuneration for its services. The energy costs are not included in these services, but there is an obligation for energy efficient investments, via a severe energy performance level (max E70 compared to standard E100).

The third-party investor concept involves making an investment and ensuring that it is reimbursed itself off on the basis of savings or cash flows generated by the investment. The third-party investor principle is particularly adapted to areas in which savings or new cash flows may be generated and quantified, e.g.: cogeneration, energy audits and energy-calculation assignments, relighting, power metering and monitoring, building renovation.

2.6 European structural funds

European structural funding is used to promote energy efficiency in certain regions. However it is not possible to give a complete overview of the funds, since mostly the building part is only one part of the project for which the European structural fund is used. Just some examples. The 'Doelstelling-II project Kempen' focuses on improving the life climate in order to reboost the economical activities. Elements in the program are: transfer of environmental technologies, sustainability, renovation of industrial buildings, …

European structural funding has been used by several provinces to develop centers about durability, e.g. Kamp C in Antwerp and CEDUBO in Limburg. These are information centers for individuals and companies which work on sustainable development. (www.cedubo.be and www.kampc.be)

2.7 Higher energy price paid for electricity from PV or CHP

When producing electricity from PV or CHP, the producer obtains a green certificate for each MWh produced. These certificates can be sold at the free market, since every energy (electricity) company needs to produce a certain percentage of green electricity. The regional governments can guarantee minimum prices for the green certificates as a function of the energy source. Since 2006, in Flanders, green certificates are guaranteed over 20 years at 450 €/MWh from PV.

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

Such mechanisms are not available in Belgium.

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

Such mechanisms are not available in Belgium.

b. Increasing tariff with the energy consumption

Such mechanisms are not available in Belgium.

3 Non-governmental activities

3.1 Sector agreements

a. Components

The umbrella organization of the insulation companies is promoting energy efficient construction by means of lobbying, information and participation in consultation with the government, research and dissemination programs. Other umbrella organizations are doing similar efforts.

Around the passive house and office organization a platform of contractors and installers is working on the practical implementation of energy efficient constructing.

b. Installers

For the moment there is a debate going on in the organization of the flat roof installers in order to incorporate systematically the price of insulating the roof in the offers they make for renovating the roofing.

c. Regional / municipal

The sectors are signing benchmark covenants or energy contracts with the regional governments in which they define clear targets as far as the energy consumption in their sector is concerned (cf supra). But as far as known to the authors, in most sectors these covenants/agreements are focusing mostly on the energy use in the industrial processes. Nevertheless in some sectors this may have an impact on the building (e.g. frozen food sector).

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

Energy saving targets are imposed to the electricity and gas suppliers and distributors. In order to obtain their targets the electricity and gas suppliers and distributors promote and subsidize of energy efficiency improvements in the residential energy sector and auditing and information supply in the non-residential sector. Since the electricity and gas suppliers and distributors are organized in sub-regional areas, these promotion and subsidies vary quite somewhat: insulation, installing of PV or solar boilers, installing of a high efficiency boiler, etc.

b. System of the white certificates

4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

There is a wide range of demonstrations projects, ranging from small organizations working on energy efficiency that set up individual demonstration projects over more wide scale demonstration projects. There is a large offer of information sessions. Therefore only a few major projects are mentioned:

1. CEDUBO, the Centre for Sustainable Construction, is addressing both the large public and the building sector. Their activities range from organizing workshops, demonstrations and exhibitions about sustainable construction,, demonstration projects of renovation/energy efficient heating/ sustainable houses/… . For more info: www.cedubo.be (only in French and in Dutch). Kamp C is a similar organization.
2. Zonnige Kempen. This social housing company is developing their recent projects with a high accent on energy efficiency, both driven by the economical interest of their inhabitants as by more general society's interests.
3. Construire avec l'énergie: the candidate builders or renovators can visit projects which have been constructed in the framework of the energy efficiency program.

4.2 Research and development project/ fundamental research

Research and Development on energy efficiency is done at a wide variety of institutions and organizations in Belgium. The most important are:

- Belgian Building Research Institute: participates in European, national and regional research projects dealing with energy efficiency and is a privileged partner for the regional governments to develop energy performance legislation and calculation procedures. (www.bbri.be),
- Regional Research Institutes (e.g. VITO) : participate in European, national and regional research projects dealing with energy. Also does energy consulting and energy efficiency technology research for industry. (www.vito.be),
- Universities: several laboratories at different universities do fundamental and applied research on energy consumption in buildings, on energy efficiency of installations, etc. They participate in European, national, regional and industry research projects,
- Industry: industry can obtain finance for research and research assistance developing new technologies or products which are sometimes dealing with energy efficiency,
- Some energy consultancy companies participate in research programs,
- Non profit organizations working on energy efficiency or sustainability participate in research programs.

The Brussels government has worked out a voluntary energy audit tool for residential buildings.

5 Promotional measures/ increase of public awareness

5.1 Campaign on related advantages to energy savings

Promotional campaigns concerning efficient energy use are organized by a wide range of organizations in Belgium: from the federal state over the regions and municipalities to the electricity suppliers and non profit organizations. The scope of the promotional campaigns is very large: from already energy conscious people to the whole population. Therefore only some examples will be given.

Regional level

The Flemish government organizes four large-scale promotion campaigns a year in all media. A key element in the promotion is the month of the energy saving where schools, organizations etc. are stimulated to work around energy and energy savings. Other capital elements are the information and awareness campaigns oriented to the market actors as there are architects, contractors etc. The implementation and promotion of the new EPB decree on the energy performance of buildings has and is done in close cooperation with the representative organizations of these market actors. A recent major promotional instrument is the website www.energiesparen.be which is a portal site for energy efficiency in Flanders.

The Walloon and Brussels government work similarly and have a special promotion.

Local level.

Several cities organize promotion activities themselves or by their environmental council. These actions can be information leaflets, working groups, open door activities, etc.

There are many non profit organizations dealing with energy efficiency. Some are organized on the local level, some at the scale of the regions. These organizations mostly offer information and promote energy efficiency. Some links to organizations:

- ODE Vlaanderen (www.ode.be) the Flemish organisation for sustainable energy with as aims to promote and create awareness around renewable energies and energy efficiency and to organize sectoral information platforms.
- APERE (www.apere.org) is an independent umbrella organization working on the theme of renewable energies.

Also individual companies, especially the electricity and gas distributors, are doing promotional campaigns, both in the media and at fairs about energy efficiency in residential and non residential buildings. This is part of their legal obligation to reduce the energy consumption.

5.2 Voluntary labelling/ certification initiatives

The Walloon government certificates residential dwellings which participated to the 'Construire avec l'énergie' program (more information on http://energie.wallonie.be). This program aims to

1) Give a technical guidance to architects and contractors,

2) Guarantee an energy consumption which is lower than required by the standards,

3) Streamline the market linking clients with buildings professionals with the government as mediator.

The certificate is given when the building has a general concept oriented towards energy efficiency, air quality and good thermal comfort in both winter and summer. Therefore a higher insulation level than the legal minimum is needed, a well designed ventilation system and the boiler should have a high performance. The architect designing the dwelling should subscribe the program. Also contractors can get a labeling. Installers can get a Soltherm-certification when they have followed the training program organized by the Walloon government.

The PassiefHuisPlatform gives a passive house certificate to buildings which heating demand is less than 15 kWh/m².y and which total energy consumption is lower than 42 kWh/m².y.

The organizations of oil and gas installers have introduced several labels: one at product level expressing the energy efficiency of the boiler or hot water system and one for the quality of the installers themselves.

The European labeling of energy consumption of household appliances is widely implemented. The Brussels government subsidizes the purchase of the most energy efficient appliances.

5.3 Information on cost-efficient measures

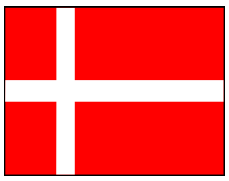
See 1.5.1.

6 References

1. Wina Roelens - Flemish Energy Agency – Belgium - Status of the EPBD Implementation in the Flemish Region (Belgium) – EPBD information paper P06 – 31.08.2006 – www.buildingsplatform.eu

Situation in Denmark

Author(s): Kirsten Engelund Thomsen
Ole Michael Jensen
SBi
May 2007



This report gives an overview of the existing measures designed to improve the energy efficiency for new and existing buildings in Denmark. The information mainly comes from different national sources and was compiled at the Danish Building Research Institute (SBi).

1 The regulation tool

1.1 Legal Requirements (technical)

1.1.1 Adopt and/or reinforce requirements

The route for legal enforcement of minimum energy performance standards in buildings is the Building Regulations, which are governed by the Danish National Agency of Enterprise and Construction.

Since the introduction in 1972 the energy requirements for new buildings have been strengthened in: 1977, 1985, 1995/98 and 2006. The requirements are illustrated in figure 1.

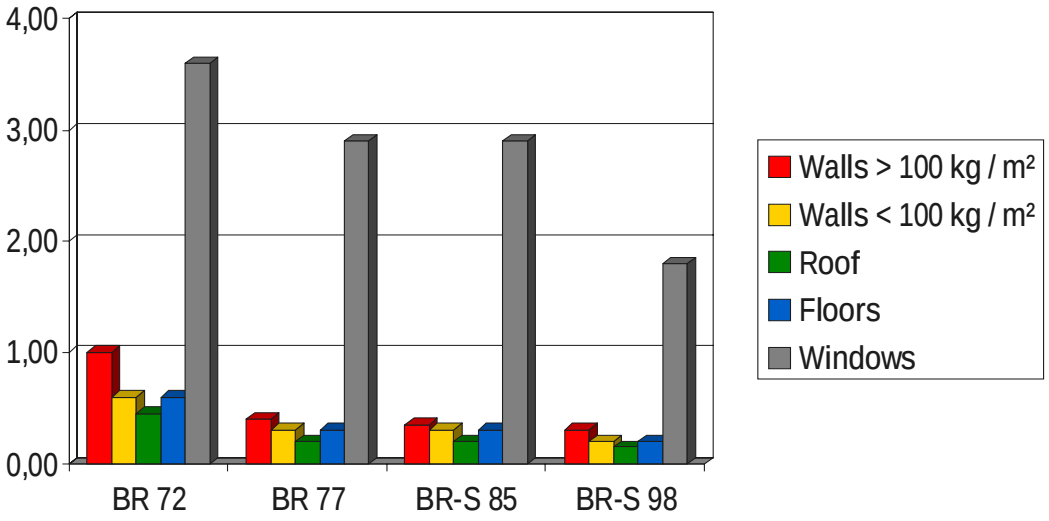


Figure 1. U-value requirements (W/m^{2}K) in 4 building codes.

This is the single most powerful initiative to reduce the energy consumption of buildings. The effect can be seen from Figure 2 - although the total heated floor space has gone up the total energy consumption for household heating has gone down.

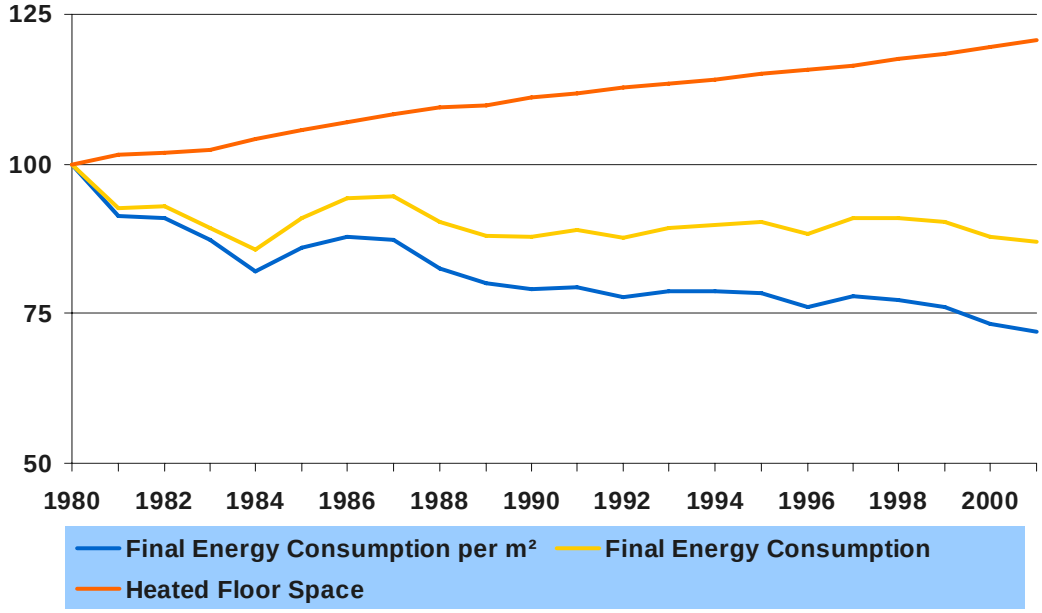


Figure 2. Climate adjusted energy consumption for space heating in households (1980=Index 100, from the Danish energy statistic).

a. At the building level - overall energy performance

The Building Regulations since 1995 (BR-95) has resulted in a reduction of 25 % in the heating demand in new buildings compared with the previous Building Regulations (BR-82). New energy regulations (BR-2006) have been prepared to facilitate the EPBD. Once again, the requirements to new buildings have been tightened with 25-30 %. This time however, it is difficult to make a direct comparison because of different calculation methods. In accordance with BR 95 it was possible to choose between three different ways to prove compliance with the building regulations: The U-value method, the heat-loss-frame method and the energy-frame method. With the new energy regulations two of these are abandoned and only the energy-frame method are legal. This method includes a whole building energy calculation and will include energy for heating, hot water, cooling and ventilation and for non-residential buildings built-in lighting. When the energy frame is estimated, electricity consumption is multiplied by 2.5 to compensate for the efficiency of the power production.

The building regulations governing residential buildings stipulate that the total energy consumption shall not exceed

$$70 + \frac{2200}{A} \text{ (kWh/m}^2 \text{ year)}$$

A is the total heated gross floor area.

For non-residential buildings like schools, institutions and offices where the intensity of use is larger and the electricity for built-in lightening must be included the energy calculation; the energy frame is extended with 25 kWh/m^2 year. For all categories of buildings, there is a fixed limit for the transmission losses for the thermal envelope excluding windows and doors. Moreover, the energy frame is supplemented by specific requirements for U-values, minimum boiler efficiency, pipe insulation, heat recovery, fan power efficiency etc.

Besides a standard class, a building can be classified as a low energy building class 1, if the total energy consumption is less than 50 % of the energy frame and as a low energy building class 2 if the energy consumption is less than 75 % of the energy frame. The two low energy levels indicate the levels that are to become minimum requirements in the next revisions to be made in 2010 and 2015. Low energy buildings can be exempted from the requirement of connection to existing district heating.

In any case, proof of compliance with the energy requirements must be made after the completion of the building in order to obtain the permit to use the building. Control of compliancy with building regulations is the responsibility of the local authority where the building is located. In practice the control of the building in relation to the energy requirements is performed by the energy consultants who also issue the energy label, see later.

The calculation procedure is described in SBi-direction 213: Energy demand in building (In Danish). This publication also includes a PC calculation program. The calculation core from this program is to be used by all other programs to ensure identical calculation of energy demand of buildings.

In the Danish building regulations there are also requirements when a building is renovated in a major way. The definition of a major renovation is taken from the Directive (Article 6). The 25 % rule (preamble 13) in the EPBD applies to all buildings. Cost efficient energy saving measures are required if renovation of the building shell, or the energy installations is higher than 25 % of the value of the building, excluding the value of the land, or if more than 25 % of the building shell undergoes renovation. Also cost efficient energy saving measures not included in the original renovation plan have to be completed in large buildings. Only churches, museums or buildings worthy of preservation are exempted from the requirement.

"Cost efficient energy saving measures" is defined as measures that by simple calculation pay back with at least 33 % overhead over a standard life time dependent on the type of the measure. The cost efficient energy saving measures are identified by the energy consultant as part of the labelling of a building, see later.

The 25 % rule has been the most debated issue during the implementation of the EPBD in Denmark. The government's original plan was to implement the same rule for both small and large buildings. This however, concerning small dwellings was dropped at a late phase of the implementation due to severe problems regarding legal responsibilities.

Concerning extensions, the requirements are in principle the same as for new buildings. But besides using the energy-frame method, it is for extensions still legal to use the former U-value calculation method and heat-loss-frame method.

b. At the building level - subset performance

A subset performance concerning new buildings is a set of minimum insulation, i.e. maximum U-values related to specific building parts, like walls, windows and floors. See Table 1.

Table 1. The maximum U-values that must be observed although the energy-frame method for new buildings is compulsory.

	Walls	Floor	Roof	Windows 2006 / 2008
U-values W/m^{2}K	0,50	0,30	0,25	2,30 / 2,00

Additionally, a subset performance is legal for building extension. This reflects the 1995 building regulations' principles, where three calculation methods can be decided: The U-value method, the heat-loss-frame method and the energy-frame method. If the energy-frame method is adopted, only the extension must observe the maximum energy consumption in force for new buildings.

c. At the component level

The building regulations include requirements at the component level in case of major renovation. The building regulations impose maximum U-values to the individual envelope components like glazing, walls, floors, etc. Furthermore some requirements to new ventilation systems and boilers exist.

d. Enlargements of the application field of the requirements

By the implementation of the EU directive, the application field has been enlarged and now includes inspection of boilers and heating systems (Decree no. 1296 of December 13, 2005 on Inspection of Boilers and Heating Systems in Buildings from the Danish Energy Authority (in Danish) with addition in Decree no. 217 of March 20, 2006). The inspections of boiler and heating systems are based on the same act as the energy labelling scheme.

The inspection of boilers and heating systems was implemented on September 1, 2006, on the same date as the energy labelling scheme. At that time Denmark had already an inspection scheme for oil-fired burners. It is expected that the new scheme for inspection of air conditioning will also include inspection of large ventilation systems. The new scheme is expected to be implemented from January 1, 2008.

1.1.2 Adaptation of energy and environment standards

No specific energy and environment standards have further been adopted than the above mentioned.

1.1.3 Visible meters in the building

In Denmark it is legal that consumption of heat water and electricity must be made up by use of individual meters; that means separate meters for each family house, flat and rent. This however does not imply that meters must be visible in daily use of the building, for instance be visible in the entrance hall.

1.1.4 Requirements compliance check

In Denmark, energy performance requirements are set up by Danish National Agency of Enterprise. However, the control of the compliance lies within the power of the local authority, i.e. the building department of the municipality. Thus, to get a permit to build an application of a building (or a major renovation) must be enclosed documentation of the compliance in the form of a calculation of the energy performance of the building. This calculation must be based on a computation form, issued by the Danish Building Research Institute. If approved, the administrative body will issue a building permit. After construction, the building owner must ask for an authorized energy consultant to carry out an energy certification. If this is in accordance to the building project, the administrative body will issue a permit for use. Eventually, the administrative body will ask for a density test of the house before issuing the use permit.

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

There is no stricter requirement to governmental buildings than other kind of buildings. However, it is mandatory for the public authorities to implement energy-saving measures pointed out in the energy label with a pay-back time of less than five years as described in the energy certificate of the buildings.

b. Integration of the energy performance of buildings in public procurement procedures

Most often building investments and the operational costs are separate budgetary items. Nevertheless several municipal administrations try to incorporate building energy efficiency in their decisions.

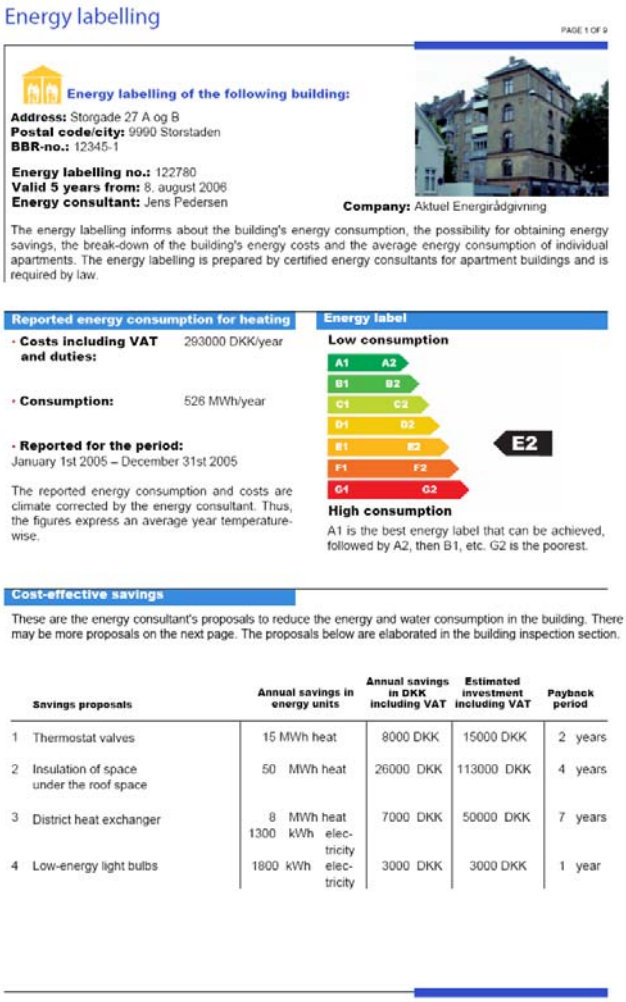
c. Retrofitting of public buildings

There are no specific demands to public buildings. However, the municipal administrations in some cases have set up recommendations that include a higher energy performance quality in case of renovation for their own buildings.

1.2 Other legal supporting measures

1.2.1 Energy Certification Scheme

The requirements regarding the energy certification (labelling) of buildings has been adopted by the Danish Parliament by Act no. 585 of June 24, 2005 on Energy Savings in Buildings (in Danish). Based on the act by Parliament the Danish Energy Authority has issued Decree no. 1294 of December 13, 2005 on Energy labelling of Buildings (in Danish).



Energy labelling

PAGE 1 OF 9

Energy labelling of the following building:

Address: Storgade 27 A og B
Postal code/city: 9990 Storstaden
BBR-no.: 12345-1

Energy labelling no.: 122780
Valid 5 years from: 8. august 2006
Energy consultant: Jens Pedersen

Company: Aktuel Energirådgivning

The energy labelling informs about the building's energy consumption, the possibility for obtaining energy savings, the break-down of the building's energy costs and the average energy consumption of individual apartments. The energy labelling is prepared by certified energy consultants for apartment buildings and is required by law.

Reported energy consumption for heating

- **Costs including VAT and duties:** 293000 DKK/year
- **Consumption:** 526 MWh/year
- **Reported for the period:** January 1st 2005 – December 31st 2005

The reported energy consumption and costs are climate corrected by the energy consultant. Thus, the figures express an average year temperature-wise.

Energy label

Low consumption

A1 A2
B1 B2
C1 C2
D1 D2
E1 E2 — E2
F1 F2
G1 G2

High consumption

A1 is the best energy label that can be achieved, followed by A2, then B1, etc. G2 is the poorest.

Cost-effective savings

These are the energy consultant's proposals to reduce the energy and water consumption in the building. There may be more proposals on the next page. The proposals below are elaborated in the building inspection section.

	Savings proposals	Annual savings in energy units	Annual savings in DKK including VAT	Estimated investment including VAT	Payback period
1	Thermostat valves	15 MWh heat	8000 DKK	15000 DKK	2 years
2	Insulation of space under the roof space	50 MWh heat	26000 DKK	113000 DKK	4 years
3	District heat exchanger	8 MWh heat 1300 kWh elec-tricity	7000 DKK	50000 DKK	7 years
4	Low-energy light bulbs	1800 kWh elec-tricity	3000 DKK	3000 DKK	1 year

Figure 3. Front page of the Danish energy certification (Energy label) in an English translation.

In the new energy labelling scheme buildings need an energy label:

- when they are new constructed,
- when they are sold and
- when (a flat in) the building is let out.

In the case of new buildings the building needs to have a sufficient energy label to fulfil the energy requirements in the building regulations to be granted a permit for use.

In the case of existing buildings being sold or rented out, or flats are let out, the buildings must have an energy label that is not more than 5 years old. This also applies to blocks of flats, where individual flats are let out or sold. In blocks of flats the labelling is done on the whole building, but complemented with an individual label for each flat.

There are 14 classes on the labelling scale from A1 to G2, where A1 is the best. The decision to have 14 classes on the labelling scale is based on the need to have a sufficient

number of classes to make it possibly to improve the label by performing relevant energy saving measures in buildings of different ages and energy standards. New buildings must at least be labelled as class B1 to get the permit for use. Class A1 and A2 are for low energy buildings class 1 and 2.

The daily operation of the labelling scheme is delegated to a secretariat also operating the other schemes related to the EPBD.

The specific rules for labelling to be used by the energy consultants are in a "Handbook for Energy Consultants". The handbook is available to the public on www.femsek.dk (in Danish). The handbook also includes tabular data for typical constructions and installation in building to facilitate the uniformity of the labels being given by different consultants.

The energy consultant is supposed to identify two types of energy saving measures:

- immediately feasible measures and
- measures that are only feasible if carried out as supplement to ongoing renovation.

Since September 1, 2006, energy labelling of existing buildings have been conformed to the new schemes.

a. Way certificates are communicated/displayed

The energy certificate in Denmark is mainly communicated/displayed towards sellers and buyers of buildings in order to increase the consciousness about energy consumption to be a value besides position and architecture.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

In Denmark, there is no mandatory realisation obligations except for the public building, where energy-saving measures pointed out in the energy label must be realised if pay-back time is less than five years, as mentioned in 1.1.5 a.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

Only to a small extent the development of adopted supporting has been based on knowledge of the building stock extracted from collected energy certificates. Thus the former energy certificates mandatory since 1997 have been evaluated, and the results have contributed to the development of the new certificate mandatory since 2006. A larger analyses based on energy certificates has found the total energy saving potential in existing housing (Wittchen, 2004).

d. Linking incentives to energy performance certification

Nothing of that kind has been executed in Denmark at the moment, but it is planned. On the contrary an investigation of house owners' lack of interest and motivation base on certificates and interviews has been carried out (Jensen, 2005).

1.2.2 Encourage reconstruction instead of heavy renovation works

High waste taxes themselves encourage reconstruction. Apart from that no specific encourage in favour of reconstruction.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

There is for most rental houses an agreed procedure by which 5 DKK (about 1 EURO) per square meter a year must be placed in an investment fund for protection against fire and for energy saving measures. However, this money is usually not spent for that purpose, because thus money cannot generate higher rent.

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

No such measure foreseen yet.

1.2.4 Legislation concerning co-ownership

There are internal rules concerning decision-making processes in co-ownerships. These rules however do not specific take into consideration energy saving measures.

a. Reduced majority level to decide to implement measure proven to be energy efficient

No such measure foreseen yet.

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

No such measure foreseen yet.

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

The owners have to form a financial reserve.

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No such measure foreseen yet.

1.2.5 Legal status of the co-ownership for bank credits for energy refurbishments

The co-ownership is not a legal organisation.

1.2.6 Energy-friendly urban regulations

There are in some local authority's special regulations concerning energy-efficient retrofitting.

Action plan for stand-by consumption

In January 2004, the Danish government presented an ambitious action plan to reduce the unnecessary energy consumption by appliances on stand-by. By 2010, stand-by consumption for relevant new products on the market must be down to 1 Watt or less. This is a great improvement compared with the average today. The initiatives will be implemented either this year or next year. Agreements include a new framework for energy-correct procurement by the public sector. Another focus area is a new low-energy label for use by the Danish Energy Authority, The Electricity Saving trust, and the electricity grid companies in connection with a number of products (2004).

Making buildings more efficient

In February 2004, the Danish Energy Authority entered into a sector agreement on phasing out traditional double-glazing and promoting more energy-efficient window solutions. The agreement ensures that the traditional double-glazing, with its large energy losses, is replaced by energy-efficient glazing. This is economic feasible for society and for the individual. With respect to consumers, energy-efficient windows mean lower heating bills and improve comfort. The investment is often recovered in very few years. The Danish government has also earmarked DKK 20 million in the Finance Act to ensure broader efforts to promote energy-efficient window solutions, i.e. also window frames and removable double-glazing.

1.2.7 Minimum energy requirements for renting

There are no special minimum energy performance requirements for rented buildings.

1.2.8 Environmental permit

Denmark has obligatory inspections of boilers.

1.2.9 Adoption of annual energy efficiency plans

The 2005 Action plan adopted by almost all parties in the Danish parliament defines the political framework for future energy savings measures. The plan includes a short-term target for the annual effect of energy savings measures of at least 1 % of consumption and a long-term milestone of keeping consumption (excluding transport) at current levels until 2025.

In accordance with 'A visionary Danish energy policy', Denmark should, in the long term, become entirely independent of fossil fuels – coal, oil and natural gas - which will be replaced by renewable energy.

1.2.10 Mandatory energy efficiency impact assessment of new regulations

Before any new requirements are put into force studies of the impact are done beforehand.

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

No such measure foreseen yet.

b. Taxation stimuli of energy efficient buildings and penalties for others

For the moment, there are no taxations which take into account the degree of energy efficiency of a building.

c. No increase of the building taxes in case of energy efficient refurbishment

No such measure foreseen yet.

2.2 The taxation tool

a. Reduced VAT

i. On energy saving products

ii. On energy supply

No such measure foreseen yet.

b. Energy tax

In Denmark, both electricity and heat are imposed a duty for housing and non-industrial purpose. The electricity tax is composed of energy tax, public service obligations (PSO), CO_2 tax and VAT. Out of a total price of approx DKK 1.75 per kWh the energy tax is 0.58 DKK, the PSO is 0.08 DKK, the CO_2 tax is 0.09 DKK and VAT is 0.37 DKK, a total of 1.12 DKK.

c. Buildings included in the CO_2 taxation market

There is no CO_2 taxation in Denmark for buildings.

2.3 Subsidies for Energy Efficient Technologies

For the moment there are no subsidies.

Earlier to encourage the development of new supply technologies subsidies, although in small scale, have been used for:

- Wind-generated electricity
- CHP-plants
- Solar heating
- Photovoltaic.

Condensing gas boilers had:

- Subsidy 5 - 10 % of the costs.
- Very successfully implemented.
- Performed by the gas suppliers.
- In the last period ~90 % of boiler retrofit is with condensing boilers.
- In new buildings (before 2006) only ~50 % was condensing boilers.

Recently a support program for the dismantling of old wind turbines has been put into force. Moreover, biogas and more general: biomass has been supported by demonstration funds. Also legal frameworks have been utilised e.g. a legal framework for expanding the number of wind farms and for a better functioning electricity market.

2.4 Granting soft loans

a. Higher amount possible if more energy efficient

Such measures are not implemented in Denmark.

b. Lower interest rate with credits

There are no such lower interest rates. Low incomes can profit lower interest rates when they take up a credit to renovate a dwelling, but there are no specific energy restrictions.

c. Specific loans for energy efficient retrofitting / pre-financing of the works

There are no such guarantees.

2.5 Third party financing (PPP)

Not used for improving the energy efficiency in Denmark today. Will be in the near future.

2.6 European structural funds

Not used for improving the energy efficiency in Denmark.

2.7 Higher energy price paid for electricity from PV or CHP

Such measures are not implemented in Denmark.

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

Such measures are not implemented in Denmark.

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

Such measures are not implemented in Denmark

b. Increasing tariff with the energy consumption

Such measures are not implemented in Denmark

3 Non governmental activities

3.1 Sector agreements

a. Components

The phasing out traditional double-glazing can be mentioned here (see §1.2.6).

b. Installers

Such measures are not implemented in Denmark.

c. Regional / municipal

Such measures are not implemented in Denmark.

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

The government's ambition concerning energy savings are that energy suppliers should save 3.0 PJ per year. At the same time is introduced a so-called energy saving market with energy saving certificates.

b. System of the white certificates

White certificates will be implemented in Denmark in 2010.

4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

There are a few examples in Denmark of individual municipalities and building associations who has implemented requirements to new buildings that are stricter than the current building regulations. A couple of building associations have made tenders or competitions for ultra-low energy houses. One municipality, Stenloese, has decided that for a new development area very strict sustainability rules shall apply in 4 areas:

1. Energy consumption must be considerably below (50 %) the current regulations.
2. Rain water must be used for toilet flushing and washing.
3. PVC must not be used.
4. Pressure-impregnated timber/wood must not be used anywhere in the construction.

These rules have been well accepted and the municipality has not had any difficulty selling the construction sites so far. The strict energy requirements have been based on a total-economical calculation, which shows that the increased investments pay off from day one. Also Copenhagen has - based on the same calculation - made a similar requirement for all new social houses to be built - energy consumption must be 25 % lower than what is required in the current national building regulations (today of 2006).

4.2 Research and development project/ fundamental research

Research, development and demonstration have played an important role in the Danish Energy Policy since the oil crisis. The programmes have covered both the supply side and the energy conservation side. There have, for example, been extensive programmes in low energy houses, wind energy, biomass, solar heating and PV. In the recent years there has been a CO_2 tax on the electricity bills, which has been used for R&D on electricity production and use.

5 Promotional measures/ increase of public awareness

5.1 Campaign on related advantages to energy savings

Promotional campaigns concerning efficient energy use are organized by a wide range of organizations in Denmark. Individual companies, especially the electricity and gas distributors, are doing promotional campaigns, both in the media and at fairs about energy efficiency in residential and non residential buildings. This is part of their legal obligation to diminish the energy consumption.

5.2 Voluntary labelling/ certification initiatives

A voluntary labelling of windows is available in Denmark.

The organizations of oil and gas installation fitters have introduced several labels: one at product level expressing the energy efficiency of the boiler or hot water system and one for the quality of the fitters themselves.

The European labelling of energy consumption of household appliances is widely implemented. The Danish government subsidises the buying of some of the most energy efficient appliances.

5.3 Information on cost-efficient measures

Information on cost-efficient energy saving measures is provided by several sources e.g. projects and websites. Furthermore the mandatory certification scheme also provides information and costs about several retrofitting measures.

6 Conclusions

The Danish Government has set up both short and long term strategies for the improvement of the energy efficiency of all buildings in the country. New buildings in Denmark are considered to have a relatively high insulation standard. But 75 % of existing buildings were constructed before 1979 when the first significant tightening-up of requirements to energy performance was introduced. So when implementing the new EU-building directive (EPBD), it was decided to tighten up the regulations governing both new and existing buildings as well as the rules for labelling schemes. This way, the energy regulations and the rules for energy certification (labelling) was linked. Thus, before the official permit to use a new building is given, an energy audit has to be performed by a certified or approved energy consultant to check that the assumptions used when calculating the energy consumption are correct. Furthermore it is mandatory for the public authorities to implement energy-saving measures with a pay-back time of less than five years as described in the energy certificate of the buildings.

Furthermore research, development and demonstration have played an important role in the Danish Energy Policy since the oil crisis.

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Situation in France

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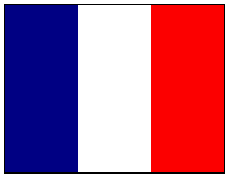


This report gives an overview of the existing measures designed to improve the energy efficiency of new and existing buildings in France. The information mainly comes from different national sources which are quoted in the text, and was compiled at CSTB

1 The regulatory measures

1.1 Legal requirements (technical)

1.1.1 Adopt and/or reinforce requirements

New buildings

In France the first energy crisis has lead to the setting up of regulations for new residential buildings in 1974 and for new non residential buildings in 1977. These regulations were then updated regularly nearly each 5 years. Then between 1988 and 2000 the energy pressure was lower and the regulations remain unchanged.

New regulations were then set up in 2000 (RT2000) and updated in 2005 (RT2005)(www.rt2000.net)

The evolution between 1974 and 2005 has lead to :

- the consideration of an increasing number of energy flows: in 2005 the following flows are considered: heating, domestic hot water, ventilation, auxiliary energy for heating and ventilation, air conditioning, lighting, the use of renewable and exported energy

- the explicit consideration of summer comfort since 2000

- the tightening of the requirements.

According to the EPBD next modification of the regulations for new buildings are planned for 2010.

Most of the tightening of the regulations was prepared by voluntary schemes which was supported by the government and enabled to test future requirements.

The following table presents the evolution of regulations and labelling schemes:

date	Building type	Energy flows considered	Requirement level
1974 regulation	residential	Heat loss through envelope and ventilation	
1976 regulations	Non residential	Heat flow through envelope	
1980 high insulation voluntary	residential		
1982 regulations	residential	Heat loss and gains	
1983 high performance and solar voluntary schemes	residential		
1988 regulations	Non residential	Heat flow through envelope + requirements on HVAC systems	
1988 regulations	residential	Hearting, domestic hot water, ventilation, auxiliary energy	
RT 2000 regulations	All buildings	Same+ lighting + summer comfort	RT1988 -15%
2001 high performance voluntary schemes	All buildings	same	
RT 2005 regulations	All buildings	As 2000+ cooling	RT2000 -15%
Voluntary schemes	All building	As RT2005	About -10%, -20%, -50% from RT2005

Existing buildings

No energy regulation exists today for existing buildings but in order to implement the EPBD nevertheless two new texts are under preparation.

The first text will be applicable in fall 2007. It sets requirements on components when components are upgraded in a building. In case of modifications of a window, a boiler… a minimum energy performance shall be achieved after the renovation.

The main planned requirements are the followings:

	Minimum thermal resistance
External wall	Between 2 and 2,3
Wall in contact with unheated space	2
Roofs	Between 2,5 and 4,5 depending on roof type
Floors	Between 2 and 2,3
Windows	Uw < 2,6 and Ug < 2,3

Roof windows	Mobile Solar protection with g<0,15
boilers	Efficiency > 87+1,5log P
Heat pumps	Cop>3,2
Thermostatic valves or radiator thermostat	mandatory
Programmable Boiler thermostat	mandatory

A second text is planned for 2008 it will set global requirements expressed in primary energy for the different energy uses defined by the EPBD. It will be applicable to large renovation: i.e. building with a surface of more than 1000m2 with a retrofit cost of more than 25% of the building value.

a. At the building level - overall energy performance

For new buildings The RT2005 sets requirements expressed in term of maximum primary energy consumption for the uses defined in the EPBD.

The regulation for large renovation will also set a requirement on overall energy performance.

b. At the building level - subset performance

A subset performance is the maximum mean U-value (Ubat) for the building envelope that is part of the French energy performance requirements according to RT2005.

c. At the component level

The RT2005 in addition to the overall energy performance requirement includes requirements on a set of components. These values are worse than the value needed to achieve the overall energy performance defined by RT2005. They are used to limit the tradeoffs between components and to avoid the use of low quality components.

The regulations under preparation for simple renovation is based on requirements at the component level (see above).

d. Enlargements of the application field of the requirements

There is no reflexion now to enlarge the application field of the requirements of EPBD however, for existing buildings the energy regulation will not be applied only in case of major renovation for buildings with a total useful floor area over 1000m² but it sets requirements on components when components are upgraded in a building Independently of its size

1.1.2 Adaptation of energy and environment standards

Not applicable in the French context.

1.1.3 Visible meters in the building

RT2000 and RT2005 have set requirements regarding mandatory meters in the buildings. These meters shall enable to determine the amount of energy used for the different usages.

Level of metering is adapted to building size.

Metering is mandatory for management purposes. There is no requirement regarding the visibility of meters by the building users.

1.1.4 Requirements compliance check

There is no strong control scheme applicable in France. A limited number of controls are performed each year mainly to have a statistical vision of the level of compliance with the requirements. The penalties which can be applied in case on non compliance are very scarcely used.

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

The French prime minister has signed in September 2005 a text regarding the “exemplary state”. Regarding buildings the following direction are defined:

- Temperature limitation in buildings to 19°C during heating and to 15°C during cooling
- Information campaign towards buildings users regarding the impact of personal behaviour on energy consumption
- 80% of the new state owned building 20% better than RT2005 in 2008
- Requirements regarding energy efficiency of retrofitted buildings as close as possible to regulations for new buildings
- Proscribe low efficiency lighting
- Realise feasibility studies on possible improvement of heat generation
- Use condensing boilers and windows with Uw <1,8

In practice this is more defining a direction than strict requirements.

Some local authorities are now applying, stricter requirements for the buildings they build or retrofit. This trend is very recent but seems to be increasing quickly.

b. Integration of the energy performance of buildings in public procurement procedures

In the past public procurement had to be done on the lower cost basis. It can now be done on the “best proposal”. So it is possible to set up requirements which include a life cycle cost analysis.

Though the building investments and the operational costs are still separate budgetary items, more and more public players base their decisions concerning energy efficient measures on life-cycle costs.

Some local authorities are very active in these fields.

c. Retrofitting of public buildings

There is no special requirements regarding retrofitting of public buildings. Nevertheless some public authorities are now setting up retrofitting policies which includes strong energy requirements.

1.2 Other legal supporting measures

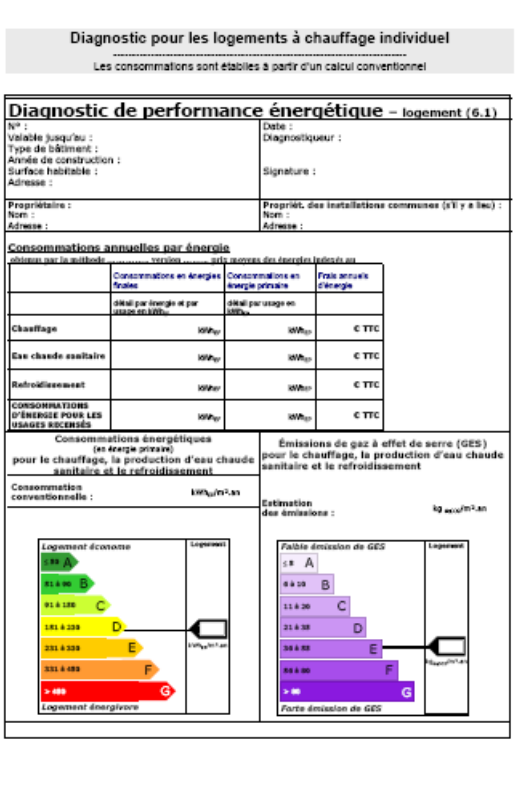
1.2.1 Energy certification scheme

Like all EU Member States, the French implementation of the EPBD requests the certificates for the energy performance of buildings for new buildings and in case of sales or rent of existing buildings.

This is already implemented since November 2006 for the sales of existing buildings. http://www.logement.gouv.fr/article.php3?id_article=5873

It will be implemented in July 2007 for rent of existing buildings and in 2008 for public buildings.

An example for a French certification scheme is presented in the following graphic.



Diagnostic pour les logements à chauffage individuel

Les consommations sont établies à partir d'un calcul conventionnel

Diagnostic de performance énergétique – logement (6.1)

N° :
Valable jusqu'au :
Type de bâtiment :
Année de construction :
Surface habitable :
Adresse :

Date :
Diagnostiqueur :
Signature :

Propriétaire :
Nom :
Adresse :

Propriét. des installations communes (s'il y a lieu) :
Nom :
Adresse :

Consommations annuelles par énergie

	Consommations en énergies finales	Consommations en énergie primaire	Frais annuels d'énergie
	détail par énergie et par usage en kWhep	détail par usage en kWhep	
Chauffage	kWhef	kWhep	€ TTC
Eau chaude sanitaire	kWhef	kWhep	€ TTC
Refroidissement	kWhef	kWhep	€ TTC
CONSOMMATIONS D'ÉNERGIE POUR LES USAGES RECENSÉS	kWhef	kWhep	€ TTC

Consommations énergétiques (en énergie primaire) pour le chauffage, la production d'eau chaude sanitaire et le refroidissement

Consommation conventionnelle : kWhep/m².an

Émissions de gaz à effet de serre (GES) pour le chauffage, la production d'eau chaude sanitaire et le refroidissement

Estimation des émissions : kg eqCO2/m².an

Logement économe
A
B
C
D
E
F
G
Logement énergivore

Faible émission de GES
A
B
C
D
E
F
G
Forte émission de GES

a. Way certificates are communicated/displayed

The certificate in case of sales is made at the same time as the other diagnosis on the building including: presence of asbestos, lead, termites,…

This has created a market for the building diagnosis with a lot of different players with different level of competence. A single search on Google with the words “diagnostic immobilier” gives a huge number of relevant links and about 20 commercial links.

At the end of 2007 the certifiers will have to achieve a certain level of quality through an accreditation procedure.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

There are no requirements to apply the recommendations enclosed with the energy certificate.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

Discussions are going on this topic but no final decision has already been made. It was not possible to include in the legal text setting up the certification process a rule making mandatory to provide the data regarding the certificate to a central place. This was due to law on personal data.

The ministry of housing is sponsoring the development of a tool which will enable to get a better knowledge of the building stock based on a modelling of the whole stock based on typology of buildings.

d. Linking incentives to energy performance certification

Different banks are now setting up schemes to support low energy buildings or low energy retrofit. Announcement has already been done by “Banque Populaire”, “Caisse des depots et consignations” and “Credit foncier”.

Up to now these incentives are based on other tools than the energy performance certificate which is not considered today as sufficiently reliable.

Official “labels” which are based on RT2005 are used for new buildings.

A new label supported by the French government as well as by an association linking regions, manufacturers and banks is being set up. This label will be used for low energy buildings. The banks involved expect to use this new label to link incentives. www.effinergie.org

1.2.2 Encourage reconstruction instead of heavy renovation works

Discussion on advantages or reconstruction versus heavy renovation works is very active in France. Policies are set up to reconstruct buildings in order to enable renewal of some urban areas.

Nevertheless these policies are based on social approaches. The energy aspects are not considered today.

Links between these “social policies” and the energy policies could be very important to develop.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

The rules defining what has to be paid by the owner and what has to be paid by the renter do not enable the owner to charge energy investment costs by adding them to the rent.

Nevertheless there could be private agreement between owner and renter.

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

Not generally possible in France. There might be private agreements between the owner and the renter.

1.2.4 Legislation concerning co-ownership

According to French law renovation measures which enables a transformation an addition or an improvement of **common parts** of the building shall be decided by a majority of 2/3rd of the co owners.

Changes that deal only with private parts of the buildings without any effects on the common parts can be decided by each owner. This includes for example new lighting systems, heating control, internal insulation, etc.

a. Reduced majority level to decide to implement measure proven to be energy efficient

See below

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

Some measures can be decided by a majority of ½ of the co-owners. This includes energy savings works dealing with thermal insulation, heating system, ventilation system, domestic hot water. These works shall have a payback time of less than 10 years.

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

No such reserve is mandatory. Nevertheless it is possible to set up a reserve.

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No such measure foreseen yet.

1.2.5 Legal status of the co-ownership for bank credits for energy refurbishments

Banks offer special loans for co ownerships in order to enable people who do not have the possibility to pay cash to stop the decision of starting works.

1.2.6 Energy-friendly urban regulations

Urban regulations may limit the possibility to retrofit a building. For example, external insulation can be prohibited for visual reasons or because it increases the building size.

Local urban regulations can make mandatory the connection to a heating or cooling network for new installations above 30kW provided that the heating network fulfil certain requirements.

New actions are being prepared to enable more “energy friendly urban regulations”.

Local authorities often have an easier access to the land. Some of them are setting rules which will authorize the construction of building only if their energy performance is higher than the requirements sets by the regulations. This approach is very new.

In order to clarify the rules new decrees are being prepared at the national level to enable an higher construction density for buildings which have an energy performance 20% better than RT2005 or for building extensions which intensively used renewable.

1.2.7 Minimum energy requirements for renting

There are no special minimum energy performance requirements for rented buildings. The only conditions are dealing with the safety of heating and ventilation system and possibility to get a minimum comfort.

1.2.8 Environmental permit

There is no mandatory control of boilers. Texts are under preparation.

1.2.9 Adoption of annual energy efficiency plans

There are no annual energy efficiency plans in France for building owners. Nevertheless due to the increase interest in energy, large building owners are now working on the introduction of an energy plan in their strategic plan for building management. French teams are especially actives in different European projects on this topic http://kheops.champs.cstb.fr/EpiSohoEu/ ,

1.2.10 Mandatory energy efficiency impact assessment of new regulations

Before new regulations are enforced in France, in most cases different studies are available on the impact of the new rules. These studies can either be paid by the government or its ministries, by the federal states or by certain industry branches linked to the new regulations.

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

Fiscal deductions are applicable in France for the following energy investments:

	% of the cost of the material or system (does not include the installation cost)
Low temperature boiler	15%
Condensing boiler	25 % or 40% if installed in an existing buildings less than 2 years after its acquisition
Wall insulation (R>2,4)	
Roof insulation (R>4,5)	
Windows (Uw<2 or Ug<1,5)	
Insulating shutters	
Heating network insulation	
Heating system controllers	
Heat pumps	50%
Thermal Solar systems	
PV systems	
Wood burners	

http://www.industrie.gouv.fr/energie/developp/econo/textes/credit-impot-2005.htm

In 2006, the tax reduction amounted to 1 000 Million Euros, 45% being for windows change.

b. Taxation stimuli of energy efficient buildings and penalties for others

Social housing generally does not have to pay the land tax in the firs 15years. For social housing buildings which apply a series of “environmental measures” including energy reduction, the exemption is for 20 years instead of 15.

c. No increase of the building taxes in case of energy efficient refurbishment

Since 2007 the municipalities can reduce the land tax for buildings where the owners has spent more than 10 000 Euros for the implementation of energy efficient measures in building built before 1989. The measures are the measures defined in §1.2.1.1. The reduction can be 50 or 100% of the tax and last for 5 years.

2.2 The taxation tool

a. Reduced VAT

i. On energy saving products

In France the VAT for renovation work in housings is of 5,5% instead of 19,6% for other works. This lower VAT level is applicable to the works and the materials and equipments provided they are charges on the same bill.

This applies to energy savings product as well as to other products.

ii. On energy supply

The energy consumption costs such as gas tariffs or electricity costs are charged with the same amount of VAT as other products (19,6 %).

The VAT level is reduced (5,5%) for the power subscription.

Local taxes of about 11% are added to electricity tariffs.

b. Energy tax

In France, an energy tax for petrol, diesel and heating oil called TIPP has been existing for a long time. The levels of the tax for 2007 are the followings

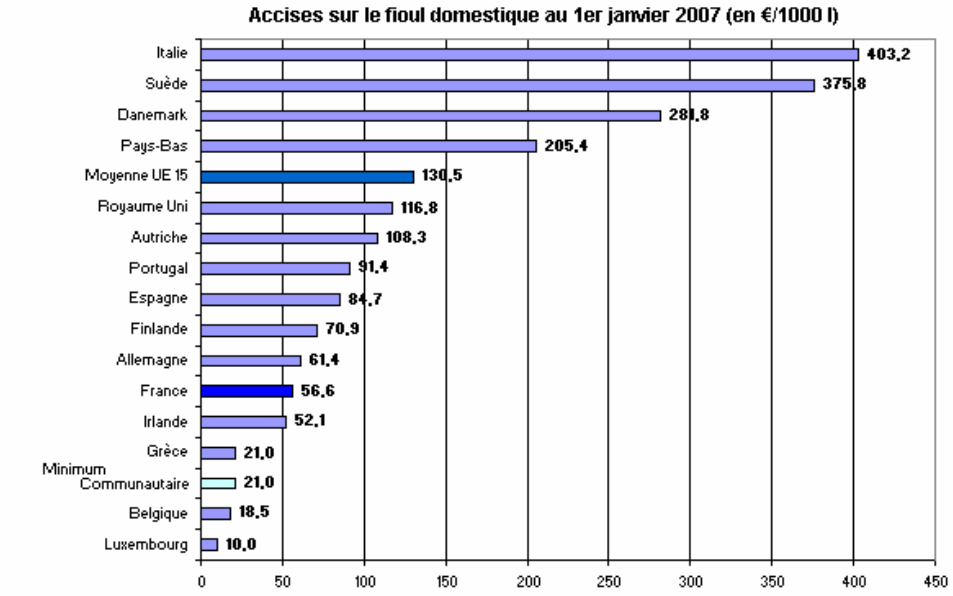
In € for 100liters

Supercarburant sans plomb	60,69
Gazole	42,84
Fioul domestique	5,66

The value of the tax for heating (fioul domestic) is much lower than its value for transport.

The VAT is also applied in addition to the TIPP.

The ministry of economy provides the following comparison of the TIPP with similar taxes in other countries.



c. Buildings included in the CO2 taxation market

A first inclusion of building in CO2 market is starting in France. The first text was signed in March 2007. Application may come in the following months.

One expects that this measure can have an impact on three main types of projects: energy management of non residential buildings, evolution of commercial refrigeration, replacement of fossils fioul boilers.

More Information at: http://www.caissedesdepots.fr/spip.php?article630

2.3 Subsidies for energy efficient technologies

At the national level

Subsidies for energy efficient technologies were applied in the past especially by ADEME but they were difficult to manage on a wide scale. They are now replaced by tax reduction.

Subsidies for retrofit are given on a wide scale by ANAH to low income building owners who occupy their home and to building owners who rent homes or apartments. www.anah.fr

Subsidies are given to buildings older than 15 years for the following purposes:

- Improvement on security, comfort, health, access to diabled people
- Energy efficiency and Acoustic insulation.

For building owners who occupy their home, subsidies can represent 20% of the costs limited to13000€.

For building renters the subsidy rate is 15% but can go up to 70% for certain types of buildings.

478 Millions € were subsidised and 133 400 houses were improved.

Among these subsidies part are dedicated to energy efficient systems:

High acoustic or energy performance window	80€
Condensing boilers	900€

Wood boiler	900€
Solar collector for domestic hot water	900€
Air / Water heat pump	900€
Ground source heat pump	1800€
Solar collector for heating and DHW	1800€

At the regional or local level

Many regions or municipalities provide subsidies in particular for the use of renewables: solar thermal, solar PV and wood. The subsidies varies from one region to the others:

A list of subsidies is available at : http://www.cler.org/info/rubrique.php3?id_rubrique=76

2.4 Granting soft loans

Until last year no soft loans was available in France for low energy buildings or for energy retrofit. This is changing rapidly now with the announcement by different banks of new loans.

In addition the French Government has modified the rules regarding a special saving account. This saving account called in the past "codevi" was supporting the industrial development. It was changed in 2007 to become a "sustainable development saving account". Up to date 50 billions € are collected and 10 new billions are expected in the near future due to rules change. Banks will have to offer new loans to support energy efficiency and use of renewable in existing buildings. The loans they will offer will have to represent 2% of the collected money in 2008, then 5% in 2009 and 10% in 2010. One can then expect new loans of about 6 billion € per year after 2010.

http://www.industrie.gouv.fr/energie/developp/econo/textes/livret-dd.htm

Some examples of new loans offered by 3 banks are described below:

- The bank "caisse des depots et consignation" which finances widely social housing develops two new loans. The "energy performance loan" is devoted to the extra cost of new buildings which are at least 20% better than the energy regulations. The interest rate is 2,45%. The loan can cover up to 7% of the construction cost, which are extra costs due to increased performance. An other loan related to building retrofit is under preparation.
- The "banque populaire" has launched at the same time in march 2006 a special saving account (codevair) and a special loan (prevair) to help financing the energy conservation and sustainable development in the building field. The codevair enables to collect money at a low cost (1,75%), this money is then used to finance energy efficiency measures for individuals at 2,75%. Up to 15 000 € can be financed.
- The "credit foncier" has launched a new loan "evolution énergie" which takes into account the savings due to a better energy efficiency to adapt the amount which can be borrowed or the amount of the repayments.

a. Higher amount possible if more energy efficient

This approach is followed by the "credit foncier" and by "caisse des depots"

b. Lower interest rate with credits

This approach is followed by "banque populaire" and "caisse des depots"

c. Specific loans for energy efficient retrofitting / pre-financing of the works

Some of the loans described above are applicable for retrofitting.

2.5 Third party financing (PPP)

A law enables since June 2004 “partnership contracts” which enable the public bodies: state, local authorities, public establishments to set up new type of contracts with private companies.

These contracts enable a private company to finance, build, operate and maintain activities which support the public body in the realisation of its public activities.

Application of this type of contract is developing now but is still in a learning process.

2.6 European structural funds

Not used for improving the energy efficiency in France.

2.7 Higher energy price paid for electricity from PV or CHP

The owners of the electricity grids have to take over the produced energy and pay the producer a defined amount of money per kilowatt hour.

Since July 2006 new tariffs were set up regarding sales of electricity produced by renewable. Regarding photovoltaic this tariff is designed to enable a quick development of PV in France as well as an architectural integration in buildings.

The contracts are signed for 20 years and the buying prices are 30ct€/kWh if the system is not integrated and 55ct€/kWh if the system is integrated.

The owners of the electricity grids have to take over the produced energy and pay the producer a defined amount of money per kilowatt hour. The following table summarises the payment modalities

renewable	Contract duration	Tariffs for new installations
Photovoltaic	20 ans	30 à 55* c€/kWh en continental France 40 à 55* c€/kWh in Corsica and overseas *For architecturally integrated photovoltaic
Wind	On the ground : 15 year	8,2 c€/kWh for the first 10 years 8,2 à 2,8 c€/kWh in the next 5 years 11 c€/kWh overseas
	offshore : 20 year	13 c€/kWh for the first 10 years. 13 à 3 c€/kWh for the next 10 years
Biogaz	15 year	7,5 c€/kWh à 9 c€/kWh in continental France 10,3 à 8,6 c€/kWh Overseas + addition for efficient systems comprises between 0 et 3 c€/kWh
Geothermal	15 year	12 c€/kWh in continental France

		10 c€/kWh overseas+ addition for efficient systems comprises between 0 et 3 c€/kWh
Biomass combustion	15 year	4,9 c€/kWh** + addition for efficient systems comprises between 0 et de 1,2 c€/kWh
Animals wastes	15 year	4,5 à 5 c€/kWh** addition for efficient systems comprises between 0 et 0,3 c€/kWh
Petites installations (< 36 kVA)	15 year	7,87 à 9,60 c€/kWh** (51,6 à 63 cF/kWh)issu du tarif « bleu » aux clients domestiques
Déchets ménagers sauf biogaz	15 year	4,5 à 5 c€/kWh** (29,5 à 32,8 cF/kWh) + prime à l'efficacité énergétique comprise entre 0 et 0,3 c€/kWh (2 cF/kWh)
Cogeneration	12 year	6,1 à 9,15 c€/kWh** (40 et 60 cF/kWh) environ en fonction du prix du gaz, de la durée de fonctionnement et de la puissance
Hydraulique	20 year	5,49 à 6,1 c€/kWh** depending on power + addition between 0 et 1,52 c€/kWh in winter depending on production stability

http://www.cler.org/info/article.php3?id_article=3281

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

Not yet applied in France.

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

This is not used in France.

b. Increasing tariff with the energy consumption

Actually, the reality is just the other way around. For example, the costs of electricity and gas are lower for higher quantities.

3 Non-governmental activities

3.1 Sector agreements

There are no sector agreements applied in France.

a. Components

Not applied in France.

b. Installers

Not applied in France.

c. Regional / municipal

Some regions and municipalities are trying to develop stronger requirements regarding buildings. As they do not have the power to set regulations on this issue they use other approaches such as conditions put on the access to the land. Some municipalities or public agencies have defined contracts with property developer which give them access to the land provided they develop low energy buildings.

Different regions are also setting up an energy label called Effinergie for new buildings at 50kwh/m2.year and retrofitted buildings at 80kWh/m2.year.

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

See next paragraph

b. System of the white certificates

The system of white certificates is starting in France. The goal is to save 54 TeraWh in three years from July 2006 to June 2009.

Detailed information is available at:

http://www.industrie.gouv.fr/energie/developp/econo/f1e_eco.htm.

These 54 tWh are split in the following way:

electricity	31 TWh
Natural gas	14
Oil	7
gpl	1,5
Heat/cool	0,7

The energy suppliers will have to get “energy savings certificates during this period”. If they are not able to get them they will pay a penalty of 2c€/kWh.

They can get certificates by different types of actions.

Nevertheless in order to facilitate the management of the system a list of standardised actions with their impact is defined. Other actions can also be implemented

These actions are for example for residential buildings:

Name of the action	Operation reference
Residential building	
Building envelope	
Ceiling insulation	BAR-EN-01
Wall insulation	BAR-EN-02
Floor insulation	BAR-EN-03

Windows	BAR-EN-04
Terraced roof insulation	BAR-EN-05
Roof insulation overseas	BAR-EN-06
HVAC system	
Individual solar system for DHW (France metropolitan)	BAR-TH-01
Collective solar system for DHW (France metropolitan)	BAR-TH-02
Water to water heat pump	BAR-TH-03
Air to water heat pump	BAR-TH-04
Electric radiant panel with electronic control	BAR-TH-05
Individual condensing boiler	BAR-TH-06
Collective condensing boiler	BAR-TH-07
Individual low temperature boiler	BAR-TH-08
Collective low temperature boiler	BAR-TH-09
Low temperature radiator with combustion system	BAR-TH-10
Outside temperature control	BAR-TH-11
Independent wood system	BAR-TH-12
Independent wood boiler	BAR-TH-13
Large wood boilers	BAR-TH-14
Hydraulic network insulation	BAR-TH-15
Low temperature heating floor	BAR-TH-16
Thermostatic radiator valve	BAR-TH-17
Intermittent heating control for collective combustion system	BAR-TH-18
Intermittent heating control for individual combustion system	BAR-TH-19
Intermittent heating control for electric system	BAR-TH-20
Individual energy metering	BAR-TH-21
Condensing heat recovery	BAR-TH-22
Optimiser in collective heating	BAR-TH-23
Individual solar system for DHW (overseas)	BAR-TH-24
Balanced ventilation system with heat recovery	BAR-TH-25
Exhaust ventilation system	BAR-TH-26
Exhaust ventilation system with humidity control	BAR-TH-27

Electric radiant panel or ceiling with automatic control	BAR-TH-28
Air to air heat pump	BAR-TH-29
Equipment	
fluo-compact lighting bulb class A	BAR-EQ-01
washing machine class A+	BAR-EQ-02
Fridge class A+	BAR-EQ-03
Services	
Training of entrepreneurs, and building workers to energy savings.	BAR-SE-01

From : http://www.industrie.gouv.fr/energie/developp/econo/f1e_eco.htm

Far each action a conventional impact is defined.

The energy suppliers have three ways to obtain the certificates:

- They can act on their own buildings or sites
- They can support their customers in implementing energy savings measures
- They can buy certificates on the market.

The first 3 years period is considered as a training period.

4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

In France different demonstration programmes and projects were run in the past on the development of energy efficient buildings but a very strong speed increase has came recently.

A summary of the projects already realised in France is given in:
http://www.prebat.net/benchmark/annexe_1.pdf

The main demonstration projects are launched within the framework of the prebat project (see next §). They are managed together by ADEME and the regions.

4.2 Research and development project/ fundamental research

Research and development projects on energy in buildings were managed in the past by ADEME.

The research and development funding has been reorganised recently in France for all sectors.

Two main agencies were set up: ANR: National Agency for Research and AII: Agency for industrial innovation.

ANR is funding basic and applied research when AII is funding research which is closer to the market.

In addition to these agencies French government has supported the creation of private Research Foundations. The foundation Energy in Buildings was created within this framework.

ANR and prebat

ANR has set up different programs in all sectors. www.agence-nationale-recherche.fr One program called PREBAT (Research program on energy in building) is devoted to building energy research. Other programs are devoted to Photovoltaic, energy storage, CO2 sequestration…

Prebat (www.prebat.net) is managed by ANR in coordination with a number of organisations including 5 ministries, ADEME (French Agency for Energy and Environment), and two agencies who develops large retrofitting programs ANAH (see above) and ANRU (which manages the policy regarding town renewals).

Prebat is launching different calls: calls for research and calls for demonstration projects.

Demonstration projects calls are launched in connection with regions.

AII

AII is launching projects managed by one industrial leader. Regarding energy efficiency in buildings a large project called Homes managed by Schneider Electric is selected and is waiting for EU green light to start. The project focuses on energy distribution and energy management.

http://www.aii.fr/srt/aii/home

Foundation Energy in Buildings

This foundation was launched together by Arcelor, Lafarge, EDF and Gaz de France with the support of ADEME and CSTB.

It has already funded research projects on retrofitting of single family houses and low energy office building.

http://www.batiment-energie.org/

5 Promotional measures/ increase of public awareness

5.1 Campaign on related advantages to energy savings

The Agency of Environment and Energy efficiency was created by the minstries of research, environment and industry.

It develops campaign of related advantages to energy savings with advertisement on the radio, tv etc…

http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=14295

In the past the energy suppliers have also develop campaign on energy savings. The development of energy savings certificate will lead to new information campaigns.

5.2 Voluntary labelling/ certification initiatives

There are different voluntary certification schemes on products but no global action in this direction.

5.3 Information on cost-efficient measures

Information on cost efficient energy savings measures is provided to the public by a network on “Energy information spaces” throughout the countries. They enables a direct access to a first level of information. http://www.ademe.fr/particuliers/PIE/InfoEnergie.html

Information can also be obtained from energy suppliers information points.

6 Conclusions

Actions for energy efficiency in buildings are developing quickly in France. The key point is probably that the actions which were in the past coming mainly from the central state and it’s agencies are now coming from different points;

- the central state
- local authorities
- national or regional agencies
- energy suppliers
- public as well as private banks

….

The trend is clearly to move from a point where energy was considered by many players as a non important issue to a point where all the players are working hard to solve their energy problems or to develop new business linked to energy.

A long term plan called “plan climat” is also developed to clarify the direction for new actions.

7 References

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2. http://www.logement.gouv.fr/article.php3?id_article=5873 information on energy certificates
3. www.effinergie.org information on effinergie scheme for efficient buildings
4. http://kheops.champs.cstb.fr/EpiSohoEu/ information on epi soho project
5. http://www.industrie.gouv.fr/energie/developp/econo/textes/credit-impot-2005.htm information on tax savings
6. http://www.caissedesdepots.fr/spip.php?article630 orientations for CO2 certificates in the building sector
7. http://www.cler.org/info/rubrique.php3?id_rubrique=76 information on regional subsidies for energy products
8. http://www.industrie.gouv.fr/energie/developp/econo/textes/livret-dd.htm information on sustainable development saving account
9. http://www.cler.org/info/article.php3?id_article=3281 information on selling prices of electricity produced by renewable
10. http://www.industrie.gouv.fr/energie/developp/econo/f1e_eco.htm information on “energy economy certificates
11. http://www.prebat.net/benchmark/annexe_1.pdf description on low energy buildings in france
12. www.agence-nationale-recherche.fr Information on Agence nationale de la recherché

13. www.prebat.net information on the research and development program PREBAT
14. http://www.aii.fr/srt/aii/home information on AII Agence de l'innovation industrielle
15. http://www.batiment-energie.org/ information on the Fondation batiment energie
16. http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=14295 campaigns on related advantages to energy savings
17. http://www.ademe.fr/particuliers/PIE/InfoEnergie.html list of information point on energy

Situation in Germany

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March 2007

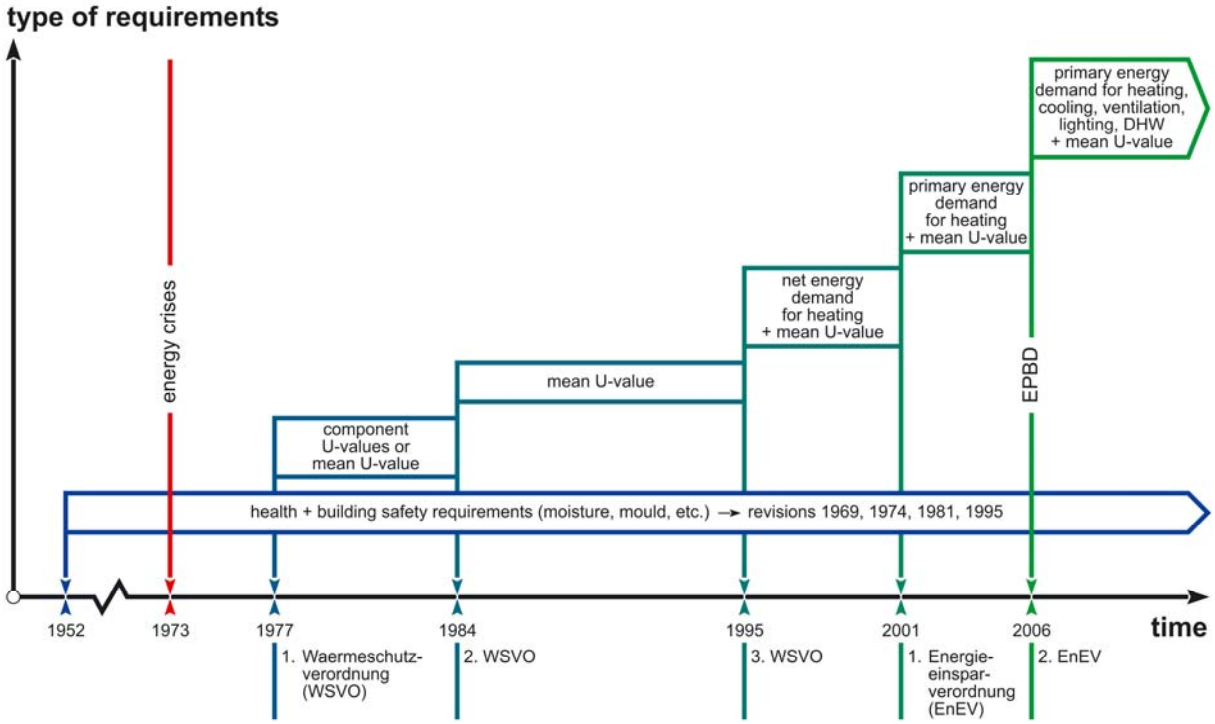
This report gives an overview of the existing measures designed to improve the energy efficiency of new and existing buildings in Germany. The information mainly comes from different national sources, such as the Federal Ministry of Transport, Building and Urban Affairs and the KfW Promotional Bank and was compiled at the Fraunhofer Institute for Building Physics (IBP).

1 The regulation tool

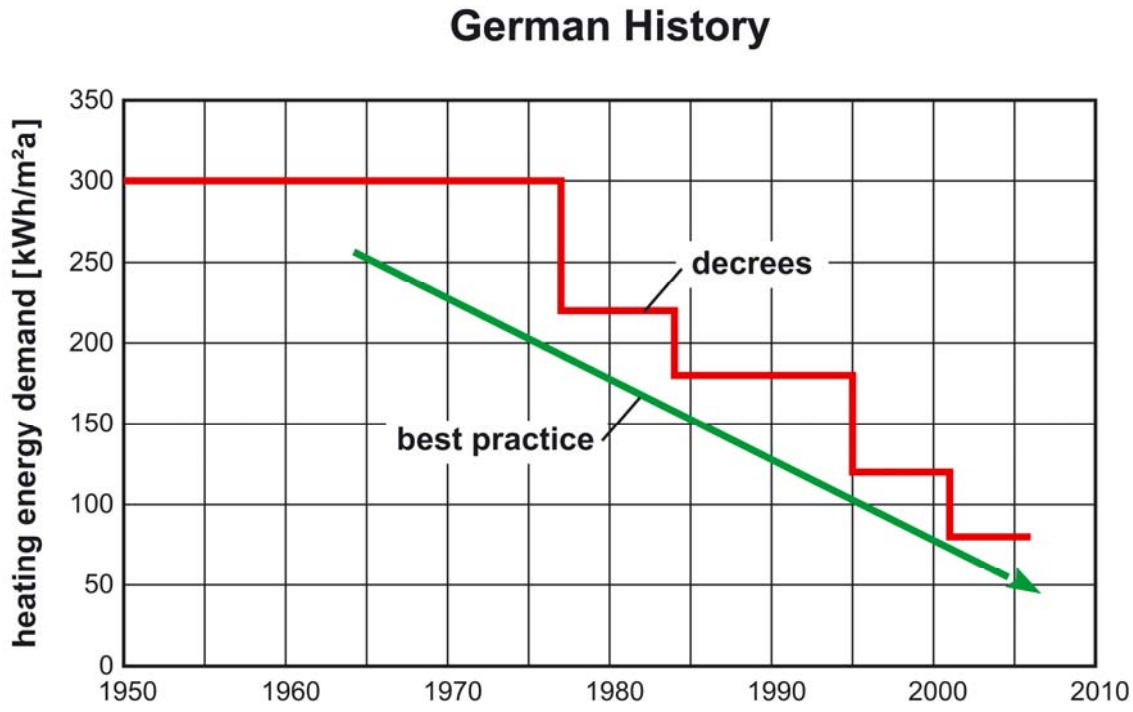
1.1 Legal requirements (technical)

1.1.1 Adopt and/or reinforce requirements

In Germany, legal requirements to the thermal and energy performance of buildings have existed since 1952. Until 1977, the focus of those requirements was placed on the health and building safety (moisture, mould, etc.), which was expressed by minimum thermal resistance coefficients of the building shell. Later on, the required values were revised and tightened in 1969, 1974, 1981 and 1995. In 1977, the first energy based requirements concerning component U-values or mean U-values (choice) were set up within the 1st Wärmeschutz-verordnung (Heat Insulation Ordinance); in 1984, the 2nd Wärmeschutzverordnung established a maximum mean U-value for the building envelope. In 1995, the 3rd Wärme-schutzverordnung changed the requirements from the component or building-envelope level only to a maximum net energy demand for heating and a maximum mean U-value for the building envelope. The 1st Energieeinsparverordnung (Energy Saving Ordinance) in 2002 (slightly revised in 2004) made the next step towards a maximum primary energy demand for heating, ventilation and domestic hot water and again fixed a mean U-value for the building envelope. The 2nd Energieeinsparverordnung in 2007 resulted from the EU Energy Performance of Buildings Directive and therefore took into account the primary energy demands for heating, cooling, ventilation, lighting and (domestic) hot water by setting up a maximum value dependent on a reference building with defined standard technologies, along with a maximum U-value for the building envelope. The next revision of the Energie-einsparverordnung with strengthened requirements is planned for 2009. The series of legal requirements is presented in the following graphic.



It has to be said that the enforcement of the requirements by the Federal German Government was always tested in advance in order not to demand values that cannot be achieved in practice or that will prevent the application of certain technologies existing on the building and system market. The first steps of such tests are the research projects, followed by a broader market acceptance. Only after that the requirements were increased as shown in the next graphic.



The graphic illustrates that the heating energy demand of a newly built single-family house could be reduced from 300 kWh/m²a to 80 kWh/m²a within the last 25 years.

a. At the building level - overall energy performance

As described above, the Energieeinsparverordnung (Energy saving ordinance EnEV 2007) sets minimum overall energy performance requirements by specifying maximum primary energy demands for heating, cooling, ventilation, lighting, and (domestic) hot water, dependent on a reference building with defined standard technologies.

b. At the building level - subset performance

A subset performance is the maximum mean U-value (H_T') for the building envelope that is part of the German energy performance requirements according to EnEV 2007.

c. At the component level

The EnEV 2007 includes requirements at the component level in case of major renovations of buildings. In this case, certain maximum U-values for the different components have to be met. These requirements have also to be met if new components are added to the buildings. Alternatively, it can also be proven by calculations that the maximum primary energy demand for new buildings multiplied by factor 1.4 will not be exceeded after the renovation.

d. Enlargements of the application field of the requirements

In the EnEV 2002, the first requirements to existing buildings (also without major renovations) were fixed. These requirements are also part of the new EnEV 2007:

- Insulation of not walkable but accessible floors to the attic (maximum U-value of 0.30 W/m²K)
- Insulation of non-insulated distribution pipes for heating and domestic hot water
- Replacement of boilers if the existing boiler was installed before October 1978 (with some exemptions)

1.1.2 Adaptation of energy and environment standards

The EnEV 2002 and also the EnEV 2007 make reference to a European directive 2005/32/EG that requires all boilers used in Germany to have the CE label.

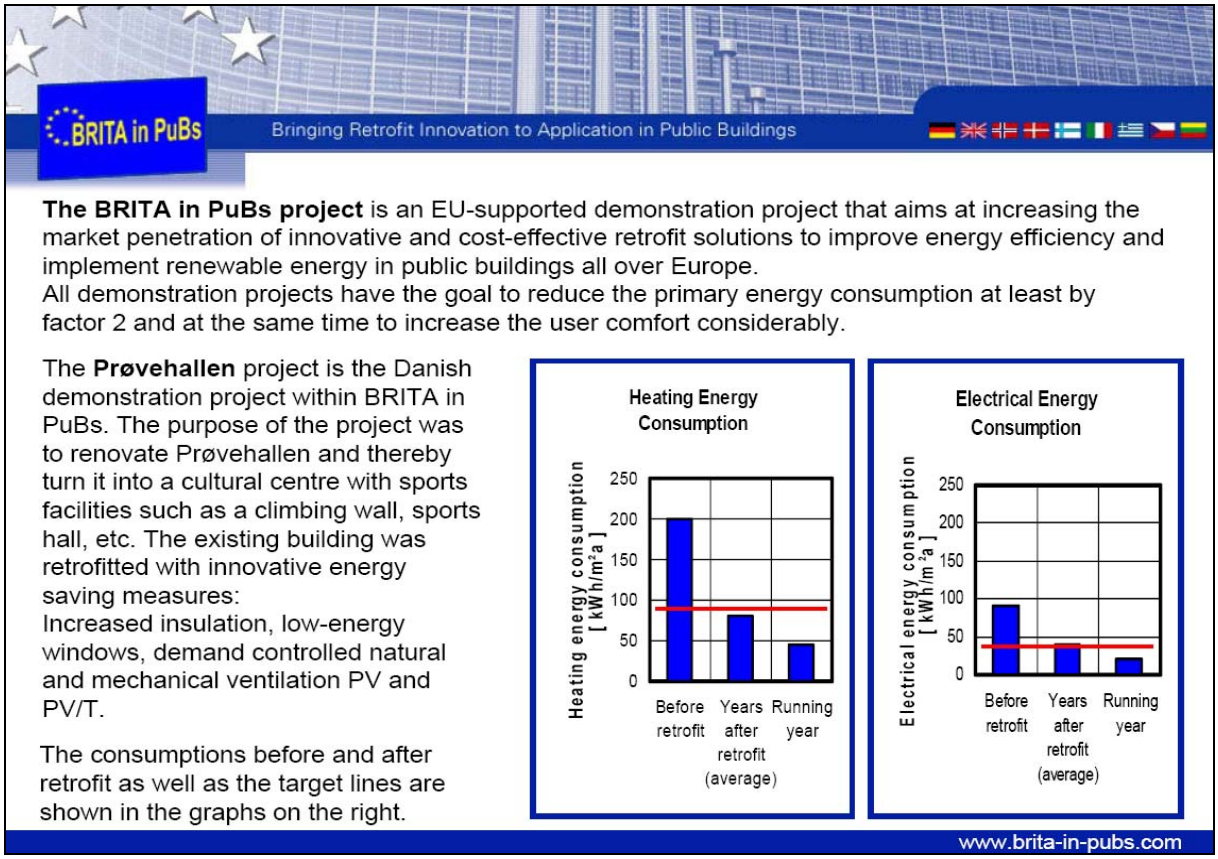
The regular inspection of boilers is required by the German Environmental Decree (Bundesimmissionsschutzverordnung). If a boiler exceeds the defined CO emission or produces too high waste-gas temperatures, the boiler or burner has to be replaced by an environmentally more acceptable boiler/burner.

1.1.3 Visible meters in the building

There are no such requirements existing in Germany. However, the vast majority of buildings have a metering system that is visible, even though it is mostly placed in the cellar. If a group of buildings is owned by the same building owner and not rented to other users, the building owner might consider using only one meter for all those buildings. This is the case in some university complexes, for example.

The EU 6 FP BRITA in PuBs (TREN/04/FP6EN/S07.31038/503135) will use electronic displays in the entrance areas to present the current energy consumption of the building after the realised retrofit. The displays will also allow the comparison of the consumption before

and after the retrofit. One of the demonstration buildings is the Filderhof nursery home in Stuttgart. The following graphic shows the template of this information display that is planned for all buildings in BRITA in PuBs, using the example of the Danish project Proevehallen.



1.1.4 Requirements compliance check

In Germany, energy performance requirements are set up by the Federal Government. However, the control of the compliance lies within the power of the Federal States. According to the experience made with earlier requirements for new buildings, the building owner must send a documentation of the compliance (calculation of the energy performance stated in an 'Energieausweis' = energy performance certificate) to the administrative body that is responsible for issuing the building permit. This body will file the certificate, which will only be compared to reality (i.e. to the actually built construction) if there is a problem such as a lawsuit on the building.

For the new Energieeinsparverordnung no other control mechanism is yet planned.

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

The Berlin buildings of the federal government of Germany have to fulfil the requirement to perform 30 to 40 % better than stipulated by the EnEV requirements. This applies for both new and existing buildings (decision of the Bundeskabinett/ Federal Cabinet as of 11/12/1991).

In addition, there are several city administrations that demand a better energy performance quality for their own buildings and for buildings that are going to be built on their ground. An example of this practice is given by the city of Stuttgart, which has set up an energy decree for this kind of buildings. The city requirement is to do 30 % better than the general German requirements. Also, certain technologies known for bad energy performance (e.g. conventional ballasts for lighting) are not allowed. In the case of buildings to be raised on ground that has to be purchased from the city, they make these requirements part of the selling contract, too.

b. Integration of the energy performance of buildings in public procurement procedures

Though the building investments and the operational costs are still separate budgetary items, more and more city administrations base their decisions concerning energy efficient measures on life-cycle costs.

c. Retrofitting of public buildings

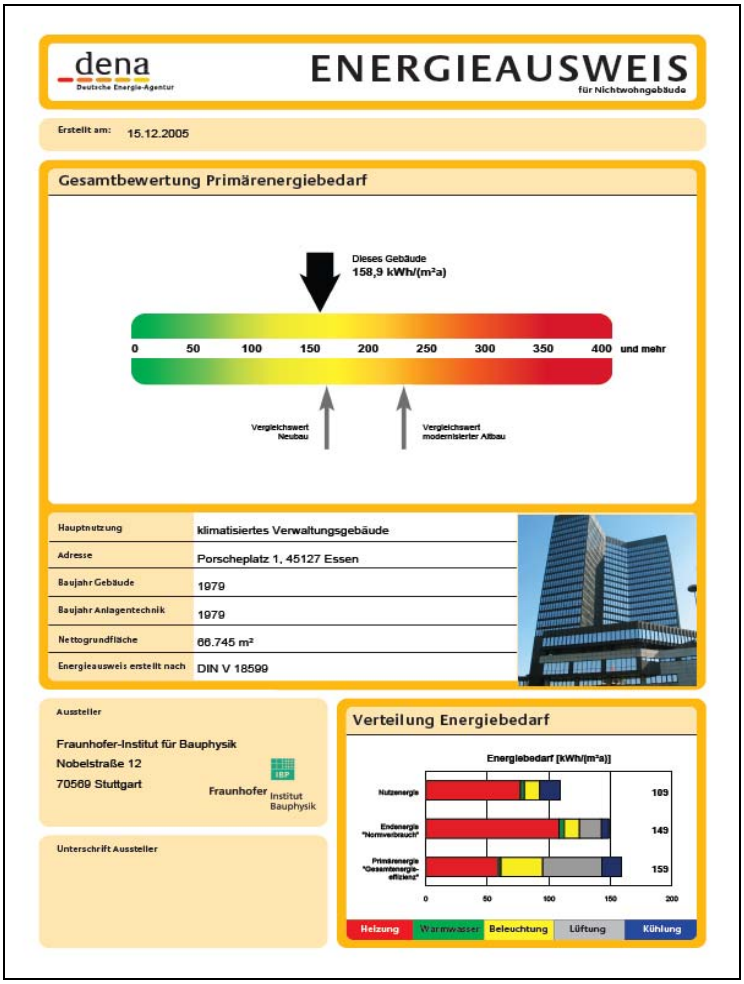
In 1999, the German Federal Ministry of Economy has started a big retrofit programme entitled “EnSan”, which includes both demonstration buildings (see also chapter 1.4) and research projects for retrofitting technologies. Public buildings are also part of the demonstration buildings. For example, the city of Stuttgart received co-funding for applying retrofit measures and for the design and monitoring of the retrofit concept that was tailored for a home for the elderly in Stuttgart-Sonnenberg. All buildings within this programme have to cut their energy demand by 50 % due to the renovation. However, this programme covers only about 30 demonstration buildings. In general, public buildings in Germany are not subject to higher requirements concerning retrofitting than other buildings. The Berlin buildings of the federal government of Germany have to fulfil the requirement to perform 30 to 40 % better than specified in the EnEV, also in case of retrofit (decision of the Bundeskabinett of 11/12/1991).

There are several municipal administrations that demand a better energy performance quality in case of renovation for their own buildings. An example of this approach is the city of Stuttgart, which has set up its own energy decree. The city’s requirement is to be 30 % better than the general German requirements. Neither allowed are certain technologies with a bad energy performance (e.g. conventional ballasts for lighting).

1.2 Other legal supporting measures

1.2.1 Energy certification scheme

Like all EU Member States, the German implementation of the EPBD requests the certificates for the energy performance of buildings for new buildings (this has actually been in force since 1995) and in case of sales or rent of existing buildings. For public buildings, these certificates have to be displayed at a prominent place within the building. An example for a German certification scheme is presented in the following graphic.



a. Way certificates are communicated/displayed

In order to test the wider application of the certification scheme, the 'dena' (Deutsche Energie-Agentur/ German Energy Agency) was charged with the organisation of a field test for (1) residential buildings and (2) non-residential buildings. The Fraunhofer Institute for Building Physics (IBP) was a partner in the evaluation team of both field tests. More than 1,000 residential buildings and about 50 non-residential buildings took part. Both the field test itself and the results were used to announce and explain the procedure of the energy performance certification, and to teach the first consultants how to issue such a certificate.

One of the biggest concerns expressed by the public and multiple building owners was that those energy certificates would cost a lot of money. They argued that - due to the holistic and detailed calculation method stipulated in German standard DIN V 18599 for non-residential buildings - the costs per certificate would be too high. The German government decided that certificates based on consumption values are also allowed for most building types. This decision simplifies the application of the energy performance certificates.

It is expected that the energy performance of a building will now be a more important part of the building value during the sale or rent of a building. Yet, the performance certificates only have to be presented during the sales or rent negotiations, they need not be shown or given to the tenants/ renters. In case of public buildings, the first certificates have been issued and

are now on display in the entrance area of the buildings. The German government is a front-runner in the non-residential area. For example, the Fraunhofer Institute for Buildings Physics (IBP) got the order to issue about 10 energy performance certificates for various ministry buildings in Berlin.

A different way of publishing the energy performance of buildings is preparing an energy report for the public building stock of a city or other types of governmental buildings. The city of Stuttgart has been producing such reports for more than 30 years now. The reports state the energy consumption and the energy costs of all public buildings in Stuttgart and compare actual consumption rates to earlier values of past years.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

In the German implementation of the EPBD, two versions of energy performance recommendations for existing buildings are prescribed: the first one with economic advice (only measures that have a short payback period), the second one with higher energy savings. This shall make the realisation of the recommendations more probable. There is however no requirement to realise the given recommendations.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

The German ministries do not foresee to sponsor the gathering of information from the issued energy performance certificates, neither to do this work themselves. The evaluation work done for the field test studies showed that this work would not merely be statistical work, but that it would also require the analysis of the data in order to filter out incorrect certificates and the information contained therein. There are several national and international projects that collect such kind of information on a smaller basis.

For about 10 years now, the government has possessed a similar tool to predict the effects of possible requirements. This tool called IKARUS is based on many different building types representing the building stock in Germany, and possible measures that can be applied.

d. Linking incentives to energy performance certification

The state-owned German KfW Promotional Bank grants low-interest credit loans for the retrofit of buildings. These loans are available to private people, but since the beginning of 2007 public bodies and non-profit associations are also entitled to receive such loans. A part of these loans is paid when the intended energy-performance improvement has been calculated according to the DIN V 18599 and proves to be better (by a specified percentage) than the common requirements. For more information on the incentives in Germany, please have a look at chapter 1.2.4.

1.2.2 Encourage reconstruction instead of heavy renovation works

The control of what makes more sense, reconstruction or renovation, is not easy. Generally, the building owner or buyer is interested in finding out which solution serves him better. On the one hand, there are incentives that support the renovation; on the other hand, a new building will of course have a higher value than a partially renovated one. There are also incentives for new buildings with low energy demands. In Germany, there is no other influence on this decision than that of the open market.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

In Germany there is a rule that the investment costs of renovations (including energy efficiency measures) can be transferred to the tenant by an increase of up to 11 % of the investments on the yearly rent. This helps to cover the gap between the investor (building owner) and the one that benefits from energy efficient retrofit measures (tenant).

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

Not generally possible in Germany. There might be private agreements between the owner and the renter.

1.2.4 Legislation concerning co-ownership

According to German law renovation measures are divided into:

- Changes that have to be agreed upon unanimously: changes that influence the stability, the security or the architecture (e.g. changes at the façade), changes that reduce the daylight availability, and changes that will produce an advantage or a disadvantage for a single owner.
- Changes that have to be agreed upon by the majority of owners: e.g. renewals/ improvements of the heating system and the ventilation system.
- Changes that can be made without the acceptance of other owners: new glazings, measures inside of the apartment (such as for example new lighting systems, heating control, internal insulation, etc.).

a. Reduced majority level to decide to implement measure proven to be energy efficient

No such measure foreseen yet.

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

No such measure foreseen yet.

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

In Germany, the owners of such apartment buildings have to form a financial reserve so that necessary renewals can be paid. This reserve is however limited to a certain percentage, a fact which restricts the possibilities of taking energy efficiency measures at the building. The annual reserve has to be equal to 1 % of the investment for the new building.

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No such measure foreseen yet.

1.2.5 Legal status of the co-ownership for bank credits for energy refurbishments

In Germany, the group of co-owners of the building can not easily obtain additional funding for measures from a bank, as they are not a legal organisation. Therefore, most measures can only be realised if the total investment costs do not exceed the financial reserves maintained for the building.

1.2.6 Energy-friendly urban regulations

Generally, there are no restrictions to energy-efficient retrofitting in Germany. There are, however, some limitations (for example with regard to listed buildings), where external insulation might not be allowed as this could change the façade impression.

In some city centers in Germany fossil fuel burners are not allowed. The buildings have to be supplied by the district heating system or heated by electricity.

1.2.7 Minimum energy requirements for renting

There are no special minimum energy performance requirements for rented buildings. However, it is believed that the market will control this problem and that buildings that have a very high energy demand will not easily be rented. This will increase the application of energy efficient retrofits to buildings.

1.2.8 Environmental permit

In Germany, the chimney sweep annually checks the environmental performance of the boilers. He measures the CO emission and the waste gas temperature (see 1.1.1.2). The regular inspection of boilers is required by the German environmental decree (Bundes-imissionsschutzverordnung). If a boiler exceeds the defined CO emission or produces too high waste-gas temperatures, the boiler or burner has to be replaced by a boiler/burner with better environmental compatibility.

1.2.9 Adoption of annual energy efficiency plans

There are no annual energy efficiency plans in Germany. However, the current German government has set targets for the energy efficiency also in the building sector (to double the efficiency by 2020 compared to 1990 and to renovate each year at least 5 % of the existing building stock). The German chancellor is currently trying to convince the other Member States of the European Union to decide for a target of 20 % less energy consumption and a 20 % share of energy generation by renewables to be achieved by the year 2020.

1.2.10 Mandatory energy efficiency impact assessment of new regulations

Before new regulations are enforced in Germany, in most cases different studies are available on the impact of the new rules. These studies can either be paid by the government or its ministries, by the federal states or by certain industry branches linked to the new regulations. These studies are not mandatory, but generally no new regulation is made without.

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

This measure is currently not applied in Germany. In the 1990s it was allowed to reduce the tax by 800 DM/year in 10 years, if the taxpayer had built a low-energy house.

b. Taxation stimuli of energy efficient buildings and penalties for others

Not applied in Germany.

c. No increase of the building taxes in case of energy efficient refurbishment

Not part of the German taxation system.

2.2 The taxation tool

a. Reduced VAT

i. on energy saving products

Energy saving products have the same VAT rate in Germany as other products. The rate has just been increased from 16 % to 19 %, with the exemption of food and special products like art, etc. that remain at 7 %.

ii. on energy supply

The energy consumption costs such as gas tariffs or electricity costs are charged with the same amount of VAT as other products (19 %).

b. Energy tax

In Germany, an energy tax for petrol, diesel and heating oil called “Mineralölsteuer” has been existing for a long time. In 1999, Germany introduced an ecological tax (“Ökosteuer”) with an increasing rate for mineral oil of all types, for heating oil and for gas. Additionally, a tax for electricity was introduced. The increase was introduced in 4 steps until the year of 2003.

The current rate of Mineralölsteuer including Ökosteuer for heating oil is 6.14 Eurocents per litre. The following table gives an overview of the tax rates; it is based on information from the Bundesumweltamt /Federal Environmental Agency.

(http://www.umweltbundesamt.de/uba-info-daten/daten/oekosteuer.htm)

Energy carrier	Tax rates according to		
	Mineralöl-StG up to 31/03/1999	Mineralöl-StG plus Ökosteuer in 2003	Share of Ökosteuer in 2003
Diesel [cent/l]	31,70	47,04	15,34
Petrol [cent/l]	50,11	65,45	15,34
Light fuel oil [cent/l]	4,09	6,14	2,05
Heavy fuel oil [cent/kg]	1,53	2,50	0,97
Natural gas [cent/kWh]	0,18	0,55	0,37
Electricity [cent/kWh]	-	2,05	2,05

c. Buildings included in the CO2 taxation market

Not used in Germany.

2.3 Subsidies for energy efficient technologies

Some years ago this measure was applied for certain technologies, one of them being condensing boilers. Nowadays condensing boilers are a cost-efficient measure since the prices for the technology went down along with the larger scale of application.

For some years, such measures were not offered by the government in Germany, but since 2007 the KfW Promotional Bank offers a new system that gives subsidies for energy efficient retrofitting to private owners of single-family houses, twin-family houses or apartments. The subsidy is dependent on the energy demand after the retrofit:

- 30 % better than the requirements for new buildings: 17.5 % subsidy, maximum 8750 €/accommodation unit
- Equivalent to the requirements for new buildings: 10 % subsidy, maximum 5000 €/accommodation unit
- Significant reduction, but not reaching the requirements for new buildings: 5 % subsidy, maximum 2500 €/accommodation unit

There are different regional subsidy programmes in the federal states. For example, Hamburg offers subsidies for the energy efficient retrofit of apartment buildings.

Besides subsidies for technologies there are also subsidies for the consultancy on energy efficient retrofit measures. The so-called 'Vor-Ort-Beratung' (on-site counselling) of the Bafa (Bundesamt für Wirtschaft und Ausfuhrkontrolle/ Federal Office of Economics and Export Control) subsidises the costs paid for the consultant.

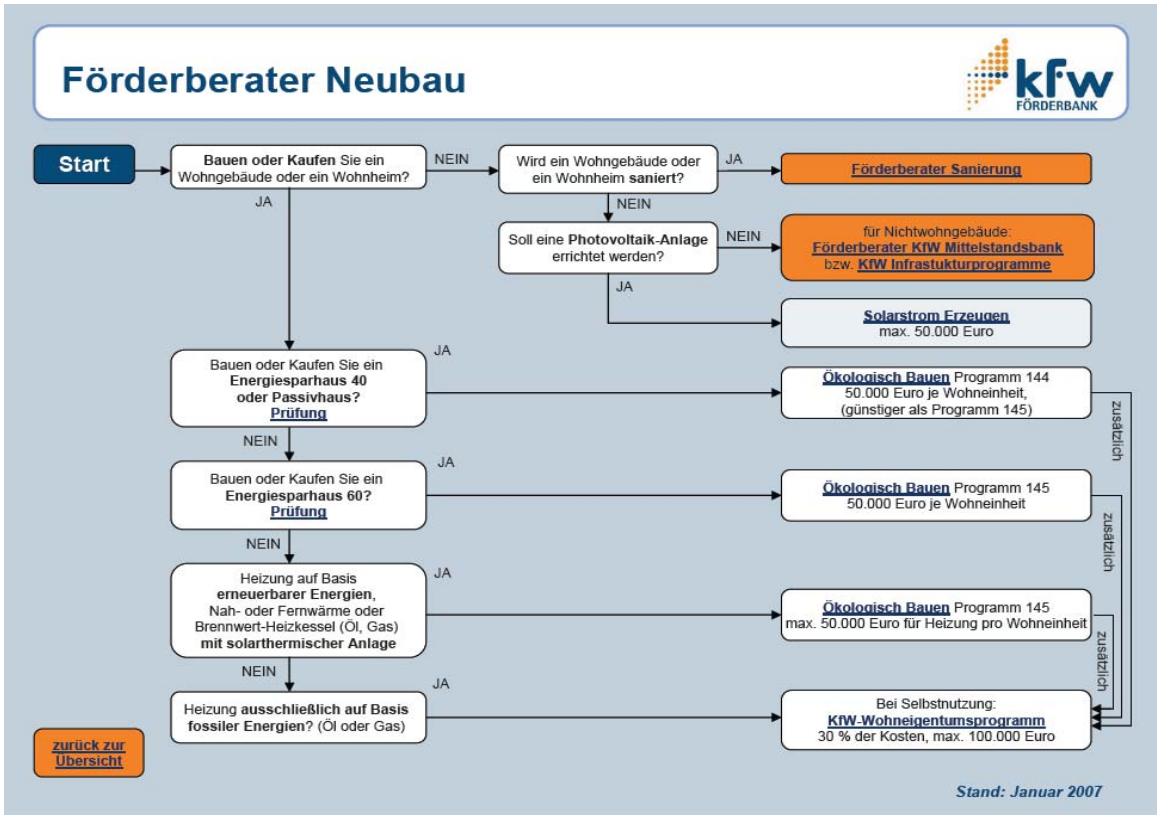
2.4 Granting soft loans

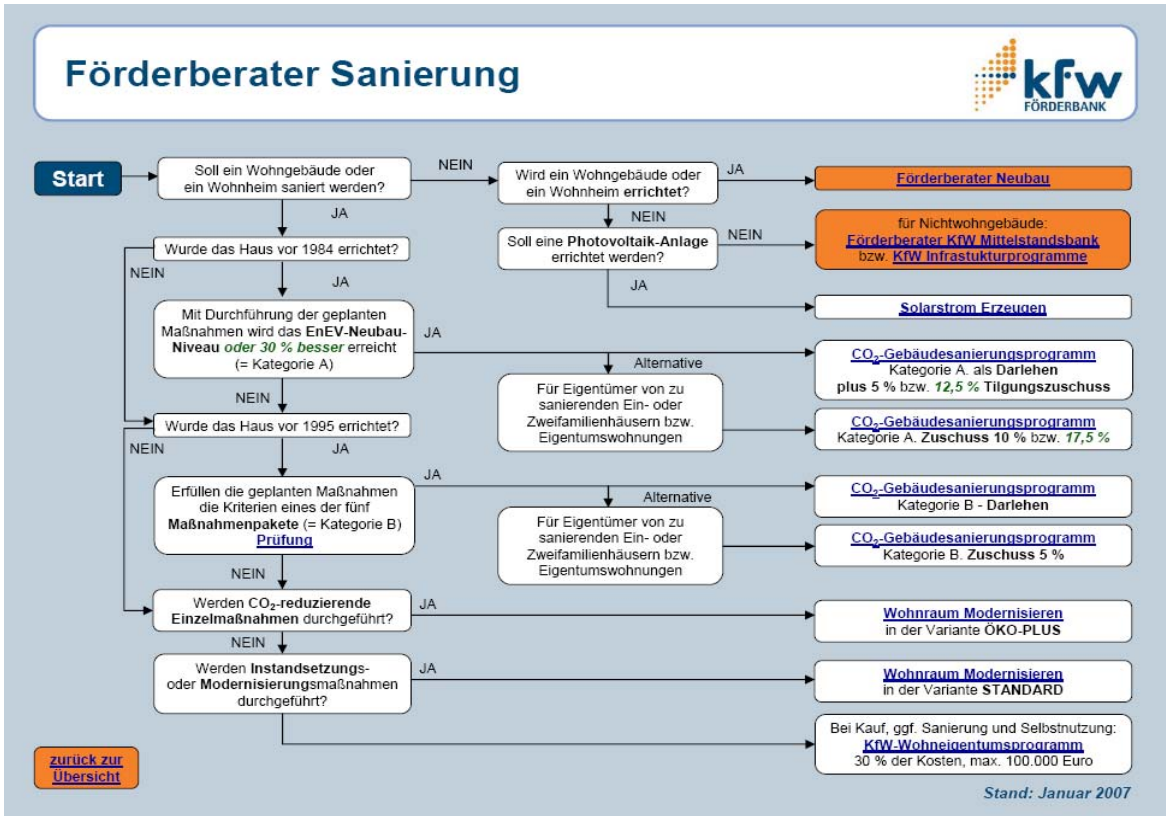
The KfW Promotional Bank (a bank owned and financed by the state) offers different types of loans for energy efficient new buildings, but also for the energy efficient retrofit of buildings. Originally, these loans were only available to private people, but since the beginning of 2007 this bank also offers loans for public administrations and for non-profit associations.

For detailed information please visit

http://www.kfw-foerderbank.de/DE_Home/KfW_Foerderbank/Aktuellesa62/CO2-Gebaeudesanierungsprogramm_erweitert.jsp

The following two graphics, copied from the KfW-website, give an overview of possible loans for new dwellings and for the retrofit of existing dwellings:





In addition to these dwelling-targeted loans, a new programme was launched in 2007, which specially addresses communities ("KfW-Kommunalkredit – Energetische Gebäude-sanierung"). It is intended to facilitate the energy efficient retrofitting of schools, sports halls, nurseries and club homes. The buildings have either to reach the level of new buildings or must use a package of 4 measures (out of a list of defined measures). The loans may cover up to 100 % of the costs, with a maximum of 300 €/m² net floor area (if the new buildings level is to be reached) or 200 €/m² if the measure package is applied.

Soft loans are also offered by the federal states for different measures.

a. Higher amount possible if more energy efficient

As indicated in the information above, the maximum amount of the loan is generally dependent on the energy level reached.

b. Lower interest rate with credits

All loans of the KfW Promotional Bank generally have a lower interest rate than common bank loans.

c. Specific loans for energy efficient retrofitting / pre-financing of the works

The listed KfW loans are specific for either new energy efficient buildings or for the energy efficient retrofit of existing buildings.

2.5 Third party financing (PPP)

The system of third party financing has been used in Germany for several years. The experience made in the last years with PPP financing showed that the limited contract time leads to limited investments, which is the reason why no PPP-project covers investments in the building envelope, only in the HVAC systems or lighting equipment and the associated controls.

In addition, some communities have started so-called revolving funds for the investments in energy efficient retrofittiong. With PPP financing the money comes from a third party that will be paid mainly by the costs saved due to reduced energy consumption. With revolving funds the city defines an amount of money that will be spent on energy efficient retrofit only and will be paid back by the saved costs for energy carriers. When the money is paid back it can be used again for other retrofit measures. In this way the cities save the costs for the third party, but have of course at first to be able to start the fund with their own money.

A more detailed description of a revolving fund, applied by the city of Stuttgart is available at: http://edit.brita-in-pubs.eu/fundanemt/files/BRITAResults/D7-revised-II-HK-22-3-06.pdf

A new kind of third party financing was developed in the last years in Germany. The "Bürgercontracting" (citizens' contracting) collects money for the energy efficient retrofitting of schools from the parents, pupils and other citizens. The payback rate of this type of fund investment is comparable to bank offers.

2.6 European structural funds

Not used for improving the energy efficiency in Germany. Structural funds are intended for the New Member States only.

2.7 Higher energy price paid for electricity from PV or CHP

In 2004 a new law on the feed-in of electricity from renewable energy sources was put into force in Germany ("Erneuerbare-Energien-Gesetz – EEG", Renewable Energy Resources Act). Its aim is to prioritise the electricity made from renewables. The production of the electricity by renewables can be realised by hydropower generators, wind turbines, solar photovoltaic, geothermal and biomass. The owners of the electricity grids have to take over the produced energy and pay the producer a defined amount of money per kilowatt hour. The following table summarises the payment modalities set out in the Federal Law Gazette (Bundesgesetzblatt, volume 2004, part I, no. 40 as of 31/7/2004.

Type of electricity production		Payment [Cent/kWh]
Hydropower	< 500 kW	≥ 9.,67
	500 kW < power < 5 MW	≥ 6.65
	5 MW < power < 150 MW	≥ 3.70 to 7.67 (depending on power increase)
Bio gas	< 500 kW	≥ 7.67
	500 kW < power < 5 MW	≥ 6.65
Bio mass	< 150 kW	11.5
	150 kW < power < 500 kW	9.9
	500 kW < power < 5 MW	8.9
	> 5 MW	8.4
Geothermal	< 5 MW	15
	5 MW < power < 10 MW	14
	10 MW < power < 20 MW	8.95
	> 20 MW	7.16
Wind power		5.5
Solar photovoltaic, generally		45.7
Solar photovoltaic at or on a building or a noise barrier	< 30 kW	57.4
	30 kW < power < 100 kW	54.6
	> 100 kW	54.0

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

This is not yet realised in Germany. However when communicating with some insurance companies they regarded this idea as very interesting and will discuss it at internal meetings.

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

This is not used in Germany.

b. Increasing tariff with the energy consumption

Actually, the reality is just the other way around. For example, the costs of district heating can be divided into consumption-based costs and fixed costs according to the peak load needed. The higher the peak load, the lower the relative fixed costs. This does not make energy saving measures more cost efficient.

3 Non-governmental activities

3.1 Sector agreements

In Germany, the market is ruled by competition. So, mostly all products are available, energy efficient ones and less energy efficient ones. There has never been an approach to a sector agreement that is more advanced than the governmental requirements.

On the other hand, there are some advanced manufacturers who can set the pace for their competitors. For example, the WeberHaus company (a manufacturer of pre-fabricated houses) some years ago set the goal of producing low-energy houses only (or houses achieving even better energy-efficiency), and thus caused some of the company's competitors to include low-energy houses in their product range, at least.

a. Components

Not realised in Germany. See paragraph above.

b. Installers

Not realized in Germany.

c. Regional / municipal

Not realised in Germany.

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

Not yet implemented in Germany. Under discussion is how the energy suppliers can realise the EU energy service directive to reduce their annually delivered energy by 1 % each year.

b. System of the white certificates

The KfW Promotional Bank works on a method how to realise the white certificate trade in Germany.

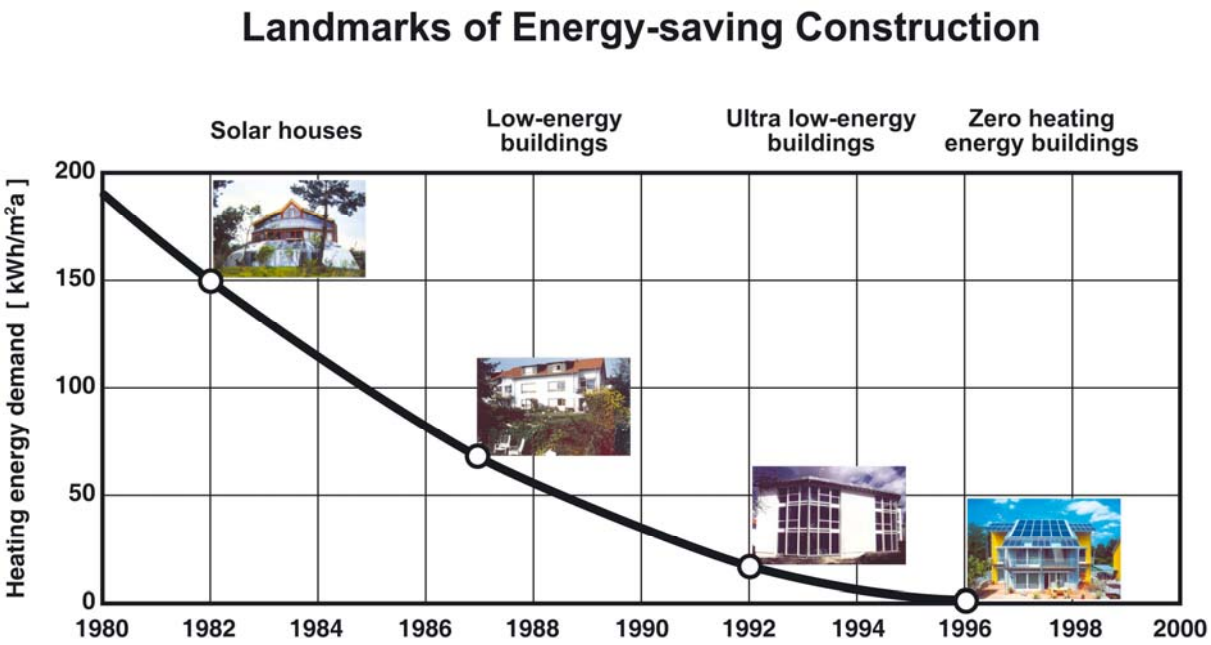
4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

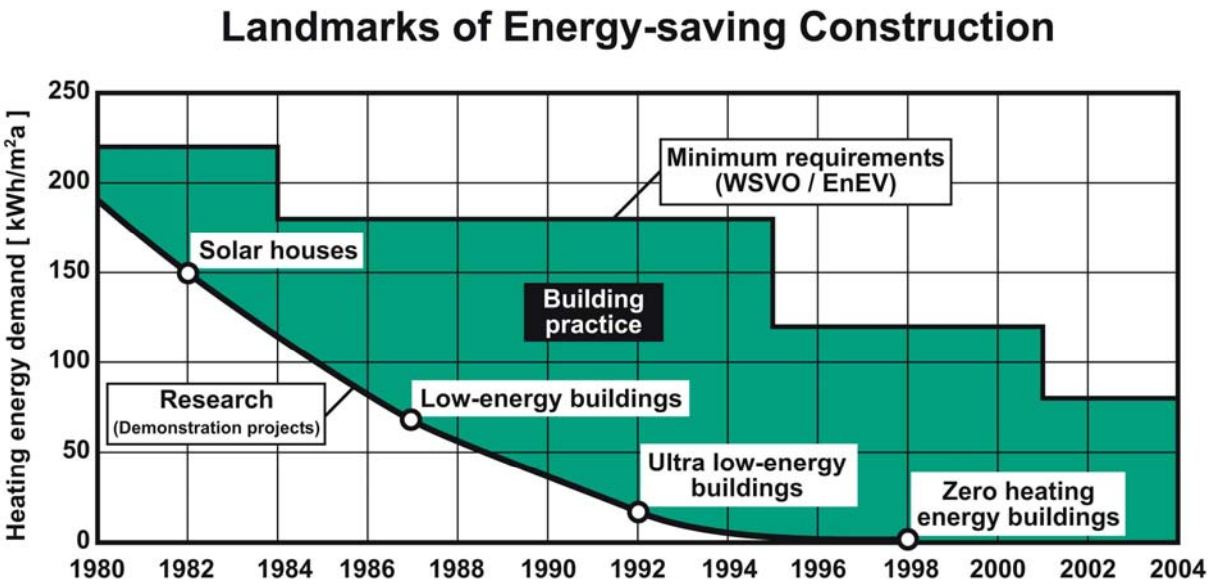
In Germany, many demonstration programmes and projects have dealt with making buildings more energy efficient. The following list is an extract of the projects conducted during the last 25 years:

Year	Project name (description)	(Co-)financed by
1982	Solar houses Landstuhl	BMBF
1987	Low energy houses Heidenheim	BMBF
1992	Ultra-low energy house Rottweil (case study in IEA Task 13)	BMWA
1995	Zero-heating energy house Berlin (case study in IEA Task 13)	BMWA
1996	Zero-heating energy house Durbach (by a prefabricated housing company)	BMWA
1997	SolarBau-programme for energy efficient new office buildings (since 2006 EnBau)	BMWi
1999	EnSan–programme for the energy efficient retrofit of buildings	BMWi
2000	Expo passive house estates at Hannover and Ulm	KfW
2000	IEA ECBCS Annex 36 “Energy-efficient retrofit of educational buildings”	BMWi
2001	3-liter-houses Celle	BMWi
2005	EU FP6 Ecobuildings: BRITA in PuBs – Bringing Retrofit Innovation to Application in Public Buildings	EU 6 FP
2006	IEA ECBCS Annex 46 “Energy-efficient retrofit of governmental buildings”	BMWi
2007	EnEff Schule – A programme for the energy-efficient retrofit of school buildings	BMWi, KfW, BMVBS

The following graphic presents some of the above-mentioned projects before the background of the time when they were realised and the heating energy consumptions achieved.



The next graphic illustrates the relation between the demonstration buildings and the minimum requirements specified in the national regulations in Germany. It underlines the necessity of demonstration building projects for the further development of the energy efficiency of all buildings in a country. The graphic shows that it takes 10 to 25 years to transfer the demo project levels to the national requirements.



4.2 Research and development project/ fundamental research

The BMWi (German Ministry of Economy and Technology) programme EnOB (EnSan + EnBau) is the national research programme for technological development and software tools in the field of energy efficiency in buildings (www.enob.info).

The BMVBS (German Ministry of Transport, Buildings and Urban Affairs) programme "Zukunft Bau" (www.zukunft-bau.de) is targeted at application technologies (including energy-efficient technologies) in the building sector.

5 Promotional measures/ increase of public awareness

5.1 Campaign on related advantages to energy savings

The German Energy Agency (dena) was founded by 3 German ministries (BMVBS, BMWi, BMU) and the KfW Promotional Bank in order to promote energy efficiency in buildings. They have launched different campaigns including "Niedrigenergiehaus im Bestand" (low-energy level at existing buildings) and a project on contracting (PPP).

5.2 Voluntary labelling/ certification initiatives

In 2001, the EID initiative (Energiepass-Initiative Deutschland, German initiative for energy performance certificates) was founded by some major industrial manufacturers of heating systems, glazing and insulation material. They promoted the advantages of energy performance certificates.

5.3 Information on cost-efficient measures

Information on cost-efficient energy saving measures is provided by several sources including the projects and websites of EnSan (www.ensan.de), the Energy Concept Adviser of the IEA ECBCS Annex 36 (www.annex36.de, www.annex36.com), Zukunft-Haus (www.zukunft-haus.de), and 3-Liter-Haus (www.3-liter-haus.com).

6 Conclusions

As presented in this report, Germany has a long tradition in energy efficient measures and policies for both new buildings and the sector of existing buildings. Nearly all of the possible measures to enforce the energy efficiency of buildings that were compiled in this report are used in Germany. Different ministries (especially the BMWi and the BMVBS) have started research and demonstration programmes. The KfW Promotional Bank provides subsidies and soft loans for the realisation of energy improvements in the building stock - not only for private building owners, but (since 2007) also for communities and non-profit associations. The German government has set up a long-term strategy for the improvement of the energy-efficiency of all buildings, which foresees a yearly retrofit of 5 % of the building stock for the next 20 years. The energy performance certification according to the EPBD was tested in two field test studies and promoted by the German Energy Agency and also by the EID initiative. The only remaining potential of measures not yet fully exploited in Germany is the taxation field, though there is a general energy tax (Mineralölsteuer incl. Ökosteuer). Some communities and the German government have voluntarily raised the level of energy performance requirements to their buildings, compared to the general national requirements.

The German chancellor is currently trying to accelerate the energy-efficiency improvements not only in Germany, but also on the EU level. A summit on energy efficiency is scheduled for 2007 in Germany.

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2. http://bundesrecht.juris.de/enev/: Download of the EnEV 2007 (Energieeinsparverordnung/ Energy saving ordinance) text.
3. www.ensan.de: Website of the German retrofit programme for existing buidings "Energetische Verbesserung der Bausubstanz".
4. www.dena.de, www.zukunft-haus.de: Promotion website for the energy efficiency of buildings, created by the German Energy Agency "dena".
5. www.kfw.de: Website of KfW, Kreditanstalt für Wiederaufbau (Reconstruction Loan Corporation), the state-owned bank (KfW Promotional Bank) that grants subsidies and soft loans for energy efficient buildings.
6. www.umweltbundesamt.de/uba-info-daten/daten/oekosteuer.htm: Information about the German energy taxes at the website of the German Ministry of Environment.
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10. www.annex36.com, www.annex36.de: Websites of the IEA ECBCS project Annex 36 "Retrofitting of Public Buildings" including the Energy Concept Adviser tool with information on retrofit measures, presentations of case studies and a calculation tool for the assessment of different retrofit measures.
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Situation in Greece

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May 2007

1 The regulation tool

1.1 Legal requirements (technical)

1.1.1 Adopt and/or reinforce requirements

a. At the building level - overall energy performance

The existing building regulation (the Thermal Insulation Regulation) dates from 1979 and does not cover requirements for the energy performance of the buildings.

A first initiative to set requirements regarding the rational energy use and the energy saving in buildings was started in 2003 with the draft regulation KOXEE, however the draft KOXEE has been withdrawn with the introduction of the EU directive for the Energy Performance of Buildings (EPBD).

Currently, Greece is in the process of setting new regulations and requirements for the EPBD. Transposition in national law is expected within 2007, while the requirements for new buildings are expected to come into force from January 2009.

b. At the building level - subset performance

There are no subset performance requirements in Greece.

c. At the component level

For many years, requirements were used for minimum insulation values for external walls, roofs, ground-floors and partitions to non-heated enclosed spaces for the 3 different climatic zones defined in the Thermal Insulation Regulation.

At this point the type and the level of the requirements being prepared are function of the building sector (residences, office buildings, schools etc.) and may cover:

- Average insulation level;
- Maximum U-value;
- Maximum primary energy consumption per m² of floor area;
- Efficiency of boilers and air conditioners.

d. Enlargement of the application field of the requirements

The requirements and procedures that are being introduced for new buildings are expected to also cover existing buildings that are being renovated, enlarged or provided with new building components.

1.1.2 Adaptation of energy and environment standards

The new requirements on the energy performance of buildings will probably replace existing procedures on energy and environmental standards. This specifically applies to the existing boiler inspection procedures undertaken by the Ministry of Environment. As there are limited other energy and environmental standards available in the country yet, the introduction of the new regulation related to the energy performance of buildings will possibly be accompanied by new energy and environmental standards.

1.1.3 Visible meters in the building

Energy metering is not yet mandatory in Greece. However, billing of electricity use is in practice realised through metering, which means that the majority of buildings have a metering system that is at least accessible and thus visible to the user. In specific cases, like for examples in sites, where there is generally only one building owner but separate buildings or building usages, only one meter may be found. Also, in flats, communal electricity use is metered through one and only meter. The total energy use is then divided to the separate apartments based on their floor area.

1.1.4 Requirements compliance check

The energy performance requirements in Greece are being set up by the Ministry of Development and the Ministry of the Environment, Physical Planning and Public Works. However, control of compliance with the energy performance requirements is expected to be the responsibility of the Regional Authorities, the existing Building Permit Offices. There is no clear or strong control mechanism known at this stage, besides the possibility that no building permit may be issued without an energy study.

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

It is expected that the energy requirements for public governmental buildings will be exactly the same as for other (private owned and/or non public) buildings. In fact, experience has shown us that compliance with the requirements may be more difficult for public buildings than in case of a private building.

b. Integration of the energy performance of buildings in public procurement procedures

Public procurement procedures in Greece normally apply on the lower cost basis. Yet, in exceptional cases, specific requirements may allow for differentiation to that rule. It is not yet known to which extend, the energy performance of buildings will or can be integrated in public procurement procedures.

c. Retrofitting of public buildings

The same requirements will apply as for the retrofitting of other buildings.

Through a new national legislation (Law 3389/2005) that was prepared by the Hellenic Ministry of Economy, retrofitting of public buildings is possible via a Private Public Partnership concept in the Greek economy.

1.2 Other legal supporting measures

1.2.1 Energy certification scheme

a. Way certificates are communicated/displayed

The energy certificate model to be used will possibly follow the A to G label. It is expected that energy certificates will be displayed on demand when the building is being sold or let. There might also be a regional central administration point where all energy certificates are being gathered. All public buildings will probably display their energy certificate in a prominent place visible to the public.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

At this point it is not expected that realization of the recommendations enclosed in the energy certificates will become mandatory in the country. It is however expected that minimum energy performance requirements (but not the means there to) will become mandatory in the future.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

The energy performance requirements and supporting tools are planned to be reviewed in or after 2009. It is the intention that at that point, the knowledge gained by collecting energy certificates for the buildings stock may be taken into consideration.

d. Linking incentives to energy performance certification

At this stage, little to no attention is paid yet by the responsible authorities to raising awareness of the public and linking incentives to energy performance certification. In fact it is expected that most building owners will consider the initiative of mandatory energy certification of their building as another (financial) burden. Fortunately, many research institutions as well as other sensitive persons are paving the way towards acceptance and promotion of the advantages of energy performance certification.

1.2.2 Encourage reconstruction instead of heavy renovation works

Formal discussions on this issue are not known to the authors. It is therefore not expected that this issue be dealed with within the regulation.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

The authors do not have access to any formal discussions on the above issues a and b. However, it is not expected that a legal framework will support those links between energy efficient investments and the renting level. It is considered more realistic that investments in energy efficiency measurements will gradually trade into the renting market and define both the renting price as well as the costs paid for energy use.

1.2.4 *Legislation concerning co-ownership*

a. Reduced majority level to decide to implement measure proven to be energy efficient

No such measures foreseen in Greece

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

No such measures foreseen In Greece

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

No such measures foreseen in Greece

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No such measures foreseen in Greece

1.2.5 *Legal status of the co-ownership for bank credits for energy refurbishments*

In Greece a group of co-owners of a building may not be considered a legal organisation or legal entity.

1.2.6 *Energy-friendly urban regulations*

There are no energy-friendly urban regulations known to the authors. It is known however that general urban regulations may sometimes block the application of energy efficient measurements especially when they alter the appearance of traditional settlements, buildings and monuments officially protected as part of a designated environment or because of their special architectural merit.

1.2.7 *Minimum energy requirements for renting*

There are no conditions related to energy and indoor quality for renting buildings in Greece, specifically not for residential use. In case of shops, industry buildings, schools, hospitals etc. only safety requirements may apply. However, it is expected that soon the market will automatically be redefined to control this problem with an increase of the price of rented buildings with a high energy demand.

1.2.8 *Environmental permit*

An environmental permit is only required for some specific, large scale activities mostly in the industrial-, agricultural- and tourist- sector and public works. Compliance with the environmental permit is often far from desired. It is not expected that energy performance requirements make part of the environmental permit at this stage, except in really exceptional cases.

1.2.9 Adoption of annual energy efficiency plans

At this moment any energy efficient plan is produced out of free will. It is unknown how this issue will be dealed with in the future, but it is expected that the number of energy efficient plans adopted out of free will, will increase.

1.2.10 Mandatory energy efficiency impact assessment of new regulations

Theoretically, studies on the impact of new regulations are carried out before a new law may come into force. In practice the relation and impact between laws may not be that clear, except in specific predefined areas of pertinence.

2 The financial levers

Many financial measurements supporting and promoting energy investments are set up in Law 2601/98, which provides for various subsidy mechanisms on the energy market, as well as within the Operational Programme of Competitiveness for Energy of the 3rd EU Framework Programme. Still, the Greek energy market is very immature, so novel financing mechanisms in general have not been tested yet.

It is important to note that in most cases, financial tools to promote energy efficiency are integrated within acts for development and that they are addressed to entrepreneurs instead of private individuals.

2.1 The fiscal tool

a. Deduction for energy investments

Existing specific decrees already favor the use of Renewable Energy Sources both in the building sector as well as elsewhere, by deducting fiscus for the purchase and the installation of Renewable Energy Systems.

b. Taxation stimuli of energy efficient buildings and penalties for others

Tax exemption or reduction may be offered in specific cases for the use of energy efficient measures in the residential sector and specifically for residences constructed before 1979 (before the Thermal Insulation Regulation came into force) as well as for the use and installation of PV's in residences. Penalty mechanisms are not favoured.

c. No increase of the building taxes in case of energy efficient refurbishment

See point 2.1.b above.

2.2 The taxation tool

a. Reduced VAT

i. On energy saving products

Same as for point 2.1.b above

ii. On energy supply

No specific measurements known

b. Energy tax

No specific measurements known

c. Buildings included in the CO2 taxation market

There is no CO2 taxation market in Greece.

2.3 Subsidies for energy efficient technologies

Various subsidy mechanisms on the energy market are set up. Some of them can be provided within national Law 2601/98, others within different laws for development. Special subsidies are possible for the application of RES in existing or new buildings, while specific subsidies may be given for improvement of buildings built before 1979.

2.4 Granting soft loans

a. Higher amount possible if more energy efficient

May be included in point 2.4.b

b. Lower interest rate with credits

Loans with lower interest rates may be granted to resident owners with residences constructed before 1979 (before the Thermal Insulation Regulation came into force).

c. Specific loans for energy efficient retrofitting / pre-financing of the works

Allowance of specific loans for the realization of overall energy performance interventions may be possible for existing buildings in the private sector.

For public buildings, a new national legislation (Law 3389/2005) that was prepared by the Hellenic Ministry of Economy, has made a first introduction of the Private Public Partnership concept in the Greek economy. For a Private Public Partnership agreement to be established, there are two major partners involved: the public authority and the investor. Besides them, the implementation of the agreement is only feasible through the involvement of a bank and the advisors. Such schemes are expected to be popular for the establishment of public buildings like hospitals and schools especially in the province of Greece.

2.5 Third party financing (PPP)

For energy systems with high initial capital cost and low running costs, the concept of Third Party Financing is being introduced through a national draft legislation. Especially when considering renewable energy schemes, the high initial capital costs can be met by a third party, while the user pays for the energy units delivered rather than for installation and running of equipment. Worldwide there are three methodologies of Third Party Financing known, namely the project financing, the contractor financing and the customer financing. Which methodologies will become popular in Greece, is not yet known.

2.6 European structural funds

Not use for this purpose in Greece.

2.7 Higher energy price paid for electricity from PV or CHP

According to Law 3468/06 for the RES, the price for the sale of 1 kWh of PV electricity fluctuates between 0,40-0,50 €/kWh and is continuously readjusted to the conventional energy price. So the price per kWh produced from PV and sold to the energy provider/net is five times higher as the price for purchase.

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

Not yet applicable in Greece

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

Such a measurement is not introduced in the country.

b. Increasing tariff with the energy consumption

There are different scales of energy prising according to the energy consumption. For the industrial sector, peak energy values are charged.

3 Non-governmental activities

As in all countries probably, in Greece also, the market is ruled by competition. So, when new components, products or services are provided that consider the energy efficiency and the environment while being competitive in price-quality relationship, applicability, functionality, design and safety, the change is big that they will penetrate the market and cause a swift to more efficient products and services. However, the Greek awareness and the Greek market are not yet that far developed and mature. In that view, governmental activities and laws are the best incentive to initiate energy efficiency.

3.1 Sector agreements

a. Components

Non known in the country.

b. Installers

Non known in the country.

c. Regional / municipal

Non known in the country.

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

Not implemented in the country.

b. System of the white certificates

Not implemented in the country

4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

A number of demonstration projects and good examples have been carried out in the country through individual initiatives or within the framework of national or European projects.

4.2 Research and development project/ fundamental research

Many research activities and development projects on the field of energy efficiency in buildings have been carried out in the country.

5 Promotional measures/ increase of public awareness

Some individual organisations and research institutes are promoting energy certification and the advantages of energy saving in the country on own initiative or within the framework of specific programmes. Indicative such actions are organised for example by the Hellenic Society for the Protection of the Environment and the Cultural Heritage, which has organised a series of lectures on energy efficiency and certification in the past, by CRES which has organised different conferences on energy saving and RES as well as NKUA, which is organising different lectures, workshops, conferences and other national events on energy efficiency and the EPBD.

5.1 Campaign on related advantages to energy savings

Official (government promoted) campaigns to increase public awareness on energy saving are scarce at this moment.

5.2 Voluntary labelling/ certification initiatives

Some individual organisations and research institutes are promoting voluntary certifications initiatives in the country on own initiative or within the framework of specific programmes. One of those programmes was the EP label European project which started an initiative on energy certification of buildings with the EP label software tool. During the Greek EP label workshop, organised by NKUA in Athens in February 2007, 7 buildings were voluntarily assessed. The EP label challenge is another initiative of the EP label team to promote certification of the building occupied by the government officials working on the implementation of the EPBD in each participating country. Greece is still working on it.

5.3 Information on cost-efficient measures

Official sources of information on cost-efficient measures are specialised companies and research institutes, some banks providing specific loans for energy saving measures and of course the different relevant laws mentioned above. Specifically for PV's the official source of information is the Hellenic Association of Photovoltaic Companies (HELAPCO),

6 Conclusions

The national law on energy performance of buildings is not implemented yet in Greece, which makes it difficult to already talk and define appropriated financial measures, specific requirements and campaigns. However, the research sector, the market and some pro-active entrepreneurship are already prepared for the energy efficiency to make part of the legal context of the country.

7 References

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Situation in The Netherlands

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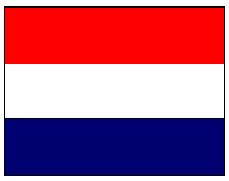
May 2007



This report gives an overview of the existing measures to improve energy efficiency in new and existing buildings in the Netherlands. The information mainly comes from www.vrom.nl and www.senternovem.nl

1. The regulation tool

1.1. Legal requirements (technical)
1.1.1. Adopt and/or reinforce requirements

a. At the building level - overall energy performance

Since 1995 extensive renovated buildings have to meet the same energy performance requirements (EPC) as new buildings. On regular basis these requirements are tightened (every few year).

For existing buildings a voluntary energy performance advice (EPA) is in use. An advisor will calculate the energy savings, saving of energy costs and the investments needed for this. A link with the comfort improvement can be made.

In line with the EPBD implementation, this will be replaced by the EPBD certificate from January 2008.

Another voluntary instrument is the energy performance on location (EPL), which gives insight in energy saving measures on district level.

b. At the building level - subset performance

No subset performance requirements are known to the author.

c. At the component level

For many years, requirements are used for minimum insulation values for insulation and glazing. There also are maximum infiltration requirements.

e. Enlargements of the application field of the requirements

Requirements for new buildings are already applicable to almost all new buildings. Requirements for major renovations are already applicable for almost all buildings sizes. Enlargement is not relevant for these aspects.

The definition of major renovation could be enlarged though. But there are no actions to that account know to the author.

1.1.2. Adaptation of energy and environment standards

The Dutch energy standards are being revised to be in line as much as possible with the CEN standards.

1.1.3. Visible meters in the building

There are no such requirements existing in the Netherlands. However, the vast majority of buildings have a metering system that is visible, even though it is mostly placed in the cellar. Some multi family houses use one meter for all apartments.

1.1.4. Requirements compliance check

The control of the requirements for new buildings is done by the municipalities. The building permit is not given when the building plan does not meet the requirements. Municipalities should also do control during the building process, but this is done in a percentage of the cases due to lack of capacity and other priorities (construction safety, fire prevention and ventilation are more import and aspects for control).

1.1.5. Public governmental buildings

a. Stricter requirements to governmental buildings

Goventmental buildings do not have stricter requirements regarding the EP requirements. The minimum Rc-value of opaque constructions is 3,0 m^2K/W in stead of 2,5 m^2K/W.

b. Integration of the energy performance of buildings in public procurement procedures

Though the building investments and the operational costs are still separate budgetary items, more and more public players base their decisions concerning energy efficient measures on life-cycle costs.

c. Retrofitting of public buildings

There are no specific retrofitting regulations for public buildings which differ from those for other buildings.

1.2. Other legal supporting measures

1.2.1. Energy certification scheme

In line with the EPBD implementation, 2 schemes have been developed in the form of so called ‘Assessment directive’ (BRL):

- one which describes the procedure to assess the energy performance of existing buildings for the EPBD certificate
- another one which describes test cases to test the marked software used for the certificate

a. Way certificates are communicated/displayed

Certificates are being transferred to a new owner by the notary when the building is transferred. The government will make an agreement with associations of real estate agents and renters on this aspect.

Public buildings need to display the certificate in a place where public is allowed.

In The Netherlands a housing corporation publishes the Energy Index (EI, a figure that indicates the level of energy efficiency of a building and which is the basis for the energy label) in advertisements of houses for rent.

b. Towards the mandatory realisation of the recommendations enclosed with the energy certificates

There are no requirements to apply the recommendations enclosed with the energy certificate.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

No action in this aspect is undertaken so far.

d. Linking incentives to energy performance certification

Different banks are now setting up schemes to support low energy buildings or low energy retrofit. It is not clear to the author what methods are used to determine the energy levels.

In The Netherlands a scheme like this existed until the end of 2003: the EnergiePremieRegeling (EPR). An extra subsidy was available if energy saving measures were applied based upon a (voluntary) Energy Performance Advice (EPA). The EPR was quite popular and the allocated subsidy budget ran dry quickly. Recently the voluntary EPA evolved into the method for EPBD-based energy performance certification (the subsidy-scheme did not return, though).

1.2.2. Encourage reconstruction instead of heavy renovation works

No actions are known to the author.

1.2.3. Adaptation of the renting level

a. Right to charge energy investments in renting level

No initiatives are known to the authors.

b. Right to deduct energy efficiency investments in rent paid to owner

No measures are known to the authors.

1.2.4. Legislation concerning co-ownership

a. Reduced majority level to decide to implement measure proven to be energy efficient

No such measure foreseen yet.

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

No such measure foreseen yet.

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

No such measure foreseen yet.

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

No such measure foreseen yet.

1.2.5. Legal status of the co-ownership for bank credits for energy refurbishments

In The Netherlands it is mandatory for all owners of an apartment to be a member of the association of owners of their apartment building. This association is a legal entity and is, among other issues, responsible for the maintenance of (common parts of) the building. However, in many cases the association is inactive and neglects its reponsibilities or hasn't reserved any funds. It is possible, though, to have the association certified and doing so it is more easy for an association of owners to get loans from a bank.

1.2.6. Energy friendly urban regulations

In The Netherlands the energy performance of an area or district (EPL, Energie Prestatie op Locatie) can be determined (by calculation) taking into account the energy distribution systems as well as the energy performance of the individual buildings. When (re)developing such an area the Municipality may set requirements to the EPL. The EPL was introduced in 1998 for new-construction projects and in 2001 for existing areas.

1.2.7. Minimum energy requirements for renting

No initiatives are known to the authors.

1.2.8. Environmental permit

Companies which use more than a certain amount of electricity, gas and/or water need make a plan to invest in energy/water saving measures. All measures which are reasonably possible and have a pay back time of max 5 years need to be taken.

1.2.9. Adoption of annual energy efficiency plans

There are no annual energy efficiency plans in the Netherlands for building owners. Related to the environmental permit energy plans need to be made by companies, but not yearly.

1.2.10. Mandatory energy efficiency impact assessment of new regulations

When the energy requirements are being increased, a cost-effect study is performed, paid by the government. Based on the outcome the new level is determined.

2. The financial levers

2.1. The fiscal tool

2.1.1. Fiscal Deduction for Energy Investments

a. Deduction for energy investments

Companies who invest in environmental capital equipment can receive fiscal benefits (MIA/VAMIL).
Via MIA (Environmental Investment Deduction) 15, 30 or 40% of the investment costs of environmental capital equipment is deductible of the fiscal profit. The percentages are based on the environmental effects of the capital equipment, the extra costs in relation to the less environmental friendly alternatives, some policy aspects, etc.
VAMIL (Arbitrary Deduction Environmental Investments) gives advantages to companies on liquidity and interest.
Investment costs of energy saving and renewable energy measures are tax-deductible for companies via the so called Energy Investment Allowance (EIA). This regulation has been closed for a short period, but is reopened since January 2007.

b. Taxation stimuli of energy efficient buildings and penalties for others

No taxation stimuli or penalties are existing.

c. No increase of the building taxes in case of energy efficient refurbishment

This mechanism is not implemented in NL.

2.2. The taxation tool

a. Reduced VAT

i. on energy saving products

No reduced VAT is applicable for such products.

ii. on energy supply

Idem

b. Energy tax

Since 1994 tax is levied on the use of energy (electricity, gas, petroleum, gas oil). Aim of this energy tax (Ecotax) among other things is to make energy use more expensive. The idea is that consumers and companies are stimulated to cut back on their energy consumption. Consumers and companies who use less energy pay fewer taxes.
An advantage of this system is that the polluter pays. Via the income tax people with lower income are compensated for the increased energy costs. A comparable compensation is given to the elderly with low income.
Until recently consumers paid less tax on green electricity than on grey electricity. In this way the government tried to reduce the cost difference between fossil and sustainable energy sources. This reduction on Ecotax for green electricity has been dropped from January 2005.

The extra governmental income by the Ecotax is not specially spend on energy saving or environment.

c. Buildings included in the CO2 taxation market

There is no CO_2 taxation in NL for buildings.

2.3. Subsidies for energy efficient technologies

TELI: Temporary subsidy regulation for energy saving in households with low income 2006.
TELI is a subsidy regulation, which has been running for a very short period in 2006 and stimulates energy saving in households with low income. These households often live in old ,

badly insulated dwellings. They are less likely to invest money in insulation etc. Projects to stimulate this could get a subsidy for a period of 2 years.

CO2-reduction Build Environment 2006: Again for a short period in 2006 a subsidy scheme has been running which subsidized energy saving measures in existing buildings, like insulation, insulation glazing, solar collector and heat pump. The regulation was only open for groups of individual owners. The total budget in the scheme is already used up.

2.4. Granting soft loans

A financial regulation to stimulate sustainable building is a green mortgage. A green mortgage can be given up to an amount of EUR 34.034,-. The green mortgage is give for a period of 10 years with a interest which is 1% to 2% lower than the market rate of interest. Newly build dwellings and renovation of dwellings build before 1980 can in principle receive such a green mortgage. Of course they have to fulfill certain criteria of sustainable building. The same green funds as described above are used. Almost always the normal mortgage is used in addition to the green mortgage.

a. Higher amount possible if more energy efficient

It is unknown to the author which possibilities are used by the banks.

b. Lower interest rate with credits

It is unknown to the author which possibilities are used by the banks.

c. Specific loans for energy efficient retrofitting / pre-financing of the works

It is unknown to the author which possibilities are used by the banks.

2.5. Third party financing (PPP)

Green investments:

Projects can earn a kind of ‘Green certificate’. With this most investment banks give good financing conditions.
Money which is invested is placed in a so called ‘green fund’. These funds are used to finance environmental projects. The return of the profit is not high. But the reduced profit is compensated by a tax reduction of 2,5% (limited to investments of EUR 50.000 at the most). So investors lend out money to banks for low rates and banks on their turn give out cheap loans to e.g. environmental friendly build dwellings. This is called green financing.

For projects to receive funding, they should qualify as ‘green projects’. A project will receive a so called green certificate from the Ministry of Housing and Environment when it complies with certain criteria. With this green certificate the project can receive a loan with lower interest as is described above. The interest will be approximately 1% to 2% lower than the marked rate of interest.

2.6. European structural fund

No initiatives are known to the authors.

The extra governmental income by the Ecotax is not specially spend on energy saving or environment.

2.7. Higher energy price paid for e- form PV and CHP

No initiatives are known to the authors.

2.8. Insurance – lower insurance rate for energy efficient retrofitted buildings
No initiatives are known to the authors.

2.9. Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

No initiatives are known to the authors.

b. Increasing tariff with the energy consumption

No initiatives are known to the authors.

3. Non-governmental activities

3.1. Sector agreements

a. Components

The so called MJA (loosely translated: agreement for more years) is a voluntary agreement between the government and various sectors (agrarian sector, service sector, industrial sector, food sector) on the more efficient use of energy, and on the use of sustainable energy and energy efficient product development. It is unknown to the autor if there are MJA's on component level. See §c for more general information on MJA's.

b. Installers

The so called MJA (loosely translated: agreement for more years) is a voluntary agreement between the government and various sectors (agrarian sector, service sector, industrial sector, food sector) on the more efficient use of energy, and on the use of sustainable energy and energy efficient product development. It is unknown to the autor if there are MJA's on installers level. See §c for more general information on MJA's.

c. Regional/municipal

The so called MJA (loosely translated: agreement for more years) is a voluntary agreement between the government and various sectors (agrarian sector, service sector, industrial sector, food sector) on the more efficient use of energy, and on the use of sustainable energy and energy efficient product development. Every participator agrees to:

- Make a energy saving plan every four years: which energy measures will be taken and which improvements will be taken into account
- Per branch a list with measures is made, which will be applied by the members of the branch if cost-effective.
- Aims are formulated per branch
- The aim is that in the future also saving measures with a longer payback time shall be taken into account
- Every year the company makes a report on the implementation and progress of the plans

3.2. Energy market mechanisms

a. Require utilities to realise energy efficient measures

No initiatives are known to the authors.

b. System of the white certificates

This system is under development, details are unknown at the moment

4. Research / Demonstration projects

4.1. Demonstration projects / good examples

Large demonstration projects are under development. Mainly as private initiative (PEGO).

4.2. Research and development project/ fundamental research

The Energy Agency subsidizes research and demonstrations projects via various programs, e.g.:

- Long term research (EOS long term): aimed at fundamental and industrial research
- Demonstration (EOS DEMO regulation): this regulation supports a demonstration project which focuses on energy technology.
- Innovation Subsidy Cooperation Projects: Aimed at cooperation aimed at development of innovative and sustainable products, processes and services.

5. Promotional measures/ increase of public awareness

5.1. Campaign on related advantages to energy savings

There are no national promotional campaigns know to the author. When the certificate becames mandatory, campaigns are planned.

5.2. Voluntary labelling/ certification initiatives

There are various initiatives on product labelling. Some examples:
Labels on heating boilers: high efficiency boilers are easily recognized by a sticker on the product. There is a website on which you can see what the label is of the various boilers which are soled in the Netherlands

- In the same way a label is developed for high efficiency hot tap water boilers and solar collectors.
- Good insulating glazing is labelled. The label is printed in the spacer.
- There is a label for heat pumps
- The labels are mostly very recognizable for consumers.

There is an informal link made between most labels mentioned above and the Energy Performance Method for new buildings (in future presumably also for existing buildings) so the improved energy efficiency can easily be taken into account in the calculation of the EP of the building.
Various initiatives of voluntary labelling of energy efficient buildings have been undertaken by Branches, municipalities, etc. Sometimes in connection with labelling of linked aspects like comfort.

5.3. Information on cost-efficient measures

Various promotional measures are undertaken by the Energy Agency and the Ministry of housing (like television/radio advertisements, but also the demonstration projects, subsidy on research etc as is described above).

6. Conclusions

The amount of measures in the Netherlands at the moment is limited:
Because of the long history of energy performance requirements a lot of measures have been undertaken in the past, but are stopped because the marked is supposed to be matured.
In the case of retrofitting the requirements are not yet implemented. Measures are under construction and are not yet implemented.

7. References

The above information is taken from the following sites:

www.vrom.nl

www.sentenovem.nl

Situation in The United Kingdom

Author(s): Robert Cohen
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Energy for Sustainable Development Ltd
May 2007

N.B The following analysis focuses primarily on policies and measures in place in England (and often England and Wales). Policies in place in the devolved administrations of Scotland, Northern Ireland and sometimes Wales often differ from those of England and it is considered too complicated to perform a 4-way analysis of each administration here.

1 The regulation tool

1.1 Legal requirements (technical)

1.1.1 Adopt and/or reinforce requirements

a. At the building level - overall energy performance

a. (i) *Overview for Domestic Buildings*

Building Regulations Part L - The primary route for legal enforcement of minimum energy performance standards in residential buildings is the Building Regulations, which are governed by the Department for Communities and Local Government. The regulations apply to most new buildings and many alterations of existing buildings in England and Wales, whether domestic, commercial or industrial. Specifically the energy performance of a building is governed by the Building Regulations Part L (and approved documents).

On April 6th 2006, revisions came into affect to the Building Regulations Part L. For the residential sector, the changes will have the effect of improving the energy performance of new dwellings by 20% over the previous (2002) Regulations. The previous (2002) regulations allowed three methods of compliance for new dwellings, the 'Elemental Method', the 'Target U-value Method' and the 'Carbon-Index Method'. In the new revisions, these three methods are abandoned and replaced by a method known as the 'TCER vs DCER Method' (which stands for 'target carbon emission rate vs. dwelling carbon emission rate'). This method includes a whole building energy calculation which is sensitive to fuel type.

Under this new method designers must meet certain minimum standards for individual components, such as windows, floors and walls (the Dwelling Carbon Emissions Rate, similar to the 2002 regulations), but beyond this they must also deliver an average of 20% improvement in whole building carbon emissions (the Target Carbon Emissions Rate). How they achieve this is left open, and for the first time renewable energy sources will be able to count towards compliance.

The greater flexibility offered by the new Part L revision presents an opportunity to designers to consider potentially radical new approaches to construction. This, combined with the progressive tightening of standards, is likely to provide a strong incentive to adopt more modern methods of construction (such as off-site manufacture). These can deliver substantially improved energy performance, as well as potential cost efficiencies over traditional techniques.

Currently the Building Regulations Part L only affect the overall energy performance of new dwellings. A provisional clause to require whole-dwelling improvements of existing dwellings when undertaking refurbishment work was unfortunately dropped at the last minute. Therefore Building Regulations Part L only affect existing dwellings at the component level.

Housing Corporation Scheme Development Standards - For social housing, which in England is governed by the Housing Corporation (an agency of Government), new developments and major housing refurbishment programmes in receipt of Social Housing Grants are additionally required to meet certain minimum standards for construction and energy performance known as the Scheme Development Standards.

In terms of energy, the implications include measures such as 'evidence that cost-effective energy efficient measures have been provided', low energy external lighting provided, A rated electrical appliances (where provided), dedicated leaflets provided for tenants on the energy efficient use of the home and its controls. Minimum SAP scores are also recommended (but not required) for new and existing dwellings.

a. (ii) Overview for Non-residential Buildings

Building Regulations Part L - The minimum energy performance standards for non-residential buildings in England and Wales are enforced by the Department for Communities and Local Government. The technical requirements relating to conservation of fuel and power are outlined in Building Regulations Approved Documents. The current version of Approved Document Part L2B for existing non-residential buildings came into effect on 6th April 2006 and is applicable to all existing buildings excluding properties in conservation areas and Listed Buildings.

Previous methodologies to demonstrate compliance with Building Regulations requirements including the Elemental, Whole Building and the Carbon Emissions Calculation methodology have been replaced by a single approach covering five broad compliance criteria. Under the new approach, the annual CO2 emission rate of the building (BER) are required to be lower than that of a notional building (Target Emission Rate or TER) and this needs to be demonstrated at both the design and construction stage. Other criteria relate to minimum performance levels for building fabric and services; minimising risk of summer overheating and commissioning of building services.

The current requirements for new non-residential buildings stipulate a 23.5% and 28% reduction in carbon emissions for naturally ventilated and air-conditioned buildings respectively compared to the previous Building Regulations. There is flexibility in terms of the manner in which this reduction is achieved thereby providing opportunities to tailor the solution to a particular site. However, the regulations do not require designers to demonstrate that all possible alternative energy solutions to achieve reduction in carbon emissions have been considered in terms of their technical and financial performance before arriving at the desired solution as outlined in Article 5 of the EPBD.

In terms of existing buildings, the regulatory philosophy is to require energy efficiency improvements at the key moment of opportunity i.e. when the owner of the building is already planning to undertake work on the building. Approved Document L2B therefore requires that the energy performance of buildings with a floor area greater than 1000m^2 is improved when major refurbishment work is undertaken, where economically and technically feasible. These are called 'consequential improvements' i.e. improvements to the building in addition to those inherent in the major refurbishment work. Major works include extensions, providing fixed building services or increasing their installed capacity.

In case of extensions, consequential improvements would include measures with a simple payback period of less than 15 years and with a total value of not less than 10% of the value of the principal works. These include upgrading heating systems, cooling systems and air-handling systems more

than 15 years old, upgrading general lighting systems with an efficacy of less than 40 lumens per circuit watt for areas greater than 100m^2, installing energy metering conforming to CIBSE TM 39 guidance, upgrading thermal elements and replacing existing windows and rooflights with a U-value worse than 3.3W/m2K. For on-site low and zero carbon technologies, the recommended payback period is seven years or less before consequential improvements are required. These require increasing existing renewable provision to provide 10% the site energy demand. Extensions that are both greater than 100m^2 and greater than 25% of the floor area are regarded as new build.

Where fixed building services are installed in the existing building or their capacity is increased, the building fabric is required to be appropriately upgraded in addition to the 10% cost requirement relating to consequential improvements. Cost-effective improvements to the building fabric include upgrading general lighting systems, lowering U-values of exposed building elements, and where the installed capacity of cooling systems is increased, such requirements additionally include upgrading the solar control provisions for buildings with windows more than 40% of the façade area and rooflights greater than 20% of the roof area.

For other existing buildings less than 1000m^2, the elemental approach to compliance applies that stipulates minimum thermal requirements for exposed building elements as well as minimum efficiency of building services equipment.

b. At the building level - subset performance

No measures for non-residential and residential buildings.

c. At the component level

c. (i) Domestic buildings

Building Regulations Part L - For existing dwellings the Building Regulations Part L specify minimum standards of energy performance for windows and boilers:

- The new 2006 Building Regulations Part L requires all new and replacement boilers to be at least B-rated condensing boilers (subject to some exceptions). This has had the effect of rapidly increasing the market share of the most efficient condensing boilers.
- In the previous (2002) revision of the Building Regulations, it was made mandatory for all new and replacement windows to be double glazed with U Value equal or better than 2.0 W/m2K.

Decent Homes Standard - Following its 2000 Spending Review, the Government established a target to 'ensure that all social housing meets set standards of decency by 2010, by reducing the number of households living in social housing that does not meet these standards by a third between 2001 and 2004, with most of the improvement taking place in the most deprived local authority areas'. In 2002 the target was expanded to also include vulnerable housing in the private sector. Delivering 'Decent Homes' is now one of the key investment drivers for the social housing sector.

The definition of a 'decent home' is set out in a guidance document issued by the Department for Communities and Local Government. In essence it is one which is wind and weather tight, warm and has modern facilities. It is also required to provide a 'reasonable degree' of thermal comfort. This is defined by having in place both 'effective insulation' and 'efficient heating'. Efficient heating is defined as 'any gas or oil programmable central heating or electric storage heaters or programmable LPG/solid fuel central heating or similarly efficient heating systems which are developed in the future'. For dwellings with gas/oil programmable heating, cavity wall insulation (if there are cavity walls that can be insulated effectively) or at least 50mm loft insulation (if there is loft space) is required. For dwellings heated by electric storage heaters/LPG/programmable solid fuel central heating, a higher specification of insulation is required: at least 200mm of loft insulation (if there is a loft) and cavity wall insulation (if there are cavity walls).

There is no specification for wall insulation in solid wall properties (often among the hardest properties to heat), which is one reason why the Decent Homes standard has been criticized by some as lacking teeth on energy efficiency (the low levels of loft insulation specified for gas/oil heated properties being another).

c. (ii) Non- domestic buildings

Building Regulations Part L - Minimum levels of thermal performance in terms of both area weighted average U-value and the limiting value has been specified for new, replaced and upgraded building elements. For extensions, limits are set on the % area of windows and rooflights unless a greater proportion is present in the existing building. Where fixed building services are installed or their capacity increased, the minimum required efficiency is as specified in the 'Non-residential Heating, Cooling and Ventilation Compliance Guide', and are required to be no lower than that of the system already installed. Where the new system uses a different fuel, then the efficiency of the new appliance is multiplied by the ratio of the CO_2 emission factor of the fuel used in the appliance being replaced to that of the fuel used in the new appliance to arrive at the comparative efficiency figure.

d. Enlargements of the application field of the requirements

Not applicable in the UK

1.1.2 Adaptation of energy and environment standards

Not applicable in the UK

1.1.3 Visible meters in the building

Energy billing and metering - The Department of Trade and industry (DTI) is presently consulting on energy metering and billing provisions in both domestic and business sector with a view to reduce energy consumption and influence consumer behaviour. The proposals conform to the provisions of Article 13 of the Energy Services Directive and include requirements for provision of historical consumption data on energy use, energy efficiency advice and comparative benchmarking information to consumers as well as the frequency of billing. Proposals specifically for the business sector include provision of real-time displays providing instant consumption and cost information relating to energy use and addressing the barriers to smart metering. Specific proposals for installing heat meters in district heating schemes are also being considered.

The outcome of this consultation process is anticipated to feed into the Energy White Paper to be released later in 2007.

1.1.4 Requirements compliance check

Not applicable in the UK

1.1.5 Public governmental buildings

a. Stricter requirements to governmental buildings

Government Estate - In June 2006, new sustainability targets were set out for the Government Estate[1] covering all central Government Departments and their Executive Agencies, including buildings and land managed. These require

- Reduce carbon emissions in offices by 30% by 2020, relative to 1999/2000 levels (and

1 The Government estate comprises over 50,000 buildings and houses and occupies over 12.5 million m² of office space within England, Scotland, and Wales

12.5% by 2010-11).
- Central Government's office estate to be carbon neutral by 2012. To be achieved through combination of energy efficiency measures, renewables and carbon offsetting.
- Departments to increase their energy efficiency per m² by 30% by 2020, relative to 1999/2000 levels (and 15% by 2010-11).

The UK government's intention is to lead by example and thereby promote the wider sustainability agenda for the country.

Health Care - Mandatory energy targets set by the Ministry of Health for all NHS trusts in England include

- Reducing primary energy consumption by 15% from 2000-10
- An energy efficiency performance target of 35-55 GJ/100 cu.m for all new capital developments and major redevelopments or refurbishments; and a target of 55-65 GJ/100 cu.m for all existing facilities

b. Integration of the energy performance of buildings in public procurement procedures

Not yet applied in the UK

c. Retrofitting of public buildings

Not yet applied in the UK

1.2 Other legal supporting measures

1.2.1 Energy certification scheme

a. Way certificates are communicated/displayed

a. (i) Domestic buildings

Home Information Pack - In the residential sector, only the owner occupied sector currently has a legal vehicle in place to enforce the EPBD. This is the Housing Act 2004, which will require all sellers of dwellings to make a Home Information Pack available to prospective buyers. This Home Information Pack must contain a Home Energy Report, which will contain the energy rating and recommended list of improvement measures as required by the Directive. The Home Information Pack will take effect from June 2007. In the private rented and social rented sectors, enforcement vehicles for the Directive are still to be defined.

a. i(i) Non -domestic buildings

The Energy Performance of Buildings (Certificates and Inspections) Regulations 2007- The regulations were adopted in March 2007 and come into force incrementally from 19th April 2007 to 1st October 2008. Under the new regulation, all non-residential buildings with a floor area greater than 500m^2 (with the exception of historic buildings) are required to provide an Energy Performance Certificate (EPC) showing the asset rating to a prospective purchaser or tenant from 6th April 2008. The certificates are required to be no less than 10 years old and must be accompanied by recommendations for the improvement of the energy performance of the building. EPCs will be required on construction for all non-residential buildings. From 1st October 2008, EPCs will be required on the sale or rent of all buildings. This allows prospective owners/ tenants to make an informed choice and may well encourage investment for improving the energy performance of existing building stock, possibly emulating the success of the EU white goods energy labelling scheme.

Also, from 6th April 2008, non-residential buildings with a floor area greater than 1000m^2 and occupied by public authorities or by institutions providing public services will be required to show in a prominent position in the building clearly visible to the public a Display Energy Certificate (DEC) based on the

operational rating (actual annual energy consumption). For those buildings for which an asset rating is available, this should also be shown on the DEC.

Further, the government has committed to hold a public consultation during the summer of 2007 on extending the requirement for the display of DECs to private buildings visited by the public e.g. retail outlets, hotels, leisure facilities, etc.

Inspection of air-conditioning systems - Air-conditioning systems with an effective rated output of more than 12kW are required to be inspected by an accredited energy assessor at regular intervals not exceeding five years. The inspection report shall include an assessment of the system efficiency and its sizing compared to the cooling requirements of the building. It shall also contain advice on possible improvements to the system, its replacement or other alternative solutions. The first inspection is required to be carried out before 4th January 2009 for systems with a rated output greater than 250kW and before 4th January 2011 for systems exceeding 12kW.

b. Towards the mandatory realization of the recommendations enclosed with the energy certificates

Not yet applied in the UK, but the government is aiming to link dwelling EPCs to grants and loans - such as grants from energy suppliers and green mortgages from high street lenders.

c. Base the development of adapted supporting tools on the knowledge of the building stock gained by collecting energy certificates

Not yet applied in the UK , but at least in England & Wales, there will be a central register of all EPCs.

d. Linking incentives to energy performance certification

Not yet applied in the UK , but there is a lot of talk about this possibility.

1.2.2 Encourage reconstruction instead of heavy renovation works

Not yet applied in the UK. Conservation of 'Listed' Historic buildings is followed strongly. There has been a strong debate about demolishing large swathes of housing with solid walls, especially in the North of the country where values are lower in order to meet long term climate change targets. But this has gone no further than this, yet.

1.2.3 Adaptation of the renting level

a. Right for the owner to charge energy investment costs by adding them to the rent (agreed procedure)

No such measures for both domestic and non-residential buildings.

Despite much debate on this issue within the social rented sector (governed in England by the Housing Corporation), it is still not currently possible to reflect investments made in energy efficiency improvements in an increase in rental charges to social housing tenants in England.

Private landlords are at liberty (within certain restrictions) to make increases in rental charges which may be based on improvements to the property including energy efficiency improvements. But there is no specific legal provision which governs this for energy efficiency investments.

b. Right for the tenant to deduct energy efficiency investments in rent paid to owner (agreed procedure)

No such measures for both domestic and non-residential buildings.

1.2.4 Legislation concerning co-ownership

a. Reduced majority level to decide to implement measure proven to be energy efficient

Not yet applied in the UK

b. Reduced majority level to decide to implement measure proven to be energy efficient and cost efficient

Not yet applied in the UK

c. Requirement regarding the constitution of financial reserve for energy efficiency measures in co-owned buildings

Not yet applied in the UK

d. Rules to transfer cost savings on all co-owners or to the financial reserve when building retrofitting is applied (to be developed for all kinds of heating system and ventilation costs)

Not yet applied in the UK

1.2.5 Legal status of the co-ownership for bank credits for energy refurbishments

Not yet applied in the UK

1.2.6 Energy-friendly urban regulations

(i) *Domestic buildings*

In the UK many local authorities are adopting 'renewable energy mandates' or similar policies, which cover new developments or major refurbishment programmes over a certain size threshold (typically >1000m2) and make minimum requirements for on-site renewable energy generation. In some cases these clauses also contain requirements relating to energy efficiency.

The first local authority to do this in the UK was the London Borough of Merton in 2003, when it adopted a clause in its Unitary Development Plan which contained the following wording in its Policy PE13: "The council will encourage the energy efficient design of buildings and their layout and orientation on site. All new non-residential developments above a threshold of 1,000 sq m will be expected to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements. The use of sustainable building materials and the re-use of materials will also be encouraged, as will the use of recycled aggregates in the construction of buildings. This will be subject to the impact on the amenity of the local environment, taking into account the existing character of the area."

This type of local planning policy clause has now become known as 'The Merton Rule', and in 2004, the Government's revised Planning Policy Statement 22 (which relates to the generation of renewable energy) contained support for other local authorities to adopt a similar policy. "Local planning authorities may include policies in local development documents that require a percentage of the

energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments."

To date around 80 local authorities have now adopted such clauses in their local development plans and this is proving a major driver not just for renewable energy technologies, but also for low energy design advise and energy efficient technologies (since the more energy efficient a development, the lower the cost of the renewable energy system required to supply 10% of total energy demand!).

(ii) Non -domestic buildings

As mention above, London Borough of Merton was the first local authority to incorporate a requirement of at least 10% on-site renewables provision for all new build in its UDP. For non-residential buildings the threshold was buildings with a floor area exceeding 1000m^2 (or site exceeding 1 hectare). Subsequently Planning Policy Statement 22, published in August 2004, allowed for local authorities to require a percentage of renewable energy in new developments, and to incorporate this demand in local plans. This requirement has subsequently been adopted or is being considered as part of the draft UDP by a number of Local Authorities throughout England and Wales for both new build and major refurbishment projects.

1.2.7 Minimum energy requirements for renting

The only measures which may be worth mentioning here are:

- The requirement on all social and private landlords to carry out an annual gas safety check on all gas heating appliances, and
- The Housing Health & Safety Rating System

However, none of these relate directly to energy performance standards.

1.2.8 Environmental permit

Code for Sustainable Homes

On 13 December 2006, the Code for Sustainable Homes - a new national standard for sustainable design and construction of new homes was launched: A Code for Sustainable Homes - A step-change in sustainable home building practice

By integrating elements of this voluntary Code into new homes and obtaining assessments against the Code, developers will be able to obtain a 'star rating' for any new home which will demonstrate its environmental performance. It will provide valuable information to home buyers, and offer builders a tool with which to differentiate themselves in sustainability terms.

The Code for Sustainable Homes was launched as part of a package of measures towards zero carbon development, including an overaching consulation: Building A Greener Future on the shift to zero carbon; and a consultation on the draft of a new Planning Policy Statement: Planning and Climate Change.

The Code for Sustainable Homes will operate from April 2007 and introduces minimum standards for energy and water efficiency at every level of the new national standard. The Code will measure the sustainability of a home against key design categories, rating the 'whole home' as a complete package. The minimum standards for Code compliance have been set above the requirements of Building Regulations. New homes can achieve a rating on a scale of one to six 'Code Levels' depending on the standard achieved.

The key design categories included within the Code are:

- Energy
- Water
- Materials

- Surface water run-off
- Waste
- Pollution
- Health & Well-being
- Management
- Ecology

The Code builds on the current EcoHomes system, and apart from the above design categories, it will also include new areas of sustainability design, such as Lifetime Homes and the inclusion of composting facilities.

Compliance with the Code will be mandatory for publicly funded homes in England from April 2007, but will be voluntary in the short term within the private sector. It is likely that compliance may become mandatory for all new homes in England as early as 2008.

Homes will be assessed at design stage in a similar manner to that of the current EcoHomes system, but will additionally require verification at post-completion stage. It is proposed that the post-completion checks will be carried out on a sample basis.

1.2.9 Adoption of annual energy efficiency plans

Not yet applied in the UK

1.2.10 Mandatory energy efficiency impact assessment of new regulations

Not yet applied in the UK

2 The financial levers

2.1 The fiscal tool

a. Deduction for energy investments

a. (i) Domestic Buildings

Landlords Energy Saving Allowance - Individual private landlords (and other landlords who pay income tax) who let residential property and install loft insulation, cavity wall insulation and solid wall insulation to properties, can claim a deduction in their income tax bill. This is called the Landlords Energy Saving Allowance (LESA). The maximum amount which can be claimed is £1,500 per property.Following the 2006 Budget, from 6th April 2006 the LESA has been extended to enable landlords to also claim the allowance for expenditure from installing draught-proofing and for insulating hot water systems in dwelling houses which they let.

a. (ii) Non - domestic Buildings

Enhanced Capital Allowance - Under this scheme, private sector organisations are allowed to claim a 100% capital allowance on energy saving investments. It was introduced in 2001 as part of the Climate Change Levy Programme. Investments made on certain qualifying energy efficient plant and machinery can be deducted from the organisations Corporation or income tax bills. The Energy Technology List (ETL) is intended to be updated annually to reflect new breakthroughs in energy efficient technology. Inclusion on this list is now sought after as much for the endorsement it provides of the energy efficiency credentials of a product as for the tax advantages it might bring.

b. Taxation stimuli of energy efficient buildings and penalties for others

No such measures

c. No increase of the building taxes in case of energy efficient refurbishment

No such measures

2.2 The taxation tool

a. Reduced VAT

i. On energy saving products

Reduced rate of VAT for certain grant funded energy saving materials - In 1998 the Government introduced a VAT (Value Added Tax) rate of 5% for the grant-funded installation of certain energy saving materials (including insulation, draught stripping, hot water and central heating controls) in the homes of the elderly, less well off and vulnerable households. In 2000 the Government extended this to all households, even if the service is not grant funded. Since 2000 reduced VAT rates have been introduced for solar panels, micro wind and water turbines, ground source and air source heat pumps, micro-CHP and wood fuelled boilers.

ii. On energy supply

No such measures in the UK

b. Energy tax

b. (i) Domestic Buildings

There is no taxation of energy for residential energy consumers in the UK. The residential sector is currently exempt from the Climate Change Levy and is likely to remain so for the foreseeable future.

b. (ii) Non -domestic Buildings

The Climate Change Levy (CCL) - The Climate Change Levy was introduced in April 2001 with a view to encourage energy efficiency and achieve reduction in carbon emissions in the non-residential and industrial sector. The levy is charged per kWh of energy use and the rates vary with the type of fuel used. The levy was intended to be fiscally neutral and has been imposed in conjunction with offsetting cuts in employers' National Insurance Contributions. Electricity generated from renewable sources and CHP plants certified via the CHP quality Assurance Program are exempt from the levy. Revenue from the program is used to fund schemes promoting energy efficiency and renewable sources of energy.

An 80% exemption is available on the levy where a 'Climate Change Agreement' (CCA) for carbon emission reduction is agreed with the government. However, CCAs have only been entered with energy-intensive industries and do not apply to the non-residential buildings sector as such.

c. Buildings included in the CO2 taxation market

It is the explicit policy of the UK Government to exclude the residential sector from any domestic emissions trading initiatives, since the residential sector is already covered under the Energy Efficiency Commitment (see Section 10.2a). Inclusion of the residential sector was considered for the recent pilot UK Emissions Trading Scheme but there was considered too much potential for double counting of emissions reductions due to the pre-existence of the EEC. The UK Government is also extremely sensitive about placing any additional financial burden on the residential sector in terms of energy use.

The Energy Performance Commitment (EPCom) proposal- In keeping with the UK government's long term goal of reducing carbon emissions, both mandatory and voluntary measures are being considered to reduce emissions in large non-energy intensive organisations by 1.2 million tonnes of carbon per year by 2020. The EPCom is a mandatory auction-based 'cap-and-trade' proposal covering energy use emissions from large, non-energy-intensive business and public sector organisations. All organisations with an annual electricity consumption exceeding 3,000MWh would be

included (excluding those already covered under Climate Change Agreements and the EU ETS – see 9.2b and 10.2b), and will be required to purchase carbon allowances corresponding to their energy use either from an auction or from each other. Many of these organisations have the majority of their CO2 emissions arising from their use of buildings. The proposal is intended to increase awareness of climate change issues with the company management as well as provide a financial incentive for improving energy efficiency. The outcome of the EPCom consultation process is anticipated to be integrated into the Energy White Paper due to be released this year.

The Draft Climate Change Bill out for consultation now allows for five-year carbon budgets. These will enforce binding limits on national carbon dioxide emissions during five year budget periods, beginning with the period 2008-12.

2.3 Subsidies for energy efficient technologies

(i) Domestic Buildings

The Energy Efficiency Commitment - One of the principle means by which subsidies are on offer in the UK for domestic energy efficiency improvements is through the Energy Efficiency Commitment. However, technically speaking the EEC is a market mechanism, not a system of direct Government subsidy, so it is considered under Section 10.2.

Warm Front - Warm Front (previously known as the Home Energy Efficiency Scheme) is the Government's main grant-funded programme for tackling fuel poverty. It provides direct grant assistance for packages of heating and insulation to people on low incomes and in receipt of certain income benefits. Grants available are up to £2,700 (or £4,000 if oil central heating has been recommended). The scheme is available to those who own their own home or rent from a private landlord. Between June 2000 and March 2005 over one million households have received assistance under this scheme. In England the scheme is known as Warm Front, in Northern Ireland it is Warm Homes, in Scotland Warm Deal and in Wales it is the Home Energy Efficiency Scheme.

(ii) Non -domestic Buildings

DTI's Low Carbon Buildings Programme (LCBP) - As part of the LCBP, the Department for Trade and Industry provides grants for microgeneration technologies to householders, community organisations, schools, public sector and private businesses. It is a UK wide scheme available to new, refurbished and existing buildings. Separate grant conditions apply for Phase 1 and Phase 2 of the scheme. Grants under Phase 1 are awarded through a competitive process and runs from April 2006 for three years. Under Phase 1, public and private sector organizations can receive 40% funding for on-site renewable technologies up to a maximum of £1 million (under Stream 2A; maximum of £100K under Stream 2B). Under Phase 2 of the programme, which runs from December 2006 to March 2008, public sector not-for-profit organisations can apply up to a maximum grant of £1 million per site on a first-come first-served basis.

Bio-Energy Capital Grants Scheme - This DEFRA sponsored scheme will provide grant funding for installation of biomass-fuelled heat and CHP projects with a rated output of over 50kW in the commercial, community and industrial sectors over the next five years. A total allocation of £10-15 million is expected under this scheme for the first two financial years. Grants will cover up to a maximum of 40% of the difference between the biomass capital cost and the fossil fuel alternative.

2.4 Granting soft loans

a. Higher amount possible if more energy efficient

No such measures

b. Lower interest rate with credits

b. (i) Domestic Buildings

No such measures are available direct from Government. However, note that many local authorities provide low interest loans for energy efficiency improvements. For instance Lambeth Borough Council provide loans of up to £3000 are available for heating and insulation works, which are open to any homeowner and are repayable over 1- 2 years. Eligible measures include installing a new condensing boiler, full gas central heating, insulation (loft, cavity walls and draught-proofing) , heating controls package and solar water heating.

b. (ii) Non -domestic Buildings

Interest free loans for non-residential buildings - The Carbon Trust offers interest free energy-efficiency loans to Small and Medium Scale enterprises (SMEs) in England and Scotland and all organizations in Wales and Northern Ireland for upgrading existing equipment to a more energy efficient version. Organisations can borrow up to £100,000 as an interest free loan repayable over 4 years. The existing carbon threshold is 0.7T Carbon/annum per £1,000 loaned. Interest free loans for installing renewable energy equipment are also available to SMEs up to a maximum of £100,000. The Carbon Trust is an independent company funded by the government, primarily from Climate Change Levy receipts.

c. Specific loans for energy efficient retrofitting / pre-financing of the works

No such measures

2.5 Third party financing (PPP)

There is a strong interest in Energy Service Companys (ESCOs) although to date this is manifested more in talking and planning than in actuality. ESD has pioneered the concept at a low carbon development in the North of England (Titanic Mill).

2.6 European structural funds

It is possible there are some European Structural funds being used to promote energy efficiency improvements in some isolated regions of the UK, but these will be applied locally and probably merged with individual local authority programmes of incentives. These are too numerous to summarise here. There is no nationally co-ordinated use of European Structural funds for improving the energy performance of residential buildings.

2.7 Higher energy price paid for electricity from PV or CHP

There are no direct feed in tariffs available for any form of renewable or micro-generation in the UK. The principle system of support for renewable energy and micro-generation is to Renewables Obligation, which is a market mechanism requiring electricity suppliers to source an increasing percentage of their electricity supply from renewable sources. Compliance with the Obligation is generally achieved through the purchase of Renewable Obligation Certificates.

As such, certain energy utilities may be prepared to offer incentive payments for the purchase of electrical output from micro-generation schemes, to reflect the value of the associated ROCs (and additionally Climate Change Levy exemption, which also has financial value). However, such incentives are provided via the market, and not directly from Government, and in practice only a handful of energy suppliers are currently offering attractive tariffs or other deals for the purchase of small scale (domestic level) renewable electricity or microgeneration output. As such this category has been treated as ‘no such measures’, and is considered further under Section 10.2.

2.8 Insurance – lower insurance rate for energy efficient retrofitted buildings

Not yet applied in the UK, but insurance companies are thinking about it.

2.9 Energy tariffs

a. Adapted energy tariff according to the level of energy performance certificate

Not yet applied in the UK

b. Increasing tariff with the energy consumption

Not yet applied in the UK

3 Non-governmental activities

3.1 Sector agreements

The banking sector offers 'green mortgages' for energy efficient homes. At the moment there are only three lenders that offer the 'green mortgage' package; The Co-operative Bank, The Norwich & Peterborough Building Society and The Ecology Building Society.

Co-operative Bank - As part of its eco-mortgage, the Co-operative Bank makes an annual donation to Climate Care to offset around 20% of an average home's carbon dioxide production for every mortgage granted. Climate Care is an organisation which aims to help combat global warming by reforestation, and other renewable energy and energy efficiency projects.

Norwich and Peterborough Building Society - The Norwich and Peterborough Building Society offers green mortgage products available for new homes with a SAP (Standard Assessment Procedure) rating of 80 or more or in respect of a property that the borrower wants to make more energy efficient. For the first five years of each "green" mortgage, eight trees will be planted each year. This aims to make the home "carbon neutral", whereby the estimated emissions of carbon dioxide (CO2) from the home are offset by the estimated absorption rate of CO2 by the new trees.

Ecology Building Society - The Ecology Building Society is a mutual building society dedicated to improving the environment by promoting sustainable housing and sustainable communities. It only provides mortgages to those whose plans will be of benefit to the environment. The Ecology provides mortgages for energy efficient housing, ecological renovation, derelict and dilapidated properties and small-scale and ecological enterprise. It says borrowers do not have to be 'green' to get an Ecology mortgage. Many of its borrowers have environmental concerns, and others simply want to rescue a derelict property to make into their home.

a. Components

None known of

b. Installers

None known of

c. Regional / municipal

None known of – although some links here with Renewable Energy Mandates covered under Section 1.2.6.

3.2 Energy market mechanisms

a. Require utilities to realise energy efficient measures

The Energy Efficiency Commitment - Under the Energy Efficiency Commitment (EEC), electricity and gas suppliers are required to achieve targets for the promotion of improvements in domestic energy efficiency. At least 50% of energy savings must be focussed on a priority group of low-income consumers in receipt of certain benefits and tax credits/pension credit. So it is expected that the EEC will also contribute to the eradication of fuel poverty. The gas and electricity Regulator Ofgem is responsible for administering the EEC.

The first phase of the EEC ran from 1 April 2002 to 31 March 2005. The second phase of the EEC runs from 1 April 2005 to 31 March 2008 and requires around double the level of energy efficiency activity. The Government's intention is to extend the EEC to 2011.

In order to meet their obligations, the energy suppliers typically offer a range of financial incentives for different energy saving measures. Ofgem issues a list of each eligible energy saving measure and how many energy saving 'credits' will effectively be allocated to it. This is based on assumptions about the lifetime of the product and statistical evidence on its likely use and performance. Because there is flexibility in how they meet their obligation, typically the best incentives are for the lower cost measures such as cavity wall and loft insulation, energy efficient lighting and appliances, and high efficiency boilers. However, many offer incentives for higher cost measures such as ground source heat pumps, solar water heating and fuel switching (e.g. from electricity to gas). Many utilities team up and form partnerships with social landlords or local authorities to improve their access to households and in particular the so-called 'priority' (low income) group.

Because measures eligible under the EEC must be additional to regulatory requirements (such as the Building Regulations Part L for new build), then most of the energy saving activity supported by the EEC tends to be focused on existing housing (where the most cost effective energy saving improvements can be achieved, in terms of p/kWh saving).

b. System of the white certificates

At present there is no white certificate scheme in the UK. Generally, with regard to emissions trading, the voluntary UK Emissions Trading Scheme covering 6 greenhouse gases ended in December 2006. It has been superseded by the EU ETS which is intended to cover only carbon dioxide emissions in large energy intensive organizations.

4 Research, demonstration and development projects

4.1 Demonstration projects / good examples

Energy Efficiency Accreditation Scheme – The scheme was established in 1993 and is open to industrial, commercial and public sector organizations. Accreditation is awarded by the Energy Institute and the scheme is managed by the Carbon Trust. Organisations are required to demonstrate commitment towards energy efficiency, provide evidence of investment and future provision in plans and budgets for energy efficiency measures, and demonstrate reduction in energy consumption as a trend over the past three years. http://www.carbontrust.co.uk/energy/takingaction/eeas.htm

4.2 Research and development project/ fundamental research

R&D is ongoing into the energy performance of buildings supported by a wide range of bodies on a wide range of topics in the UK. However, here is a selection of a few projects on interest:

Personal Carbon Allowances – the Government (Department of Environment, Food and Rural Affairs) has recently announced it is to explore the use of tradeable personal carbon allowances to combat rising emissions from the domestic sector. Personal carbon allowances cover people's direct use of energy through their electricity, gas, petrol and air travel and make up to 44% of the economy's

total emissions. Carbon loyalty cards, league tables, the use of carbon offsets at point of purchase for certain sectors, awareness raising through labelling, and carbon calculators are all being explored as potential long term measures.

Carbon Vision Buildings – managed by the UK's Carbon Trust (an agency of Government), this flagship R&D programme is a £5.4 million four year research programme that involves three consortia carrying out complementary research work. It is working to achieve a 50% reduction in carbon emission associated with UK buildings by 2030. Its three principle strands of activity are:

- CaRB (Carbon Reduction in Buildings) - The CaRB project is developing computer models that will make it possible to pinpoint effective ways of cutting carbon emissions arising from energy use in buildings. Central government, local authorities and housing associations will be able to use these models to devise national or local energy-saving strategies that deliver significant reductions in emissions. The easy-to-use models will predict how much carbon can be saved by incorporating different energy efficiency or renewable energy measures (e.g. cavity wall insulation or solar power) into different types of domestic and non-residential buildings. They will also be able to calculate how much carbon could be saved as a result of advertising campaigns and financial incentives designed to encourage people to use less energy. This £3.1M, 4-year initiative consists of a range of linked tasks including a survey of how much gas, electricity and water is used in hundreds of buildings, and a realistic assessment both of how people's behaviour affects energy consumption and of how they react to energy-saving initiatives. The project has already shown that the carbon emissions produced by housing in Milton Keynes (that was designed to be more energy efficient) have actually risen by around 25% per person since 1990, even though house temperatures have stayed roughly the same. Partners: De Montfort University, University College London, University of Reading, University of Newcastle-upon-Tyne, University of Sheffield, Royal Institute of Chartered Surveyors (RICS) and Energy for Sustainable Development Ltd. Website: www.carb.org.uk

- TARBASE (Technology Assessment for Radically Improving the Built Asset Base) - The TARBASE project is identifying 'bundles' of carbon-saving technologies that, if incorporated into existing buildings, could deliver a 50 per cent cut in their carbon emissions by 2030. At least 75 per cent of the UK's current buildings will still exist in 2030, so finding ways of radically reducing their emissions is an excellent way of boosting the UK's overall carbon performance. This £1.3M, 4-year initiative is focusing on the scope for reducing carbon emissions through, for instance, greater use of combined heat and power (CHP) in buildings, the use of building fabric materials with improved insulating properties and the use of building-integrated renewable energy technologies. For different types of building, it will assess the effectiveness of a range of technologies in terms of cost, ease of installation, social acceptability and carbon performance. It will then outline those that can deliver most carbon savings for each building type. Individual tasks include definition of eight categories of building and 30-40 variants, a study of how ways of using buildings will change by 2030 and the development of examples of buildings incorporating effective carbon-saving measures. Partners: Heriot-Watt University, University of Ulster, University of Surrey, University of Nottingham, BSRIA, Integer, CIRIA and JB&B. Website: http://www.pet.hw.ac.uk

- BMT (Building Market Transformation) - The BMT project aims to explore what is needed to ensure that measures with the potential to deliver a 50 per cent cut in buildings' carbon emissions are taken up as widely and as quickly as possible. Targeting key decision-makers, this £0.9M, 4-year initiative will organise a series of seminars involving industry and government to discuss the changes necessary to achieve such a cut. It will also develop a publicly available computer model of the UK's building stock which will enable policy measures to be assessed in terms of their direct and indirect impact on emissions. Although there is significant potential for existing technology to reduce carbon emissions in both domestic and non-residential buildings, improvements are not being made. This applies both to new buildings and the refurbishment of existing ones. The BMT project will explore social

and economic as well as environmental considerations. For example, people's behaviour is changing in relation to buildings as they demand more space, heat, hot water and appliances as living standards improve. In looking to develop policy solutions, the initiative will also explore institutional, legal and technical issues. Inputs from CaRB and TARBASE will make an important contribution to BMT. Partners: University of Oxford, University of Bath, University of Surrey, University of Strathclyde and the Welsh School of Architecture at the University of Cardiff. Website: http://www.eci.ox.ac.uk

5 Promotional measures/ increase of public awareness

5.1 Campaign on related advantages to energy savings

Again, promotional measures relating to the energy performance of buildings are being promoted by a wide range of organizations in the UK, from Government agencies to local authorities to non governmental organizations. However, some key ones include:

EST – Save Your 20% Campaign – this is focused on homeowners and aims to encourage people to make a pledge to reduce their energy consumption by 20% through a combination on insulation improvements, use of more energy efficient appliances and lifestyle changes.

http://www.est.org.uk/myhome/20percent/

Climate Challenge – a cross-departmental campaign led by Defra, in partnership with the Environment Agency, the Carbon Trust, the Energy Saving Trust, the UK Climate Impacts Programme, the Department for Transport and the Department of Trade and Industry, with the aim of raising awareness of how to communicate climate change effectively, and includes a £6 million Climate Change Communications Fund for organizations and groups seeking to launch a communications campaign. http://www.climatechallenge.gov.uk/

5.2 Voluntary labelling/ certification initiatives

12.2(i) Domestic Buildings

'Energy Saving Recommended' Label - The 'energy saving recommended' logo was developed by the UK's Energy Saving Trust (an agency of Government) in 2000 as a way of signposting customers to the most energy efficient products. The logo appears on a range of different products including boilers, heating controls, insulation, lighting, fridges, fridge freezers, tumble dryers and washing machines. The recommended scheme has already endorsed around 1800 products, 109 manufacturers and 34 retailers. For refrigeration and laundry appliances the energy saving recommended logo complements the EU Energy Label.

12.2(ii) Non - domestic Buildings

Voluntary Benchmarking and Reporting - A system of voluntary benchmarking and reporting of energy use is one of the options being considered to achieve the carbon emissions reductions within large non-energy intensive organisations. This approach is intended to encourage organisations to report their energy consumption regularly and in a systematic way that will facilitate benchmarking of energy use for specific sectors and activities. The intention of this scheme is to create a knowledge base that would allow organisations to make an informed decision about reducing their energy consumption. However, the scale of success, measured in terms of actual reductions in carbon emissions, is highly dependant on the response rate for such a voluntary scheme. The outcome of the consultation process on this proposal will feed into the Energy White Paper to be released in May.

The Carbon Trust's carbon label - The recently launched 'Carbon Reduction Label' provides a measure of the cradle-to-grave carbon footprint for a product over its life. It is intended as a mechanism to encourage businesses to manage and reduce the emissions from their products, and in turn demonstrate this commitment to the consumers. The scheme will also allow consumers to make an informed choice about the products they choose to buy. The scheme is still at an initial stage and Carbon Trust will be running a 12 month review phase to define the methodology in more detail. Although the carbon labelling will not specifically quantify the embodied energy in buildings as a whole, the scheme could well cover a range of building products and appliances used within buildings in the future.

BREEAM - BREEAM is an environmental assessment method for both new and existing non-residential buildings. It assesses the environmental performance of buildings against set criteria that can be classified into 8 categories: management issues, energy, health and well-being, transport, water, materials and waste, land use and ecology, pollution. The criteria are periodically updated to ensure that the BREEAM ratings reflect current best practice. Standard versions of BREEAM exist for various non-residential buildings such as schools, offices, retail, courts and industrial. A specific version of BREEAM is available for existing (office) buildings. English Partnerships are one of many organisations within the building industry to require specific standards for all new homes, retail, office and industrial buildings built on its land. Currently they require a BREEAM rating of 'very good' to be achieved for all new schemes. Similar requirements have been put into place by certain Local Authorities for major non-residential schemes.

5.3 Information on cost-efficient measures

Carbon Trust Carbon Management Programme - The Carbon Trust is an independent company funded by the government providing advice to organisations to mitigate the risks and maximise the opportunities that climate change offers. Carbon management programmes have been tailored for the private sector, higher education institutions, NHS and local authorities. The programme aims to achieve reduction in carbon emissions by having a positive impact on all aspects of an organisation's functioning including policy and strategy, research and development, procurement, logistics and facilities management. The Local Authority Carbon Management Programme (LACM) aims to provide councils with technical guidance and change management support to reduce emissions from buildings, vehicle fleets, street lighting and landfill sites.

6 Conclusions[2]

In 2005, the UK became more aware of the combined effects of climate change and energy security. Intellectually, the tipping point was the Exeter Conference in February 2005, where it became clear that climate change was worse than we thought and urgent action was required. Emotionally, New Orleans showed us what might be in store. Financially, the oil price spike exposed our dwindling North Sea gas supplies and ageing nuclear power stations, and triggered massive increases in the prices of natural gas and electricity. Politically, the new leader of our opposition party - the Conservatives - adopted a strong green agenda.

2006 started on a low note. On 4 January all EU countries were supposed to have finalised implementation plans for the Energy Performance of Buildings Directive (EPBD). We hadn't. But since then there have been major changes, including:

- In April new energy building regulations for England & Wales.
- In June a Ministerial announcement on mandatory energy certificates when domestic buildings are sold or let (starting in July 2007), and on public display of certificates based on actual

[2] With acknowledgements to Bill Bordass personal communication

energy use and CO2 emissions in some public buildings; and more recently a commitment to consult to extend display to all non-residential buildings (perhaps by 2009).

- In October we had the Stern report (this time for the Treasury which holds the purse strings) on the economics of climate change - emphasising that action was required, and the sooner the better.

And much, much more, including plans to extend carbon trading to organisations which are not energy intensive, e.g. building owners and occupiers; and the launch in December of the Code for Sustainable Homes. Many central and local government authorities are also keen on low-carbon developments, and are already requiring percentages (typically 10%) of renewable energy and suggesting ambitious programmes to carbon neutrality of new buildings within ten years.

Now we are almost halfway through 2007. At the end of March, Regulations for EPBD Articles 7 to 10 passed into the legislation for England & Wales. The government has announced that by 2016 all new dwellings should be zero carbon[3]. A minister has also promised much more on reducing emissions from existing non-residential buildings later in the year, including the ambition to explore how far, and in what timeframe, we can make progress with new commercial buildings being low or zero carbon. All our political parties are now vying with each other to have greener policies than their rivals – although this has not yet culminated in politically difficult decisions like setting the UK's EUETS National Allocation Plan so that we would achieve our government's target 20% cut in CO2 emissions from 1990 levels by 2010, due to pressure from Industry about competitiveness, jobs etc. Nor indeed, has any major party yet committed to an immediate halt in the expansion of UK airports, etc. etc.

How will all this be delivered? It is difficult to tell: there are currently too many initiatives from too many directions, with little common understanding let alone standards; and potentially lots of confusing, conflicting and burdensome bureaucratic requirements. People involved in buildings are struggling to make sense of it all, both individually and collectively; and it is proving difficult to match the rhetoric from above with the realities on the ground. The newspapers continue to be full of climate change and green issues.

The IPCC reports published recently show that we have to stop treating climate change as an urgent issue. We have to start treating it as an international emergency. There is now general acceptance in the UK that something needs to be done, and individuals are becoming much more engaged and professional and business associations more purposeful in considering practical, effective and economic solutions. But it all needs to be joined up somehow.

[3] This means that a home produces net zero carbon dioxide emissions over the course of a year, taking into account all the energy used in the house - for lighting, heating, cooling, cooking, running the TV, and so on. Low and zero carbon solutions can be developed across a site, not necessarily for each individual home.

2. Long term vision of European countries regarding the energy efficiency in the existing building stock

As presented under the section 1 of this report, many measures exist in order to improve the energy efficiency of the existing building stock. Improving the existing building stock requires important efforts and long term planning is necessary.

Besides existing measures, discussions about ambitious measures are ongoing and some of them are under development in the different member states. This section presents the long term vision of European countries regarding the improvement of the energy efficiency in the existing building stock. This section contents possible ways to improve the existing building stock and are including measures under discussion and/or under preparation.

Long term vision in Belgium

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December 2006

This document addresses the long term plan in Belgium and more especially in the Flemish Region of Belgium.

In the framework of the Kyoto objectives, the Flemish Region has to diminish the CO_2 emissions for the period 2008-2012 with 5.2% when compared with 1990.

This document describes the envisaged activities regarding the renovation of existing dwellings. These proposals are still in a discussion phase.

1 Context

In June 2005, the Flemish Climate conference was started up [1]. This conference addresses all energy consuming sectors including the building sector. One of the major recommendations of this climate conference is to develop a large scale renovation program for existing dwellings.

In the framework of the Flemish Climate policy plan 2006 – 2012, which was adopted in first reading by the Flemish Government on May 12 2006, a feasibility study for a energy renovation program for existing dwellings is announced. The purpose of this study is to identify which combination of measures is most appropriate for a substantial improvement in 2020 of the existing dwelling stock.

The performances of the existing dwelling stock can be substantially improved. At present, many Flemish dwellings still contain simple glazing (see table below). Also, many dwellings don't have insulation in walls, floors and/or roofs/ceilings. Moreover, many dwellings have poor performing heating systems (see table below).

	1998	2001	2001 (NIS)	2003	2005
Only single glazing	31 %	22 %	28 %	22 %	15 %
Part of the windows single glazing	n.a.	n.a.	37 %	16 %	20 %
No roof insulation	44 %	34 %	42 %	34 %	33 %
No floor insulation	80 %	75 %	n.a.	76 %	74 %
No external wall insulation	59 %	51 %	54 %	51 %	55 %

Source: REG-enquiry Flemish government in 1000 households and socio-economic enquiry National Institute for Statistics

	Natural gas	Fuel
Ordinary boiler	49 %	72 %
Low temperature boiler	35 %	21 %
Condensing boiler	6 %	3 %
Others (primarily stoves)	10 %	4 %

Source: REG-enquiry Flemish government in 1000 households

In order to have a energy renovation program which receives sufficient support from the major stakeholders, a step-by-step approach is envisaged:

- Definition of the objectives (strategic and operational);
- Inventory of specific issues of concern for the renovation plan;
- Definition of the criteria to be used for judging the various possible criteria;
- For the most appropriate measures, identify possible bottlenecks (Financial resources, support measures, …) and develop strategy to solve them.;
- Setting up a concertation platform with major stakeholders;
- Identify specific research projects for implementation;
- Approve energy renovation program;
- Implement energy renovation program.

2 Objectives

2.1 Strategic objectives

The general strategic objective for an energy renovation program in the dwelling sector, is formulated as follows:

"There will be in the Flemish Region in 2020 no longer energy wasting dwellings"

2.2 Operational objectives

The following operational objectives are a translation of the strategic objectives:

1. The energy renovation program will achieve the following objectives :
   - All dwellings have in 2020 roof and attic insulation;
   - All single glazing will in 2020 be replaced by at least high efficiency glazing;
   - All central heating systems have in 2020 a water side seasonal efficiency of at least 90%;
   - All individual heating furnaces have in 2020 a seasonal efficiency of at least 90%
2. In addition, the energy renovation program will support:
   - Insulation of opaque facade components including cavity walls,
   - Insulation of floor insulation;
   - Replacement of electrical resistance heating.
3. The program also aims to limit the use of active cooling.

3 Ambition level

The ambition level of this strategic objective is very high:

	Annual # of measures in 2004 with subsidy request	Average annual dwellings to be improved 2007-2020
Roof insulation	2.635	55.000
Single glazing	3.142	70.500 - whole dwelling : 30.200 - part of dwelling : 40.300
Central heating boilers	3.948 high efficiency boilers 3.205 condensing boilers	57.000

4 Proposal of supporting measures

In order to reach these objectives, propositions of supporting measures made by the working group 'buildings' have been made. We can e.g. mention:

- Building certificate including not only the energy aspect but also quality of the ground, control of the heating system, …
- Developing subsidies and incentives via the fiscal tool,
- Commitment from the building contractors to systematically propose high-efficiency components and materials,
- Information and awareness raising campaign about energy efficiency in buildings,
- Higher requirement levels for governmental buildings,

5 Conclusions

This renovation plan for existing dwellings envisages ambition targets to be reach in 2020. It is still in the negotiation phase. In order to achieve these ambitions, it is important to have a coherent set of accompanying measures in order to eliminate the most important bottlenecks.

6 References

1. www.mina.be/front.cgi?id=2380 (in dutch)

Long term vision in Denmark

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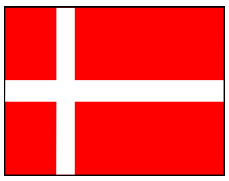
February 2007



1 Introduction

This document addresses the Danish long-term plan concerning the framework of the Kyoto objective where an overall target is to diminish CO_2 emissions for the period 2008-2012 with 21 % compared with 1990.

This document describes the Danish government's efforts to reach this CO_2 target and ensure that the entire energy supply to a great extent depends on own resources, i.e. in the long term on renewable energy. In order to fulfil this ambition three long-term plans have been presented by the Danish government. These are: 'Energy Strategy 2025' published in June 2005, 'Action plan for a renewed energy savings measures' published in September 2005 and the government's new draft energy proposal entitled 'A visionary Danish energy policy' published in January 2007. The 2005 plans are documents that have passed parliament, whereas the draft for a visionary policy is a document not yet negotiated by parliament. Both plans and the visionary policy as well refer to higher efficiency of the building stock.

2 Context

2.1 Energy Strategy 2025

The Energy Strategy 2025 is the government's long-term overall strategy on energy policy. It is the for handling the long-term challenges in terms of fluctuating energy markets, still more demanding international climate obligations and the need for more effective competition. Energy Strategy 2025 is founded on the right wing government's principles of liberalised energy markets and the use of market-based instruments to achieve objectives related to effectiveness, security of supply and environment. The energy consumption in building and industrial sector as well are included in the Energy Strategy 2025.

2.2 Action plan for renewed energy savings measures

The 2005 Action plan adopted by almost all parties in the Danish parliament defines the political framework for future energy savings measures. The plan includes a short-term target for the annual effect of energy savings measures of at least 1 % of consumption and a long-term milestone of keeping consumption (excluding transport) at current levels until 2025.

2.3 A visionary Danish energy policy

In accordance with 'A visionary Danish energy policy', Denmark should, in the long term, become entirely independent of fossil fuels – coal, oil and natural gas - which will be replaced by renewable energy. Still, the government wants the energy policy to be cost-effective and to sustain continued growth, high employment and a competitive edge. One more important aspect of energy policy is to ensure close international cooperation, in particular under EU

auspices. Therefore, ambition of government is a long-term energy plan that will provide Denmark with robust and environmentally correct energy supplies. Definite targets must be established and the means of attaining them defined. Until 2025, the government will:

- Reduce the use of fossil fuels by at least 15 % compared with today.
- Effectively counteract rises in overall energy consumption, which must remain static.

3 Objectives

3.1 Energy Strategy 2025

The strategy 2025 has three objectives:

- *Security of supply*. Less dependency on politically unstable regions seem important.
- *Global climate change*. Implementation of the Kyoto Protocol and future fulfilment of the Climate Convention's goal to limit anthropogenic climate change.
- *Growth and economic development*. Globalisation leads to increased international competition and Danish enterprises must have competitive framework conditions, including efficient energy use and access to well-functioning energy markets.

3.2 Action plan for renewed energy savings measures

The main objective of the action plan can be seen as the Danish interpretation and implementation of EPBD. Thus, besides an overall objective of no increase of energy consumption until 2015, the two initiatives brought to light in the action plan is on one hand a tightening of the requirements for the energy performance of buildings in the Danish Building Regulations and on the other hand updating the Danish energy labelling system. In 2006, both initiatives were adopted by the Danish Parliament by act.

3.3 A visionary Danish energy policy

This long-term vision and the specific partial targets must be achieved through strengthening efforts in the following crucial areas:

- *Efficient energy generation and consumption*: Energy saving efforts will be increased by 1.25 % annually with a view to keeping overall energy consumption stable until 2025.
- *Renewable energy*: The share of renewable energy must be increased to at least 30 % of energy consumption by 2025.
- *New and more efficient energy technologies*: In the run-up to 2010, the government is seeking to double publicly financed research, development and demonstration energy technology initiatives to DKK 1 billion annually.

4 Ambition level

4.1 Energy Strategy 2025

The ambition level of the Energy Strategy 2025 is stated in a list of governmental statements. Thus the government will

- Ensure intensified energy saving efforts so that the overall energy consumption (exclusive of transport) must be reduced.
- Make greater efforts to achieve concrete, verifiable energy savings corresponding to an annual average of 7.5 PJ during the 2006-2013 period.
- Promote that the proposed additional energy savings to a large extent will be achieved by means of greater savings delivered by network and distribution companies in the electricity-, natural-gas, district-heating and oil sectors.

4.2 Action plan for renewed energy savings measures

Concerning energy saving in the action plan some of the government's ambitions were expressed this way:

- An immediate tightening of the energy performance requirements of the Building Regulations by 25-30 %.
- An objective of further tightening of the requirements by 25 % by 2010.
- Building Regulation requirements for existing buildings concerning energy performance by larger renovations, replacement of boilers, windows and roof.
- Keep and improve an ambitious energy labelling scheme for buildings.
- A requirement for regular energy labelling of all public buildings.
- Visualisation of electricity consumption in public buildings.
- Requirements for distribution companies in order to realise energy savings with respect to energy labelling.
- Promotion of energy service on market conditions.
- Promotion of visualisation of energy consumption.
- Promotion of inspection systems for boilers and gas units.
- Reduction of fixed tariffs on electricity and district heating.

4.3 A visionary Danish energy policy

In the visionary plan, the government's ambition concerning energy savings are:

- *An energy saving market* (from 2010 onwards) with energy saving certificates.
- *Increased energy saving requirements* on utility companies.
- *Energy savings* in sectors not subject to CO_2 quotas.
- *Campaigns* to promote energy savings in buildings.

Concerning renewable energy and new energy technology as well, the ambitions are (of relevance to buildings):

- A subsidy system for promoting the use of renewable energy
- More heat pumps for householders
- Efficient low energy buildings
- Hydrogen and fuel cells

5 Proposal for supporting measures

In order to reach these objectives, proposals for supporting have been made e.g.:

- Agreement between government and energy supply companies. Energy savings 2006 - 2013 under negotiation:

Power suppliers	1.4 PJ/year
Natural-gas suppliers	0.5 -
District-heating suppliers	0.9 -
Heating-oil suppliers	0.2 -
Energy suppliers	3.0 PJ/year

  The energy savings must be specific and proved. Everything from information campaigns to technical savings inclusive of savings in the supply network. Framework agreement with the building branch on standard package solution. The effort should be related to all types of energy consumers.
- Public initiative should cover 4.5 PJ/year.
- Developing subsidies and incentives via the fiscal tool.

- Information and awareness raising campaign about energy efficiency in buildings.
- Higher requirement levels for governmental buildings.

6 Conclusions

Since 2005, three long term political announcements were presented in Denmark. These are: Energy Strategy 2025, Action plan for renewed energy savings measures (2005) and the government's new draft energy proposal entitled "A visionary Danish energy policy published in January 2007". The plans, both of them passed by parliament, are more and more concrete in their announcement and in their proposal for action. Thus most of the proposals of the Action plan, incidentally a fulfillment of the EPBD, have to a large extent been transformed into action.

Recently however, many politicians all over the world have changed their mind concerning global climate change an environmental issues as well. The policy presented in 'A visionary Danish energy policy', stated in January 2007 by the Danish government can be seen as a result of exactly that global change of mind. All the same, it seems clear, that energy efficiency of the existing building stock is so much more important.

7 References

Energy Strategy 2025

http://www.ens.dk/graphics/Publikationer/Energipolitik_UK/Energy_Strategy_2025/index.htm

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http://www.ens.dk/graphics/Publikationer/Energipolitik/TRM_handlingsplan_web.pdf

A visionary Danish energy policy

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Act on the promotion of savings in energy consumption. Act no. 450 of 31 May 2000

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Long term vision in France

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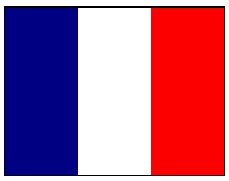
March 2006



1 Introduction

This document addresses the long term plan in France regarding energy in existing buildings.

It is based on the analysis of 2 main documents which are used for long term actions planning:

- the French climate plan defined in 2004
- the Energy orientation law [2] published on July 15th 2005 (EOL)

These two documents deal with energy in all sectors; one has selected here the actions which are applicable to existing buildings.

2 Context

The Climate Plan [1] is an action plan drawn up by the French Government to respond to the climate change challenge, firstly by 2010 (complying with the Kyoto Protocol target), and, secondly, beyond this date.

Projections for France show that national emissions could be 10% higher than the Kyoto target in 2010 if no measures are taken. This is particularly due to increasing emissions in the sectors affecting daily life (residential-tertiary sectors, transport, etc.).

The Climate Plan [1] has no legal impact but it defines a clear roadmap.

The Energy orientation law [2] regarding energy has a legal impact. It is set up to implement 4 mains policy goals:

- contribute to energetic independence and safety of energy supply

- ensure a competitive price to energy

- safeguard environment and inhabitant health especially by acting against climate change

- enabling social and regional cohesion by enabling to all access to energy.

The energy orientation law [2] is the legal support for the implementation of a large number of measures defined in the climate plan [1].

3 Objectives

3.1 Strategic objectives

Climate Plan [1]

The main objective is the implementation without delay of France's commitments made in Kyoto.

A steadfast implementation of the Climate Plan 2004 [1] was supposed to enable France to achieve and maybe even slightly exceed our undertaking to stabilise our greenhouse gas emissions by the year 2010.

Energy orientation law

Manage the energy demand in order to reduce the energy intensity by 2% yearly from 2015 and by 2,5% yearly from year 2030.

Diversify our energy sources, especially 10% shall come from renewable by 2010.

Develop research in the energy field.

3.2 Operational objectives

The Climate Plan [1] contains measures affecting all sectors of the economy and the daily life of all French citizens with a view to economising the equivalent of 54 million tonnes of CO2 each year by the year 2010.

Energy orientation law [2]

200 000 thermal solar collectors and 50 000 PV roofs per year from 2010

4 Ambition level

The ambition level of the climate plan [1] is defined in term of CO2 reduction. The following table shows the ambition for the buildings

CHAPTER 3. BUILDINGS AND ECO-HOMES					
Code	Measures	Réductions 2010 (in Mt CO_2 eq.)	Budget	Pilot	Time Horizon
BAT.2	Thermal performance of housing (excluding BAT.4 effect)	7.3		Ministry of Housing	2005
BAT.3	Thermal performance of business premises (excluding BAT.4 effect)	1.7 private 1.3 public		Ministry of Housing	2005
BAT.4	Effect of energy savings certificates (EN.1.1 measure)	1.4		MINEFI	2004
BAT.5	Reminder: air conditioning	*(approx. 5.1)* *Reminder* *See CLI.2 to 5*			
	Building research programme ("preparing buildings for 2010" and "PREBAT")	n.e.	€ 4.8 M		2004-2005
	"Green" banking products	n.e.	€ 3.5 M		2005
	Total buildings and eco-homes	**11.7**	**€ 8.3 M**		

5 Proposal of supporting measures

Three main groups of actions are dealing with buildings:

Buildings and eco-homes

- The Climate Plan [1] aims to give every French citizen, even the most disadvantaged, the opportunity to live in an ecological home.

- Using energy efficient equipment (solar water heaters, insulate materials) in home construction or renovation leads to lower energy bills, thereby reducing the economic risk for those who live in them.
- Factoring sustainable development criteria into the current plans to boost council housing, i.e. building 80,000 council homes per year, as announced by the French President, will contribute to achieving both a social and environmental objective. This renovation work will have to be conducted in accordance with specific environmental requirements (using high insulation glass, waste collection, widespread use of solar-powered water heaters).
- The energy efficiency certificate system will require energy suppliers to fund energy saving work in the residential-tertiary sectors and in industry (implemented through EOL)
- An energy performance assessment will be made compulsory before any property sale as from 2006 and before any property rental as from 2008. As a result, it will be possible to pinpoint energy investments that are required. The Energy Label will be made compulsory (with categories from A to G depending on consumption in kWh/m2) in the energy performance assessment, property owners who carry out renovation work leading to an improvement in their energy label will be entitled to exemption by local authorities from the property tax for two to six years. (implemented through EOL)
- A tax rebate of between 25 and 40% will target energy efficient equipment. Solar-powered water heaters and other equipment running on renewables will be supported by a 40% tax rebate. (implemented through EOL)
- For the first time, building regulations will be introduced for major renovation of existing buildings. Energy performance thresholds will be established for certain types of renovation work (implemented through EOL)

Sustainable air-conditioning

The "Sustainable Air-conditioning" action will aim to:

- better inform consumers,
- provide information on ways of avoiding air-conditioning wherever possible,
- instigate good practice by the private sector,
- make the State exemplary
- and see to it that the future EU Regulation on controlling air-conditioning apparatuses is adopted.

Research, and outlook beyond 2010

- A research programme aimed at devising positive energy buildings (those that produce more energy than they consume) will be launched.
- A Foundation for Energy Efficient Buildings will be established to oversee research and development by public and private stakeholders on topics relating to low-consumption or perhaps even energy-producing buildings.
- Factor 4 : A workgroup was set up to study the credible tracks capable of dividing by 4 the greenhouse gas emissions of France before 2050 to strengthen the climate plan by integrating long-term national measures. The group produces a report of 76 pages and 29 recommendations relative to the general strategy, to the coherence of the public policies and to the mobilization in the concerned sectors [3]

In addition EOL set up the following measures

Guaranteed price for selling PV electricity to energy suppliers

6 Conclusions

Building renovation is a large part of the climate plan 2004 [1]. This plan is a clear roadmap for the different actors and especially the public related bodies. The Energy Orientation Law [2] is the legal vehicle which enables then the government to implement many of the actions defined in the climate plan [1].

7 References

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[2] Energy orientation law : http://www.legifrance.gouv.fr/WAspad/UnTexteDeJorf?numjo=ECOX0400059L

[3] factor 4 : http://www.industrie.gouv.fr/energie/prospect/facteur4-rapport.pdf

Long term vision of Germany

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1 Introduction

This document addresses the long-term plan in Germany for the reduction of the energy consumptions of existing buildings.

In the framework of the Kyoto objectives, Germany has to reduce the green house gases for the period 2008-2012 by 21 % when compared with 1990.

According to data presented at the website of the Umweltbundesamt (Federal Agency for the Environment) [1], this goal is nearly realised. Germany has by 2003 reduced the emissions by 18,5 % or 231 million tons. That means that another 31 million tons of reductions are still missing.

2 Context

Currently the German government is developing a new holistic energy policy concept. The announcement of this concept is planned for the second half of 2007. Therefore the long-term vision can only be based on the publications available from the government, the responsible ministries and the results of the so-called energy summits, which took place in the chancellery in 2005 and 2006 [2]. The third and final summit is planned in 2007. The participants in the summit were the chancellor, several ministers and representatives of the energy industry, of the industrial and private energy consumers, the unions, the energy research and environmental protection organisations. After the second meeting the following elements for the overall strategy of the energy policy were defined:

- investments for the renewal of power plants and networks
- expansion of economic efficient renewable energies
- operative competition for stable energy and electricity prices
- initiatives and measures for the improvement of the energy efficiency
- research and innovation offensive for new technologies
- international cooperation with the aim to modernise the worldwide energy supply
- new worldwide climate protection agreement with the industrial countries and the new industrialising countries

As Germany has in 2007 the presidency in both the European Union and the G8 summits many actions are started in order to convince the European and international partners to focus on energy efficiency. One of it is the G8 summit, which will take place in Heiligendamm in the spring of 2007.

Germany has a top position in the international comparison concerning the achieved energy efficiency. According to the International Energy Agency (IEA) Germany is together with Japan a front-runner for the industry states in terms of producing extensive economic performance with relatively low energy input. This is possible because there exists a good

know-how in the field of energy efficiency. Since 1990 the primary energy consumption was decreased with at the same time increasing national product [3].

Still this is no reason to stop the efforts for reducing the energy consumption and the green houses gases. The current movements at the international energy markets prove that reduced energy consumption is one of the main factors to secure the energy supply of the future. Until 2020 the German government plans to improve the energy related productivity by factor 2.

3 Objectives

3.1 Strategic objectives

The German energy policy, expressed by the Federal Ministry of Economics and Technology [3] as responsible ministry, sets the three following goals:

- economic efficiency
- security of the supply
- environmental safeness

Economic efficiency means the efficient production, a low demand and the efficient use of energy. This includes the liberalisation of the German energy market.

Security of the supply means that the energy demand can be fulfilled at any time. Since Germany is poor in natural resources it is mainly based on imports concerning the energy supply. A focus shall be to have a big variety of energy sources even more since the nuclear power phase-out was decided some years ago.

The environmental safeness is important regarding the world climate and is a complex task. Energy shall be produced and used in a more rational way and renewable energies shall have a higher ratio in the future. It is emphasized that these measures have to be realised within European and international frameworks.

Concerning the energy efficiency in the German building stock the following specific goals are planned:

1. Accelerated realisation of the significant energy saving potential in the existing building stock.
2. Introduction of the energy efficiency as major factor in the real estate market
3. Encouragement of energy related research
4. Improved impact of qualified energy consulting (Bafa)
5. Improved information, motivation and education concerning energy efficiency
6. Significant reduction of the energy consumption of public buildings
7. Export initiative for energy efficiency
8. Use of the presidency of the European Union in order to boost energy efficiency in the international level
9. Realisation of the EU directive on the end-use energy efficiency and energy services
10. Energy saving through EU measures at energy consuming equipment

3.2 Operational objectives

Some of the mentioned goals can be split up into planned measures as follows:

a. Realisation of the energy saving potential in the existing building stock:

Speedy and consequent realisation of the extended CO_2-building retrofit programme (now annually 1,4 billion Euros) including reduced loans and investment subsidies.

b. Energy efficiency as factor in the real estate market

Speedy implementation of the energy performance certificates. Immediate agreement between the responsible three ministries.

c. Energy related research

Enforcement of the research programmes for energy saving new buildings and mainly energy saving retrofit of existing buildings. Support of further development of innovative technologies in the field of heating, ventilation, cooling, insulation with funds of the BMWi of about 13 million Euros.

The German government plans to increase the funds for energy related research until 2009 by 30 %. Between 2006 and 2009 2 billion Euros in total will be used for a secure, economic-efficient and environmental safe energy supply. The saving use of energy will be encouraged with 24.9 million Euros. The export initiative for renewable energies will be financed with 15 million Euros in 2007 [2].

An example of the energy related research funded by the Ministry of Economy and Technology is the EnOB (Energy optimised buildings) program with a focus on improving the energy efficiency of existing buildings (EnSan) [4]. Another project focusing on the energy efficient retrofit of public buildings is the IEA ECBCS Annex 46 [5]. The German contributions are co-funded by the Ministry of Economy and Technology as well. Both projects are active within the mentioned time frame of 2007-2010.

d. Impact of qualified energy consulting (Bafa)

Increase of the numbers of energy consultings, simplification and IT-supported processes.

e. Improved information, motivation and education concerning energy efficiency

Call for the federal states to increase the information content on energy efficiency information in the curricula of schools, universities and other types of educations. Increase of the information work of the German Energy Agency (dena).

f. Reduction of the energy consumption of public buildings

Continuation of the dena project on the energy efficient retrofit of public buildings with contracting measures. Top ten database for energy efficient office equipment. Start of an energy efficient school renovation project. [6]

4 Ambition level

Since the energy policy concept of the government is planned to be ready by the second half of 2007 no specified level was yet published. However the goal is still to realise the target of the Kyoto protocol and also to set new international targets in a similar summit soon.

The Ministry of Transport Buildings and Urban Affairs plans to strengthen the energy performance requirements by reducing the allowed primary energy consumptions for both, new residential and new non-residential buildings in 2008 by approximately 30 %. It is also under discussion to demand by law a defined rate of renewable energies for the energy supply of buildings.

5 Proposal of supporting measures

Chapter 3.2 includes also supporting measures. Since they belong to the same concept, published by either the Ministry of Economy and Technology or the German Government, it was decided to keep them in one chapter.

As mentioned in chapter 2, an overall aim is also to renew and improve the existing power stations and networks. The energy industry plans to invest more than 30 billion Euros in new power stations and the energy infrastructure until 2012. Additionally the further development and expansion of renewable energies shall be encouraged with up to 40 billion Euros.

6 Research and outlook beyond 2010

The German government has expressed the interest and plan to set new, more ambitious energy and greenhouse gas targets in a new international summit soon. Special focus is made on the inclusion of the United States into the action.

According the history of energy decrees in Germany it can be expected that updates of the "Energieeinsparverordnung – EnEV" will be realised. These might not only include the primary energy demand of the building and its systems but also of the energy incorporated in the building and system material in the phases production, transport and demolishing (re-use).

There are also signs for a shift of focus from the building level to energy efficient settlements or towns.

It is planned to realise in the coming years the trade of white certificates (emission reduction at private housings paid by the industry in order to substitute their emissions).

8 Conclusions

This report chapter gives information on the planned future development of the German energy policy. Unfortunately the German government is at the time of the report in the last phase of working out an updated energy policy. Therefore the authors had to rely on the few available documents at the governmental and ministries website. However the report still shows what kind of measures is planned in the near future.

9 References

[1] www.umweltbundesamt.de,

[2] www.bundesregierung.de

[3] www.bmwi.de

[4] www.enob.info

[5] www.ecbcs.org/annexes/annex46.htm

[6] www.eneff-schule.de

Long term vision in The Netherlands

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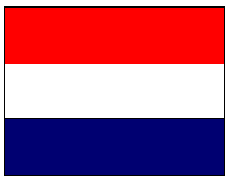

1 Introduction

This document addresses the long term plan with respect to energy efficiency in the existing building stock in The Netherlands.

In the framework of the Kyoto objectives, The Netherlands have to diminish the CO_2 emissions for the period 2008-2012 with 6% when compared with 1990.

In 2004-2005 Parliament ordered the Minister of Economical Affairs to strive for 2% energy saving per year. To reach this goal it is necessary to use almost the entire technical energy saving potential, independent of costs (ECN, 2006). If this ambitious goal would be reached, this would lead to 604 PJ energy saving per year in total (of which is 143 PJ for households) in 2020.

2 Context

In the past ten years energy saving in existing buildings came in the picture in The Netherlands and a basis was made for the future long term plans. It started with a voluntary method and instrument to calculate the energy performance of existing dwellings (EPB, later EPA) as an initiative of EnergieNed (the umbrella-organisation of energy companies). Dutch national government picked up this initiative and during several years a subsidy scheme (EnergiePremie, EPR) was linked to that. Then a method and tool were developed for non-residential buildings as well. When the EPBD was adopted by EC The Netherlands, in theory, were well on track when regarding the development of methods and tools. However, political conditions caused a delay in the implementation of the EPBD and finally it lasted until December 2006 to formally establish the implementation in law (Besluit Energiebesparing Gebouwen, BEG). The obligation to produce an Energy performance Certificate at transaction moments is foreseen to be put into action January 1 2008 latest.

The calculation of the Energy Performance Certificate is based on EPA. This is one of the pillars of the Dutch energy efficiency policy in the longer run.

3 Energy efficiency policy

In December 2006 the Minister of Economic Affairs and the Minister of Housing informed Parliament on the planned intensification of the energy efficiency policy in the built environment (letter, ref. DBO2006280188). The Ministers describe the following tools:

1. Energy saving targets will be imposed on energy companies.

Energy companies have been invited to make proposals in the first three months of 2007 how to reach these targets. After this period the Ministers will decide which instrument will be chosen. A favourable instrument is white certificates. Implementation of white certificates leads to a more certain achievement of an energy saving of 1,5% per year at national level from 2012 on. A benefit of this instrument is that it is based on mandatory results, implying guaranteed success. Energy companies will be stimulated to cooperate with their clients (including households) and find smart and cost-efficient solutions. This instrument also relates to the Energy Services Directive by EC.

Energy saving in the built environment will be linked to the EPBD and the Energy Performance Certificate. There will be eight labels (A-G), which are based on the Energy Index (EI) as calculated by the EPA (Energy Performance Advice).

2. Application of stimulating tools to overcome investment restrictions with building owners and users

Several stimulating tools have been studied ('Leuker kunnen we het niet maken, wel groener. Fiscale en financiële opties voor energiebesparing'. CE-Delft, December 2006). Promising tools are:

For Non-residential buildings:

- White certificates
- Establishment of an 'energy saving company' (a kind of public-private cooperation that can develop new forms of financing)

For privately owned, energy-efficient dwellings:

- Reduction on conveyance tax
- Attractive interest on loans for energy saving measures

For professionally rented dwellings:

- White certificates
- 'Integrated living costs', i.e. to regard all living costs, like rent and energy costs, in coherence

The white certificates (see item 1.) and the integrated living costs have been chosen to be elaborated more precisely. The integrated living costs will be addressed by valuing the Energy Index (i.e. the energy performance of a building determined by EPA) in the so-called Dwelling Valuing System (Woningwaarderingsstelsel, WWS). This system values all qualities of a building (e.g. number of rooms, floor area, equipment etc.) and is the basis for the determination of the level of the rent. A study for the effects of the integration of the energy performance in the Dwelling Valuing System will be completed spring 2007.

Apart from this the Energy Tax (Energiebelasting, EB) will be maintained and the tariff will be increased. This positively influences the cost efficiency of energy saving measures (and economical heating behaviour).

3. Knowledge transfer to building owners and users, e.g. concerning user behaviour, cost and benefits of energy saving measures, new techniques and measures

Knowledge transfer is regarded to be an important issue. Various initiatives are ongoing:

- Provision of free standby-killers, energy boxes and energy vouchers to 10.000 households (pilot project started November 2006).
- Knowledge transfer project: 'Consumer and energy' (www.consument-en-energie.nl)
- One result of the above mentioned knowledge transfer project is the 'Energielastenverlager' (www.energielastenverlager.nl), which is an interactive

website that present thermal comfort, energy saving and reduction in the financial burden as drivers for sustainable living. The response in the first weeks after launching was large, implying there is a lot of attention for tailored energy saving advice.

4. Study to various lacks of knowledge, especially with respect to behaviour

Studies are being performed on:

- user behaviour and its effect on the efficiency of energy saving measures
- the relation between user behaviour and health
- The relation between user behaviour and the energy performance of new buildings (EPC). The results of this study are expected to be of use for communication in the existing building stock as well.

4 Additional policy and tools

Involvement of the market

Exchange with stakeholders in the market is addressed as well, as private initiatives are very much stimulated. Two important initiatives are:

- Burgerplatform Klimaat en Energie. This civil platform on climate and energy has prepared an advice for the Minister of Housing concerning energy saving policy in the built environment.
- Platform Energietransitie Gebouwde Omgeving (PeGO, established May 30 2006). The goal of this platform is to prepare a vision for sustainable energy supply in the longer run (2030 onwards) related to concrete actions that market parties and authorities can take now to start up the transition to a sustainable, reliable and affordable energy supply.

Standardisation of energy performance

Standardisation of the energy performance of existing buildings is an ultimate instrument that still meets a lot of practical difficulties. Therefore it is advised that standardisation is only applicable at a moment of transaction (selling or renting of a building). When such a moment occurs the energy performance of a building should be upgraded to reach label D (according to the labelling conform the EPBD). This means that about 30% of the existing buildings need serious improvement of the energy performance (ECN, 2006).

Subsidy schemes

Subsidy schemes come and go, usually for a short period of one or two years. It is expected that they will be used in the future as well, but the exact interpretation is not known yet (in 2006 e.g. one stimulated energy saving by low income households).

Meerjarenafspraken (Long term agreements)

Long term agreements set goals on energy saving in particular branches like Universities, Banks en Insurance Companies. Organisations from these particular branches come together and make an agreement to reach a certain energy saving goal in a certain period of time.

Energiezorgplicht Wet Milieubeheer (Energy care duty in the Environmental Protection Law)

The energy care duty means that all organisations have to use their energy in an efficient way. Organisations using over 200.000 kWh per year or over 75.000 m3 of gas or other fuels in addition have to apply cost-efficient energy saving measures (i.e. measures with a pay back time of 5 years or less).

Knowledge transfer to professional target audiences in the built environment

- KOMPAS program by SenterNovem aiming to support target audiences (mainly municipalities and housing corporations) with their energy saving policy.

- BANS Klimaatconvenant, an agreement that supports municipalities and provinces setting up and executing local climate policy.

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Long term vision in The United Kingdom

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May 2007

Introduction[4]

In 2005, the UK became more aware of the combined effects of climate change and energy security. Intellectually, the tipping point was the Exeter Conference in February 2005, where it became clear that climate change was worse than we thought and urgent action was required. Emotionally, New Orleans showed us what might be in store. Financially, the oil price spike exposed our dwindling North Sea gas supplies and ageing nuclear power stations, and triggered massive increases in the prices of natural gas and electricity. Politically, the new leader of our opposition party - the Conservatives - adopted a strong green agenda.

2006 started on a low note. On 4 January all EU countries were supposed to have finalised implementation plans for the Energy Performance of Buildings Directive (EPBD). We hadn't. But since then there have been major changes, including:

- In April new energy building regulations for England & Wales.
- In June a Ministerial announcement on mandatory energy certificates when domestic buildings are sold or let (starting in July 2007), and on public display of certificates based on actual energy use and CO2 emissions in some public buildings; and more recently a commitment to consult to extend display to all non-residential buildings.
- In October the Stern report (this time for the Treasury which holds the purse strings) on the economics of climate change - emphasising that action was required, and the sooner the better.

Now we are almost halfway through 2007. At the end of March, Regulations for EPBD Articles 7 to 10 passed into the legislation for England & Wales. The government has announced that by 2016 all new dwellings should be zero carbon[5]. All our political parties are now vying with each other to have greener policies than their rivals – although this has not yet culminated in politically difficult decisions. For example, pressure from industry about competitiveness and jobs prevented the UK setting its EU Emissions Trading Scheme (EU ETS) National Allocation Plan so that we would achieve our government's target 20% cut in CO2 emissions from 1990 levels by 2010. Similarly, no major party has yet committed to halt the expansion of UK airports.

The IPCC reports published recently show that we have to stop treating climate change as an urgent issue. We have to start treating it as an international emergency. There is now general acceptance in the UK that something needs to be done, and individuals are

[4] With acknowledgements to Bill Bordass personal communication

[5] This means that a home produces net zero carbon dioxide emissions over the course of a year, taking into account all the energy used in the house - for lighting, heating, cooling, cooking, running the TV, and so on. Low and zero carbon solutions can be developed across a site, not necessarily for each individual home.

becoming much more engaged and professional and business associations more purposeful in considering practical, effective and economic solutions. But it all needs to be joined up somehow.

Energy white paper: meeting the energy challenge, published May 2007.

The UK Government set out its policy to deliver a secure, low carbon energy mix for the UK on 23 May 2007 when it published its Energy White Paper Meeting the Energy Challenge. The White Paper builds on the Energy Review Report published in July 2006, and follows a series of public consultations launched at the time of the review. Looking ahead to 2020, the White Paper announces specific measures that will ensure individuals; businesses and Government reduce their carbon emissions and save energy:

- Helping more people save energy by proposing to double energy suppliers' current obligation to provide customers with energy efficiency measures through a new 'Carbon Emission Reduction Target' from 2008-2011. This will be the third phase of the scheme formally known as the Energy Efficiency Commitment (EEC). For the first time this will include technology such as solar panels and would save over one million tonnes of carbon a year.
- A mandatory national scheme – the 'Carbon Reduction Commitment' (CRC) – to require large non-energy intensive commercial organisations (eg banks, supermarkets, hotel chains, etc.), government departments and local authorities to reduce their emissions. The CRC will target emissions from energy use by organisations whose annual electricity use is above 6,000MWh ie spending more than ~€750,000 a year on electricity and will include between 2000 to 5000 organisations. The CRC will apply mandatory emissions trading to cut carbon emissions by 1.2 MtC / year by 2020.
- Improving information on energy use to help businesses and individuals know where and how to make energy savings. A requirement for new meters to come with a real-time display from 2008 and a short term offer of free displays from energy suppliers for households to 2010. In addition, the government is encouraging the introduction of smart meters, also with displays, for households and for small firms and expects everyone to have a smart meter within 10 years, with smart meters being rolled out to all but the smallest of businesses in the next five years.
- Publication of a consultation paper setting out how the energy efficiency of consumer electronics will need to improve. The Energy Saving Trust estimates that at home we waste over €1 billion per year by leaving appliances in stand-by when not in use.
- A new consultation is also being published setting out the Government's preliminary view that new nuclear power has a role to play alongside other low carbon technologies.
- The Government is also publishing its Biomass Strategy, which seeks to realise a major expansion in the supply and use of biomass in the UK
- The White Paper also affirms and develops our approach to international climate change and energy. Renewables and low carbon energy technologies will increase energy efficiency, moderate demand and enable diversity of supply – assisting energy security and reducing emissions.

The UK's long term energy policy is to achieve a 60% reduction in CO2 emissions by 2050. Buildings, which currently are responsible for about 50% of total emissions, may well need to deliver greater cuts than this to compensate for other sectors, like transport, which may find such a target far more challenging. The building stock is characterised by longevity: if the

slow stock turnover trend continues, at least 60% of the 2050 stock will comprise buildings that exist today. Furthermore, because new buildings should be far more energy efficient than existing ones, it is the decarbonisation of this 60% that plays such a crucial part in achieving a low carbon future. UK government thinking on how to transform the energy efficiency of the building stock was summarised in a speech by the Climate Change Minister in April 2007 (see highlights in Annex A). The next section describes some of the technical challenges.

Technical feasibility of 60% CO_2 reductions from UK building stock by 2050

The achievement of such a radical revolution in building energy use will require the problem to be tackled from all directions. There are four main technical strands to a viable strategy:

1. **Building Regulations, or other incentives** for existing buildings, to reduce the energy demand for heating and cooling, ventilation, hot water and lighting
2. **Decarbonisation of energy supplies**, particularly electricity
3. **Market Transformation** to reduce the energy used by appliances and equipment in buildings
4. **People Transformation** to optimise control and behaviour

Perhaps the first essential element to achieving this strategy is to put in place a standard procedure for quantifying the energy efficiency of a building and the potential for energy improvements. In the UK, two procedures have been identified:

1. Energy performance certificates (EPCs) which are explicitly aligned with Asset Ratings and so reflect the intrinsic efficiency of a building and (potentially) the efficiency of the appliances and equipment used in it (ie the first three components of the above strategy).
2. Display Energy Certificates (DECs) which identify the Operational Rating of a building and hence cover all four strands of the strategy.

The second task is to identify the most appropriate measures which can achieve demand side reduction goals. For dwellings, for example, this would include a package of improvements such as:

- All pre-1996 cavity walls insulated by 2050
- All pre-1996 uninsulated solid walls insulated by 2050
- All pre-1996 glazing replaced and upgraded to Building Regulation standard at least once by 2050
- All pre-1996 dwellings subjected to airtightness improvements by 2050
- Building Regulation wall U-values reduced to 0.25 W/m^2K by 2010 and to 0.15 W/m^2K by 2016
- Building Regulation window U-values reduced to 1.5 W/m^2K by 2010 and to 1.0 W/m^2K by 2016
- Building Regulation air leakage limits reduced to 5 $m^3/hr/m^2$ by 2010 and to 3 $m^3/hr/m^2$ by 2016.
- All dwellings heated by gas-fired condensing boilers or electrical heat pumps with annual CoP of at least 2.3.

- Ownership of lights, electrical appliances and cooking appliances saturates by 2020 and appliance efficiencies rise continuously to 2050.

Thirdly, in parallel, through the widespread use of renewables, carbon capture and advanced fuel cells, there will need to be dramatic reductions in the carbon intensity of grid electricity from its present level around 560 gCO_2/kWh to say 350 gCO_2/kWh by 2030 and 200 gCO_2/kWh by 2050.

Lastly the strategy will need to provide the incentives for citizens to implement these measures. Several options are available:

- Fiscal incentives aligned with EPCs to encourage voluntary action
- Carbon taxes to raise the economic priority given to energy efficiency[6]
- Personal carbon allowances to oblige individuals to include the consideration of carbon in their lifestyle choices
- Mandatory emissions trading for all organisations.

Macro-economic models indicate that if all the elements of the above strategy are implemented, the carbon reduction goals can be achieved whilst economic growth continues, standards of living continue to rise, the number of households increases by some 30% by 2050 and the ownership of central heating systems and electrical appliances grows to saturation by 2020.

[6] In the UK, a fiscally neutral domestic carbon tax could gradually replace income tax. At the current position, this would ultimately price CO_2 at a dramatic £900/tonne (income tax revenues are currently £127bn, domestic CO_2 emissions are 143mtonnes CO_2). This would place a tax of €0.75/kWh on electricity (assuming the carbon intensity of grid electricity is 560g/kWh) and €0.25/kWh on gas. To protect those in fuel poverty, a reverse pricing tariff could be introduced. It might give all households a carbon tax free allowance of say 5,000 kWh gas (or equivalent for those off the gas grid) and 2,000 kWh electricity. A revenue neutral CO_2 tax on energy use beyond these allowances would equate to an extra €1.00/kWh on electricity and €0.35/kWh on gas. If carbon tax rates were raised towards these values, the demand for insulation and other energy efficiency technologies would escalate very quickly and the energy policy problem would soon switch from the present one of overcoming public inertia to the more tractable one of the management of energy efficiency supply chain shortfalls.

Annex A: Zero Carbon Homes

Extracts from speech by Angela Smith, Minister for climate change and sustainable development at the Zero Carbon Homes conference on 26 April 2007.

The zero carbon goal is not some Government whim or sexy soundbite. It's deadly serious and just one of many we must all aim towards if we are to meet the challenge of climate disruption through global warming.

The recent report by the Intergovernmental Panel on Climate Change set out the scale of that challenge. They warned that the temperature could rise by between 1.8C and 4C by the end of this century. The models suggest that the killer heatwave of 2003 could be a normal summer event by mid-century - and that we'd look back on it with nostalgia by 2080. Imagine what that means for people in the tropics, let alone in this country.

Among most of the scientific community and Governments worldwide there is no longer any real doubt that the climate is changing largely because of the actions we take. Science can't be 100 per cent certain and never will be. The point is that we know enough to be convinced.

These are the kind of impacts we could be looking at:

A million species - such as polar bears - extinct within fifty years.

Towns and cities disappearing off the map.

Hundreds of millions of refugees seeking help and homes.

And severe knock-on economic effects.

Of course there is a debate on the costs and benefits of specific policies to tackle climate change. But there should be no argument now that we need to take action. To be effective, that action must be local, national and international.

And there is an economic case for action too. The recent Stern review made it clear that the science and economics add up to a compelling argument to cut emissions across the world - and quickly.

Against the doom and gloom of what could happen, the central message of Stern is essentially optimistic. There is still time to prevent the worst effects of climate change. We cannot do this by standing in the way of development or progress. Nor by loading costs on low income families. Quite the reverse.

Action on climate change is an opportunity to develop new technologies and jobs for the future. These are highly exportable products and skills. And we need to combine this with promoting social justice and a better quality of life for less well-off people, at home and overseas.

Sustainability means bringing together environmental, social and economic factors. The UK environmental industry is worth £25bn - roughly the same as the pharmaceuticals or aerospace sectors – and employs 400,000 people. Government research indicates this market may almost double over the next ten years [to £46bn].

Of course, Government can't do this alone. Everyone from individuals to Tesco, from councils to multi-national corporations must do their bit and more. This message is getting through loud and clear to an increasing number of citizens and companies. But there is more to do.

In a recent poll on public perceptions of what will threaten their well-being, climate risks are rising higher among their concerns. Attitudes have changed a great deal but this doesn't always translate into action - we have to make it easier for people to translate their concerns into actions they can take.

Big business and local authorities are beginning to make significant changes and send out the right messages. Not only does it make sense but it is also a strategic opportunity. They're beginning to do their bit as well as responding to consumer pressure and identifying new ways to gain competitive edge.

That's something we can also see happening in the property sector - and we warmly welcome the establishment of the new Green Building Council. Local authorities too are taking action across the country and many communities are not waiting to be told.

These moves in business and among some pioneering local councils and communities are very welcome. At national level we in Government must take a lead and set out a clear strategy for climate action. That is what we are doing. We've been playing a leading role internationally - and the EU is now committed to ambitious targets for reductions in emissions and increases in the use of renewables.

The move to zero carbon homes is an important part of our strategy. Homes account for more than a quarter of the UK's CO2 emissions. By 2050 one third of the homes in the UK will have been built between now and that date. So new build is crucial. To meet our national and international targets, we need a step change in housing standards.

And we have to achieve this at the same time as building more homes. I believe that everybody has a fundamental human right to a decent home. That should be their expectation, and nothing less is acceptable. So the second major challenge, alongside combating climate change, is to build enough affordable housing for the next generation.

In some ways they appear to be challenges or tensions pulling in opposite directions. Nobody said it was going to be easy! We have to achieve some difficult balances. But the scale of each challenge actually helps the other. We need more houses - and we need the economies of scale that will bring down the costs of low and zero carbon development. The two goals support one another. But if we don't act decisively now, both issues are in danger of reaching crisis point.

We can use the need for building new homes, and for refitting existing homes, to develop new and sustainable technology. That means putting in place the right incentives for the market to invest in new technologies. We will also provide information to help communities, businesses and individuals take the action needed.

Last December we launched our policy package Building a Greener Future. The package comprised: a draft supplement to Planning Policy Statement 1, on climate action and the role of planning, the final Code for Sustainable Homes, plus - and this is a first for any country - a target date for all new homes to meet a net zero carbon standard.

Our plan is for Building Regulations to reflect the target through a number of steps over the next 10 years, to reach zero carbon in 2016. The Code gives a preview of the standards to reach at dates between then and now.

Let me make it clear that by 'zero carbon' we mean three things: that a home produces net zero carbon dioxide emissions over the course of a year, that this takes into account all the energy used in the house - for lighting, heating, cooling, cooking, running the TV, and so on and that low and zero carbon solutions can be developed across a site, not necessarily for each individual home.

Our current proposals will cut the country's carbon emissions by around 7 million tonnes a year by 2050. That's equivalent to more than the annual total emissions from the 8 largest English cities outside London.

We are working at a very practical level on the delivery of our 2016 policy. We know there must be a clear path forward and supporting policies, like guidance, in place. The 2016 Taskforce is identifying potential barriers and looking at ways of reducing them. These might include energy supply, capacity and skills, research needs and, not least, consumer preferences.

We also understand the need for incentives. The Chancellor's announcement that he will exempt zero carbon homes from stamp duty will give a significant boost to take up, for example. We are also aiming to link Energy Performance Certificates to grants and loans - such as grants from energy suppliers, to green mortgages from high street lenders.

New homes are very important, but, of course, they are not the whole story. Two-thirds of the homes that will be standing in 2050 have already been built today. And, besides homes, there are all the offices, shops, factories and public buildings that are part of life in our communities.

As the Chancellor noted in his recent speech to the Green Alliance, we will need to greatly reduce emissions from these buildings too, if we are to meet our 60 per cent national emissions reduction goal by 2050.

We will have much more to say on reducing emissions from existing buildings later in the year. And we want to explore how far, and in what timeframe, we can make progress with new commercial buildings being low or zero carbon.

We recognise that it will be vital to work closely with the commercial sector on this. Another key partner is local government. As the strategic leaders of our communities, local authorities are in a great position to bring about changes and help win hearts and minds - and, as a result, people's behaviour. And that is what we need.

I believe 2007 will go down in history as the year when the world finally woke up to the scale of the threat of climate change and started to take action. In this country we have begun. Public awareness is growing and attitudes are turning around. Now we need to go further and faster in every part of our society.

Some key parts of our strategy are now in place. It is complex and ambitious, setting policies not just for sustainable buildings but also for sustainable locations and for sustainable lifestyles and products.

The UK led the world into the industrial revolution. Let's now make sure that the UK leads the world into the sustainable construction industry. Thank you.

Speech by Angela Smith MP on 26 April 2007

3. Analysis of the situation of 8 specific building market sectors

Social housing managed by public bodies

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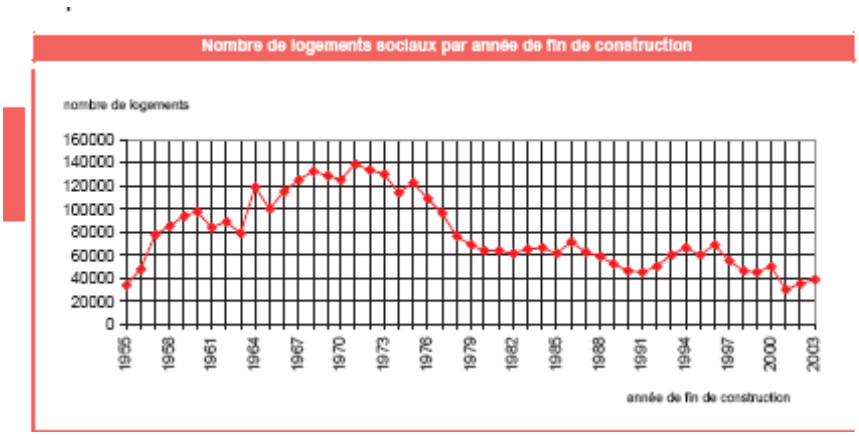
1 Introduction

The social housing occupies a dominating place in the state economy of the construction:

4 million of social housing units are built and managed by different organisms. A big number were built in the seventeen's

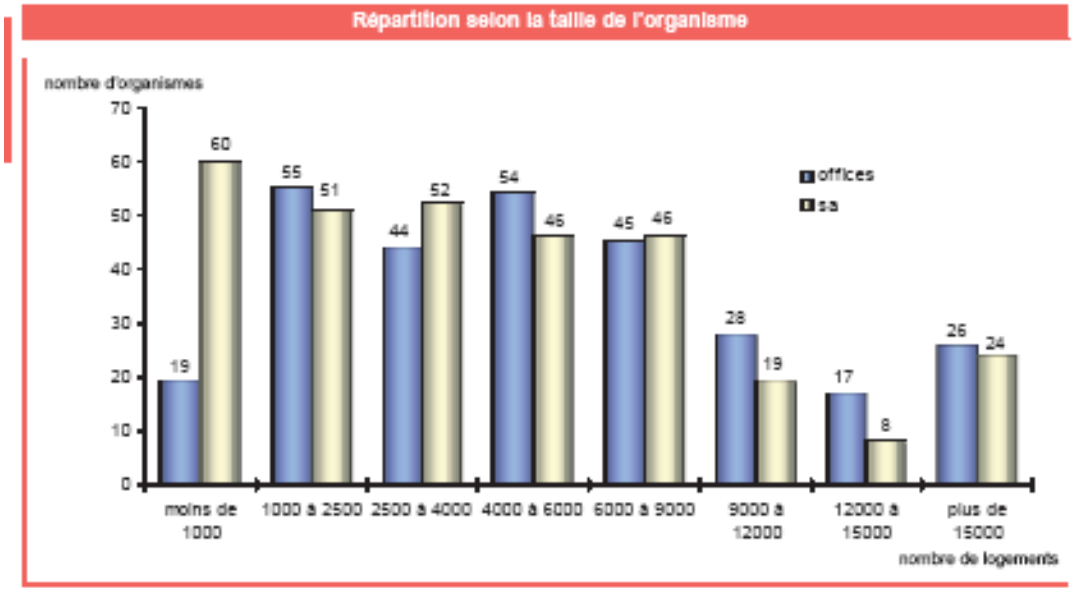
The following graph gives de number of social housing depending on the year of achievement of construction



Two types of organisms are involved in construction and management of social housings:

- Offices (public bodies)
- SA : (private bodies)

The following graph gives the distribution of number of social housings units built and managed by the organisms according to their type: offices / SA, example: 55 offices manage between 1000 and 2500 units of social housings while 51 SA manage the same number of units



2 Identification of the actors

A single public Social housing body owns and manages a large number of buildings. The different actors involved in the decision-taking process for any refurbishment work are:

Actor 1: The chief facility manager. His/her role consists mainly in:

- defining the general management policy of the building stock owned by the public body.
- taking the position on political, financial or social aspects in particular the decision about costs that occur to the renovations

Actor 2: the (local) facility manager of a group of buildings. He/she ensures a similar role as the chief facility manager for the group of buildings. The facility manager has to ensure the follow-up of payment of rents, changes of tenants, liaise with the operation manager of the technical plant and manage any specific work on the building stock. In the case the number of building is not so high, actor1 and actor 2 are the same

Actor 3: the operation manager in charge of one or a group of buildings.

Actor 4: the local authorities: municipalities, town councils, district councils or regional councils.

Actor 5: the tenant or the representative of the association of tenants.

Note: Energy management is not considered as a key issue for the facility managers (actors 1 & 2). There is seldom any « energy unit » or person in charge of energy issues within the public body. This situation will most probably change with the increasing cost of energy.

3 Renovation of BUILDINGS: Analysis of current situation

3.1 Light renovation: renovation of an apartment flat when there is a change of tenant

The works are mainly dedicated to bring the apartment into to a good state for letting: wall papers, valve and fittings, tiles and carpets, etc...

These works do not often involve the central heating system but may apply to individual heating systems. They include changing the wall boiler, scaling of the heating system or DHW network, changing the heaters for direct electric heating systems.

Renovation of the ventilation system is not part of this level of works in the apartment.

Energy performance is not an issue in small renovation

➢ The actors, their motivations

This type of work is never driven by a need to improve the energy performance of the apartment except for some cases where electric heating systems are used. The main reasons of including the heating system in the renovation works are:

- the heating system is not working properly or is broken down.
- there is a need to improve comfort

The decisions to undertake the works may be included in the master plan of the chief facility manager (actor 1) or may be requested by the facility manager (actor 2) in case of major damages to the apartment.

➢ Barriers and possible measures

The most barriers are that energy performance **is not an issue** in small renovation, there is more often renovation of a whole building rather than of a single apartment. The works that are undertaken when there is a change of tenant must have a minimum cost. The chief facility manager will not indulge into works that will not have a satisfactory return on investment and **that is not valued**.

About ventilation, when there is a central ventilation system (mechanical or natural ventilation), the main barriers for renovation works are:

- ➢ technical constraints and very costly
- ➢ intrusion in occupied apartments
- ➢ impact of the renovation work on all the apartments

Works are undertaken on the ventilation system only in case of very heavy refurbishment of the whole building implying that the occupants are temporarily moved out.

In the case of decentralised ventilation systems, the barriers are mostly technical as there is currently no offer of energy wise solutions on the market.

The following questions remain unanswered:

- What measures will make “energy performance” an important issue in each and every work within an apartment when there is a change of tenant? In other words how provide the public social housing bodies any benefit from the results of the works performed on energy performance in the apartment (return on investment)?

- What measures will promote solutions for renovation per apartment including improvement of energy performance.

- What measures will make the solutions « renovation per apartment » technically feasible and generally accepted by the various actors on energy issues: insulation, heating system, DHW system, ventilation, lighting...?

In the following some suggestions of possible answers to these questions and possible measures against these barriers:

- Show that Energy Performance could be an issue for small renovations by **executing some experiences** and by dissemination of results of these experiences. The experiences should come from concrete studies and should show the **feasibility of measures which improve the energy performance of the renovated flat** and also should list a set of **concrete solutions** adapted to the type of social housings and the type of constraints

- **Value** the works of energy savings (energy performance improvements) : an action could be an adaptation of the rent of the renewed apartment to its energy performance

- Impose to social housing organisms a **minimal threshold of energy performance** in case of rent (could be done in the field of energy performance certificate: The energy performance certificate (EPBD article 7) will have to be delivered when there is a change of tenant. This requirement will most probably urge facility managers to consider energy performance issues during these light renovation works.

- Allow the social housing organisms to realise works for energy performance improvements, the idea could be to transfer a part of the assistant to families for their service charges or of energy consumption to the social housing organisms for energy performance improvements, this measure should be done with no additional cost to the families.

3.2 Heavy renovation

In Germany there are requirements about energy performance in the case of heavy renovation (minimum U values, etc..). National authorities has already **acted and forced social housing body to realise energy efficient retrofits** also heating systems have to be checked and renewed if they perform in a too high emission rate

In France a thermal regulation of existing buildings is under preparation and will enter into force very soon. It will impose minimum requirements for each component that will be changed (minimum U values, minimum boilers efficiency, etc..). The problem is that these requirements are only in the case of renovation, but there is no regulation that requires to renovate 'poor energy performance buildings' and no measure that impose for example social housing bodies to renovate the buildings according some criteria.

3.2.1 Building shell

These are mainly renovation of the building façade and/or the roof.

- **The actors, their motivations**

The motivations to refurbish the building facade are closely related to aesthetic issues and hardly related to energy performance. However, it is quite common that this opportunity is seized to insulate the facade. There is no change of windows during this type of work since the change of windows will imply intruding in each and every apartment which is occupied. Besides, the cost of the additional will benefit only the tenants and not the owner of the building.

The refurbishment of the facade or the roof can be decided solely by the chief facility manager or the local authorities.

- **Barriers and possible measures**

What measures can be developed so that the refurbishment of the building shell will take into account energy performance issues (insulation, air tightness, change of windows, solar shadings, ventilation system with respect to change of air inlets and outlets)

For every demand of renovation of facade or waterproofness of roof, a measure could be to impose a feasibility study of insulation which takes into account various constraints, and to impose the works of insulation if the study proves their technical feasibility.

3.2.2 Heating and DHW systems

- **context**

In the case of central heating systems (most common in social housing), the boiler renewal is usually part of a general planning scheme managed by the chief facility manager (e.g.: change of the boiler of more than 20 years). This decision can also be taken by the local facility manager in case of major breakdown of the boiler.

This work can also be decided by the operations manager if the contract for operation of the building stock is a P4 type (the operation manager can decide the renovation of systems plans)

The other types of works refer to the heating network and the control system. For DHW, the works may include the installation of solar heating systems.

- **The actors, their motivations and major barriers**

The operations manager who decides to change the boiler (P4 type contract) is most likely to be motivated by an increase in the ease of operating the boiler rather than by improving energy performance. In fact, the law does not allow the facility manager to increase the operations fees of the tenant with respect to the investment cost of the boiler. Thus the operations manager will prefer solutions that will bring more robustness to the system, which implies a reduced number of faults and reduced maintenance cost. Solutions that will improve energy performance will benefit only the tenants by reducing their energy bills.

The local authorities have a major role to play to promote energy efficiency via aids to the facility managers. The aids can be direct financial aids or reduced cost of lands for expansion of social housing.

Some regions have developed their internal regulations on the type of works of energy performance that are entitled to aids (type, amount...). A few examples are: renewal of boiler, thermal solar systems, insulation...

The works on the heating network are undertaken mainly because of comfort issues. They are decided by the chief or local facility manager and some times at the request of the operations manager (if no P4 type contract available) or at the request of the associations of tenants when the thermal comfort is very poor.

The setting up of a control system does not imply a very high investment in general and the impact on the energy performance is very quick. This is an important criterion for the facility manager and the operations manager.

Introduction of an energy management policy is decided by the chief or local facility manager. The motivations are two-folds:

- On a short term basis: decrease of operations fees for the tenants and thus avoiding unpaid rents.

- On a longer term basis: reduce the dissatisfaction of the tenants, reduce damages on the heating system and on the building shell

It may happen that the operations manager, whose contract contains a target operations cost, sets up an energy management system, or undertakes works on the heating system. In practice, the operations manager seldom does specific works even if there is a target operation cost as the penalty is not deterrent enough and does not entail a breech of contract.

- **What measures are suitable against the barriers?**

The barriers are mainly economic issues. The measures must motivate the investor (actor 1) or the operations manager (actor 3) for energy performance goals

The measures already suggested in the case of small renovation about valuation of the works on energy performance of the building and about link between assistant to families and assistant to organisms are still validate in case of huge renovation

Measures must facilitate the renewal of contracts of operation managers who take into consideration energy performance and a sharp management of energy bills.

A measure should make energy management policy mandatory for social housing organisms: follow-up of energy bills, follow-up of the operation of the building, setting up criteria on energy consumption, remote data logging and analysis etc...

Measure about return on energy performance investment: legal measure should be organised, it should allow the organisms to take benefits on energy cost reduction (benefits only for tenants actually) due to energy performance improvement

4 The situation in England

Background

over the last 8 years or so the majority of social housing has passed from ownership by 'local authorities' into the hands of privately managed 'housing associations', which although private organisations, are run on a not for profit basis, and heavily regulated by a specially created agency called the Housing Corporation.

The Housing Corporation in England has been responsible for pushing the fuel poverty / affordable warmth agenda strongly to all housing associations, which has resulted in big improvements in energy performance. This has been helped by a substantial release of cash by the effective 'privatising' of social housing, when ownership changed from local authorities. This substantial cash injection has been used for major housing improvement programmes, including a substantial element of energy related measures

The energy performance measures

The Housing Corporation is in a position to require certain minimum standards on housing, including those relating to energy performance. For instance, the Housing Corporation requires all housing **associations to report annually on the average 'SAP' score of all their properties** (a measure of their relative energy performance). Although no minimum score is required (yet), it focuses the minds of housing associations who must at the very least measure their SAP scores (and hold basic records of installed energy performance measures on a database).

It also published a target some years ago for 70% of all housing associations to produce 'Affordable Warmth' strategies by 2004 - which although not mandatory, had the effect of kick starting many housing associations to think about affordable warmth and how they could deliver it. ESD recently produced a summary of the status of these strategies for the UK's Energy Saving Trust - and the results were very encouraging.

In the UK the Energy Efficiency Commitment has also the effect of providing substantial cash investment each year (in the order of €700 million) in energy efficiency improvements - much of which has to be achieved in the social housing sector. Energy suppliers have targeted social housing managers to provide substantial match funding to annual maintenance programmes - for basic measures such as cavity wall insulation, loft insulation (or top up), boiler replacement (with A or B rated boilers), and improved heating controls - often amounting to several hundred thousand pounds a year for major housing associations. This has provided a real boost to energy improvements in the sector, especially when linked to all the other 'non-economic' drivers

In England and Wales the 'Decent Homes Standard' has also had a big effect on delivering basic energy measures - namely loft insulation, cavity wall insulation, and an 'effective' heating system. This standard applies across all social housing - including local authorities AND housing associations

The Government's Fuel Poverty Strategy has also been a strong driver for pushing 'affordable warmth' up the agenda.

Also, 'culturally', it seems fair to say that it is seems more widely recognised in the English social housing community that real quantifiable benefits can accrue to managed housing providers for improving energy performance, even though the reduction in fuel bills is enjoyed solely by the tenant. For instance, it's pretty well recognised that improved thermal comfort can help decrease property 'turnaround time' (tenants stay longer in comfortable homes), and decrease the time a property remains empty (or 'void') (since comfortable homes let quickly), both of which reduce costs for housing associations. Warm, dry homes also have reduced maintenance problems (from condensation and mould growth), and modern, efficient boilers require less maintenance and call-outs. And improved homes translate into improved asset value. These arguments seem to be well made and well won among UK social housing managers (even if there is still some way to go).

There is also talk in England (although no action yet) of introducing a provision where energy performance improvements can be translated directly into (limited) rental increases (by adjusting the formula by which rental charges are calculated, by the Housing Corporation) - to reflect the investment made, and 'share' the returns with the tenant.

5 Conclusion

the social housing sector in England is beginning to be strongly regulated in terms of energy efficiency , it is generally ahead of all other residential sectors in terms of its approach to energy efficiency improvement

Residential sector - Owner-occupied residential buildings: the problematic of lack of enthusiasm and the invisibility of energy saving measures.

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1 Introduction

Various barriers can be identified that are related to energy saving in existing buildings. Some barriers are related to specific building categories (e.g. social housing or apartment buildings) with their corresponding actors (e.g. renters, (co-)owners, housing cooperation, local council, etc). Other barriers are more general. Actions to overcome the barriers can also vary with the type of actor and with the building category.

This document focuses on the typical barriers related to owner-occupied residential buildings. What is it that keeps this group from carrying out energy saving measures and what actions can stimulate them to overcome these barriers.

The barriers will perhaps be partly culturally motivated. And especially the solutions can be different from country to country. Therefore we have looked at the owner-occupied residential buildings from Danish and Dutch points of view. The situation in these two countries is described in Chapters 2 and 3 respectively. General conclusions from the two views are given in Chapter 4.

2 Owner-occupied residential buildings in Denmark

2.1 Introduction

Most building in Denmark are owner-occupied. The major group of owner occupied buildings consists of single family houses in form of detached or semidetached buildings. Minor groups consist of owner occupied flats and housing co-operatives. Distinctive for owner occupied buildings is that the owners may use the building for years or maybe whole life without feeling any special incentive to improve the energy performance of the building. Indeed, renovation takes place, most often in the first years of the ownership. Usually energy improvements have high priority. in situations of opportunity. These situations can be *out of necessity* or *out of desire*. *Out of necessity* are on one hand urgent maintenance like repairing of leaky roofs or worn-out boilers and on the other hand need for enlargement of the building caused by a growing family. *Out of desire* are usually extensions, new kitchens and bathroom, new facades and new roof and windows. Energy performance improvement can be part of both urgent maintenance and desired extensions. But in no case, energy performance has necessarily the highest priority.

Significant for owner occupied residential buildings is that the road from decision to implementation is short. Moreover the investments in building improvements and the benefits concern the same person. The exception is housing owner occupied flats and co-operatives where proposals for changes have to be presented, analysed and discussed in the owner group, and before execution voted for or against.

2.2 Identification of the actors and their motivation

Actor 1: Building owner

The building owner is comprised of family members. The family is the financial unit that will profit from energy performance measures that is carried out. In Denmark due to increasing values of a property, almost all property owners can mortgage in the building for instance in order to do renovation. In this way 'old' owners have usually a much larger value free for new investments than 'new' owners. Nevertheless new owners are usually more motivated to do renovation.

Moreover, since 1997 all buildings in Denmark that have changed owner are 'equipped' with an energy label. This is an element of the mandatory certification scheme that also includes a list with cost effective savings. Taking the energy certification into consideration and the incentive coming from this, the motivation to improve the energy performance of the buildings are still limited among building owners.

Actor 2: Local authority

The municipality is the local authority concerning building regulations and building licence. Moreover, many municipalities are involved in Agenda 21, green city and green municipality activities. Thus the green initiatives very often are focusing at energy performance in building for instance in connection with energy saving campaigns.

Actor 3: National authorities

The national authorities (Ministry of Economic and Business Affairs) have set the building regulation code and the requirements for the energy efficiency of the building. The code has newly been revised according to the EPBD. In Denmark this has upgraded the requirement for energy efficiency concerning the building envelope. The rules of energy requirements have been tightened and the requirement of a maximum heat loss frame has been replaced

by the requirement of a maximum energy frame. Following the EPBD-requirement this means that use of electricity for operation of the building, multiplied with 2.5, must be included. Moreover, the Danish Energy Authority has been responsible for a revision of the Danish energy labelling scheme according to EPBD.

Actor 4: Energy labelling secretary

In Denmark, a national energy labelling secretariat has the authority to implement the labelling scheme, guarantee regular certification of buildings including drawing up an energy label and to take care of registered data.

Actor 5: Product information and consumer organisations

Consumer organisations can influence the owners to initiate or at least be positive towards energy improvement of their buildings by giving information on energy savings and product information. In Denmark, Byggecentrum (Danish Building Information Centre) and Elsparefonden (Electricity Saving Trust) are important energy information agencies concerning energy savings. Recently, also The Ecological Council has brought out advices about energy improvements of homes.

Actor 6: Local craftsmen and energy supply companies

Usually, local craftsmen are the first actors that building owners consult when they intend to carry out energy improvement of the building. So far advice given by the local craftsman can be crucial for a satisfactory renovation of the building that takes energy efficiency into consideration. Still local craftsmen do not initiate energy saving unless they are partners with energy supply companies like a natural gas companies. Thus worn-out boilers or transfer to gas heating can involve craftsmen who can both give advice about new boilers and advice about purchase of hot-water tanks for combined use of solar and gas heating. The energy supply companies have a new agreement with the government that implies energy savings of 3.0 PJ/year in 2006 – 2013. The energy saving measures cover everything from information campaigns to technical savings including savings in the supply network.

2.3 Barriers, possible measures to overcome them and reinforce incentives

The barriers discussed here are barriers identified through questionnaires performed by the Danish Building Research Institute (SBi). Many explanations for the priorities were mentioned and some selected are presented in the following:

- ”We know, we know very well, but first of all we must finish the kitchen. The old one was beneath standard - and indeed, also the bathroom is ..
- ”We don’t let in workmen - they are too expensive and their work too slovenly made. Half of the workmanship must be redone afterwards”
- ”It’s OK, but there is only one problem: It will be charm less, ungraceful or even ugly”
- ”Well, as soon at we have time. You know, we have to do it ourselves. Maybe in a year or two”.
- ”We have already done a lot. For instance, we changed the windows - with nice bars”
- ”It will come one day, when we are going to convert the first floor anyway”

To distinguish between different kinds of barriers, among other models, at barrier model was set up, see figure 1.

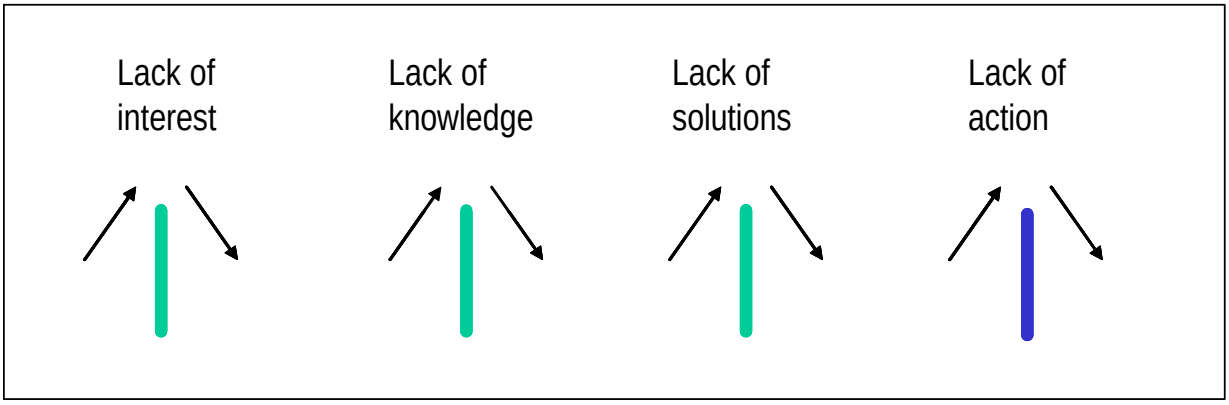

Figure 1. The barrier model.

According to the barrier model a hierarchy of barriers exists for owners in owner occupied residential buildings. These are lack of interest, lack of knowledge, lack of solutions and lack of action.

Barrier 1: Lack of interest

Lack of interest is probably the most difficult barrier to overcome. Lack of interest very often refers to lack of economical or mental resources of the building owner to focus on the subject of improving the energy performance of the building. To be specific, elderly people, people without job or people in a living situation where social or economical problems have the highest priority can be identified as people without interest. To overcome this barrier, no measures concerning energy performance are within reach.

Barrier 2: Lack of knowledge

Many building owners are well informed at a general level. However lack of specific knowledge, concerning energy consumption, economy, handcraft, architecture and other things might be exactly those barriers that stop people from carrying out energy performances. To overcome this barrier, more information and more education probably is necessary.

Barrier 3: Lack of solutions

This barrier refers to people that have interests and knowledge, but cannot identify solutions that is adequate to their house for instance concerning the architecture or the specific construction. To overcome this barrier, more information and more education probably is necessary.

Barrier 4: Lack of action

Very often the final barrier of the model: Lack of action is identified with lack of money. Nevertheless, this is not always the case. On the contrary, money is usually not a barrier, not at least in Denmark where the "free values" in most houses is considerable. Lack of action is

more about 'tiny excuses', or put otherwise, building owner has money, but when spending money it seems important, that the improvements are visible.

Unfortunately, most investments in energy improvements are not visible like a new facade or a new kitchen. If the energy performance of a building could be made more visible, this barrier might be overcome.

2.4 Actions

To overcome the barrier, a variety of more specific actions may be carried out. Some ideas are:

- *Energy labels available on the Internet*. Property values and building information are already available at the Danish public building server (https://www.ois.dk/). Correspondingly, energy certificates concerning the energy label could gradually be downloaded at the server. This way it will be possible for property owners to comparer the energy performance of their building with similar buildings in the neighbourhood or similar buildings in other places. Moreover the information could be used for benchmarking.
- *Visible meters in the home* showing the actual consumption of electricity, heat and water. In this way it will be easy for the building owner to follow the development of energy consumption and be aware of energy waste and energy saving possibilities as well.
- *Energy measure allowance*. By deduction of expenses used for energy saving measures building owners were given an extra stimulus to carry out energy saving measures.
- *White certificates.* Ordering each of the energy suppliers to reach specific energy saving targets, suppliers will compete to be the best to carry out energy saving measures for the end-user, and thus pay the end-user with "white certificates" for performed and documented energy savings. The implementation of white certificates will hopefully promote energy saving measures in buildings.
- *Progressive energy taxes*. Energy taxes have since long been implemented in Denmark. These taxes are usually three times the actual cost. Therefore energy taxes in Denmark have a tendency to bring about social imbalance. Consequently, progressive energy taxes with a low tax on consumption below average and high tax on consumption above average may comply with this and at the same time make it more profitable to save energy and carry out energy measures.
- *Annual consumption available at the home page* of the energy suppliers. Energy suppliers already render information on electricity, gas and district heating consumption for the actual and previous years. This service might be extended so that the individual consumer could compare with similar buildings, similar family sizes and other different locations.
- *Property tax depending on the energy efficiency of the building*. As already known from car duty, property taxes might depend on the energy efficiency of the building, i.e. the energy label. This will make the energy performance of the buildings much more visible and obviously generate interest in energy saving measures

3 Owner-occupied residential buildings in the Netherlands

3.1 General question

For house owners in the Netherlands financial aspects are still the most powerful motivation to take energy saving measures. But why is it that energy measures with a reasonable payback time are not raised to a standard when houses are improved?

3.2 The actor

The actor here is the private owner of the building who also is the user and has intentions to make improvements to his house.

3.3 Type of improvement

The work varies from light maintenance (refurbishment and retrofitting) of the house to heavy renovation.

3.4 Motivations

There is a clear distinction between the motivation of an owner to make improvements to his house and the motivation to carry out energy measures only:

Motivation for improvement: The main motivation for improvement of private owned houses is to improve the quality of the building resulting in higher marketability, a higher comfort level and a more healthy living space (moisture problems etc). Also architectonical improvement may be a motivation (like cleaning the façade and redoing the pointing), resulting in higher living satisfaction and also higher marketability.

Motivation to take energy saving measures: The choice to take energy saving measures is often not made because of the energy saving aspect of the measure, but because of other aspects, like described above: improving quality, higher marketability, higher comfort, etc. The fact that a measure also saves energy is a welcome bonus, but often not the main argument. Besides quality aspects, the main motivation to take specific energy saving measures is the financial advantage on the long run. Two barriers described below play a role in the decision process here: the initial investment costs and ignorance about the possibilities, the payback times etc. Initial investment cost is the number 2 barrier mentioned by the consumers why they do not take energy saving measures [1], see paragraph on barriers below.

3.5 Description of the barriers

Various barriers related to energy saving measures can be distinguished:

- Low priority and lack of interest:

  Energy saving is not a big issue. A resent survey among a large group of consumers [1] showed that the most important barrier to take more action to save energy (in general) is that consumers have the opinion that they are already doing enough to reduce their energy use. According to this study ca. 75% of the Dutch residents have this opinion. So even though they have intentions to improve their house, energy saving measures is not on the priority list

- Ignorance:

  The idea of house owners that they are already doing a lot also has to do with ignorance: The knowledge of the private owner is limited, concerning possible energy saving measures, what to do further and how much to save. And when he wants to do something in order to save energy, it does not go beyond the set of measures which are relatively usual in the Netherlands, namely: Replacing single glazing by high insulating glazing and replacing the boiler for an efficient condensing boiler. Other measures are relatively unknown, or the owner does not know where to go for more information and leaves is at that.

- Deterrent effect of investment costs:

  Private owners who consider taking energy saving measures are faced with high initial investment costs. These high initial costs will often hold back the private owner from taking energy saving measures even though the private owner knows that the investment will be paid back in a couple of years through lower energy bills.

3.6 Actions

A verity of actions has to overcome the barriers. Some ideas are:

- Energy Saving Bank:

  An interesting idea to solve barrier of the initial investment comes from the energy action plan made by a Dutch political party (PvdA) [2]. They suggest to start a Energy Saving Bank, initially funded by the government. The bank will give out loans with very low interest to finance energy saving measures of private owners, like insulation, but also efficient appliances. Paying back the loan can be done with a low interest over a few years using the money saved by the lower energy bill. By making the yearly pay back sum a bit lower than the energy saving, the consumer gets a direct financial stimulation to make the investment.

- Lower the VAT on energy saving products from 19% to 6%:

  VAT of products normally is 19%. Some products, like food, have a VAT of 6%. The government also uses the VAT rate of 6% for products and services they want to promote. E.g.: The VAT is only 6% when private house owners hire a professional house painter to paint the outside woodwork of the house when the house is older than a certain age. In the same way the government can decide to reduce the VAT for the application of specific energy saving measures and the product itself to the lower level of 6%.

- Differentiation of transfer tax:

  When a house is sold a transfer tax has to be paid. This transfer tax is 6% of the selling price of the house. By differentiating the transfer tax for different energy-efficiency levels of the house (the A-G scale on the certificate), energy saving measures give a direct clear financial advantage for the house owner. E.g.: The transfer tax of houses with a good label (e.g. A, B and C) can be lowered and than the transfer tax of houses with bad label (e.g. E, F and G) can be made

higher. Because the transfer period of a house is also a time in which improvement decisions are taken, the incentive of a lower tax can be efficient.

This can also be an action to overcome the split-incentive problem, which occurs when the owner is not the user of the building. In that situation the owner has to do the investment, while the tenant has the financial advantage of energy saving measures. With the tax advantage a financial stimulant is given to the owner.

- Added value of energy saving measures

  It is clear that few people take energy saving measures to save energy. Many house improvements go hand in hand with energy saving though. More awareness should be raised to the added value of energy saving measures to the quality of the house, improvement of comfort and health issues [5]. Examples are [4]:

  - Insulating hot water pipes: this prevents pipes from freezing.
  - Floor insulation: prevents moisture from crawl space to enter the living room. It also prevents a cold floor (no more cold feet).
  - High insulating glazing: improves the sound-proof barrier and improves the protection against burglary.
  - Better insulated frond door: improves the protection against burglary.
  - Draught stripping and anti draught features around the post-box (normally situated as a front door): prevents draughts and improves the sound-proof barrier.

4 Conclusions

Integrating the Danish and Dutch views on why house owners do not invest in a large scale in energy saving measures gives a largely overlapping picture:

In both countries a big part of the problem is the lack of interest and knowledge of house owners. For most house owners, energy savings are not a big issue, which is partly due to a matter of priority, but also due to a matter of a lack of knowing what the possibilities are and what can be done better. Lack of action appears to be the final and crucial barrier, which keeps the Danish and the Dutch house owners from investing in energy saving measures.

The Dutch and Danish views on the reason behind this lack of action are somewhat different:

- In Denmark it is said that lack of money is normally not the main problem, but that house owners most likely want to invest in visible measures like a new façade or a new kitchen, whereas energy saving measures are often not visible.
- In the Netherlands lack of money also appears not to be the issue per se, but the high investment costs are an important barrier to take the measures, even though the owner knows the investment will be paid back through lower energy bills. Like in Denmark, investments are most often made in visible measures.

Measures that are suggested by the Danish team are measures which increase the visibility of the energy use of houses, like visible meters, extra information via internet on energy use, etc.

Measures suggested by the Dutch team concerns lowering the investment barriers,by providing low-interest loans and lowering VAT on energy saving products.

For a complete list of suggested measures: see Paragraph 4 and 3.6 for the Danish and Dutch suggestions respectively.

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Residential sector – owners with no financial possibilities

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1 Identification of Actors

This case study examines the case of owner occupiers living on low incomes or in fuel poverty, who have either very limited or no available income to invest in energy efficiency improvements. They own their own property, so are solely responsible for making any improvements, yet are not, for whatever reason, in a position to finance them.

It is estimated that some 4 million people live in fuel poverty in the UK, of which some 60% are in the owner occupied sector. The Government's definition of fuel poverty is where an individual or family needs to pay more than 10% of their total income on fuel bills in order to maintain an adequate degree of thermal comfort.

In addition to those living in 'fuel poverty', many individuals and families exist on sufficiently low incomes that they would find it extremely difficult to raise the necessary finance to invest in all but the most basic energy efficiency improvements.

This case study highlights the barriers, motivations and some possible solutions to improving energy efficiency within this sector.

2. Barriers to improving efficiency:

The principle barriers to improving energy efficiency within this group of actors include the following:

- Lack of available income to finance energy improvement measures
- Lack of financial support or incentives available (such as full or partial grant payments for energy measures)
- Lack of awareness of available financial incentives
- Absence of low or zero interest loans for energy improvement measures.
- Lack of awareness of low or zero interest loans.
- Absence of an established market for 'energy service contracts' (whereby investments made by third party and benefits in terms of reduced fuel bills shared by both parties over a number of years, via fixed price, fixed term contract).

3. Motivation to improve energy efficiency of property:

- Reduced fuel bills – this should be a major driver for households on low incomes.
- Improved thermal comfort, including enhanced well being as well as health benefits, especially if household includes young, sick or elderly individuals.
- Reduction of internal problems such as condensation related damp and mould growth.
- Improved asset value (especially if energy certificate can reflect improved performance!).

4. Possible measures to overcome the barriers

- Energy Service Company (or other third party) to finance the improvements in return for a fixed term, fixed price energy contract (which recoups the initial investment over a given 'payback' period, and shares the benefits in terms of reduced fuel costs with the customer). Such 'energy service' type contracts have been discussed in the UK, and are more common place in the industrial / major energy user sector. However as yet, such arrangements for domestic/residential customers are rare if not non-existent. Such an arrangement has the benefit that the customer is protected against making large up front payments, and both parties can share in the financial savings made. However, it requires a customer to sign up for a fixed period of time (over which the investment can be recouped), which is 'culturally' goes against the grain in the UK climate of privatised energy utilities. Therefore no major utilities have yet marketed such an approach on a significant scale.
- Low interest loans – finance for improvements could be provided by a third party (such as a local authority, ethical bank, mortgage provider, etc) on a low-interest basis, enabling homeowners to finance improvements and pay back the loan with the savings made in fuel bills over a number of years. This approach has been tried in the UK, but take up is often low because:
    - The financial benefits of energy improvements / lower fuel bills are generally not sufficiently appreciated (although this perception may begin to change if fuel prices continue to rise).
    - Thos on low incomes are often reluctant to take on debt responsibilities.
- Grant payments – full or partial grant payments could be made available towards energy efficiency measures. In the UK grants are generally available through the energy utilities (often targeted at homeowners on a regional basis, in partnership with local authorities), as a result of the Energy Efficiency Commitment (EEC). The EEC is a statutory obligation which requires them to achieve a certain level of energy efficiency improvements in the domestic sector each year. This has provided substantial investment in domestic energy efficiency improvements since its introduction in 2002. However, much of the improvement has been in the social (/managed) housing sector, where increased economies of scale can be realised. Take up in the owner occupied sector has been slower, partly due to lack of awareness of the grants available, and partly because even when heavily subsidised,

energy efficiency improvements are often not sufficiently valued to be considered worthwhile. To be effective in the owner occupied sector, grant payments and their benefits need to be well publicised, ideally in partnership with other agencies, such as health agencies (doctors, health visitors), social workers, local authorities, citizens advice bureaus, faith organisations (eg churches), local environmental groups, suppliers of insulation and heating products and services. Ideally this should be accompanied by national efforts to raise awareness of the benefits of energy efficiency (e.g. the national television advertising campaigns that have been run by the UK's Energy Saving Trust).

- Energy advice – in many cases, lifestyle changes can be made that reduce fuel bills (so freeing up available cash for energy efficiency improvements?) without any up front payment. In these cases, targeted energy advice (such as the free home energy checks and follow up advice available through the Local Energy Efficiency Advice Centre Network in the UK, managed by the Energy Saving Trust).

Apartment buildings – the problematic of the co-ownership and decision making within apartments

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1 Introduction

Apartment buildings that are not owned by a single proprietor who is authorized to let the different apartments, but feature mixed ownership by various owners instead, pose special challenges to renovation opportunities. This is due to the fact that any planned modification of the building (building shell or HVAC) might require the unanimous or majoritarian acceptance of the owners[7]. If the appearance of the building is affected, the co-owners have to agree in any case. The owners meet regularly and the proposals for changes are presented, analysed, discussed and in the end voted for or against. This is true for any kind of renovation measure or addition to the building; the following short analysis, however, focuses on energy-efficient renovations.

This document was written from a German perspective. To widen the scope, additions were made from a Dutch perspective where the situation in the Netherlands differs from the situation in Germany. The Dutch remarks are marked by the national flag.

2 Identification of the actors and their motivation

Actor 1: Apartment owners

The apartment owners form a very complex group of different subjects with heterogeneous social, financial and educational backgrounds, belonging to different age groups. Therefore, their environmental consciousness, that means the interest they take in the energy efficiency of their building because of non-financial reasons, mostly differs. Financial differences influence the approval of possible retrofit measures. While some apartment owners do have resources to finance such measures, others do not or have different plans for their money

[7] According to German law the modifications are divided into:

- Changes that have to be agreed unanimously: changes that influence the stability, the security or the architecture (e.g. changes at the façade), changes that reduce the daylight availability and changes that lead to an advantage or disadvantage for a single owner.

- Changes that have to be agreed by the majority of owners: e.g. renewals/ improvements of the heating system and ventilation system

- Changes that do not require the consent of other owners: new glazings, measures inside of the apartment such as for example new lighting systems, heating control, internal insulation, etc.

In NL such division is not made. The association of owners of a certain property makes regulations, which describe on what terms decisions on maintenance and renovation are made.

right now. The age of the owner may also lead to different perspectives on the timing of costly retrofit measures.

In Germany, the owners of such apartment buildings featuring joint ownership have to provide a financial reserve so that necessary renewals can be paid. However, this reserve is limited, which reduces the possibilities for taking energy-efficient measures to improve the building. The reserve per year has to be equal to 1 % of the investment for the new building.

In NL apartment owners are obliged to form a so-called association of owners. This association makes it mandatory to have a reserve fund for large maintenance. How large this fund has to be is not fixed at a percentage per year.

If the owner is living in his/her apartment he/she will profit from energy efficiency measures. Therefore, the actor category 'apartment owners' has to be subdivided into:

Actor 1a: Apartment owners living in their apartment and

Actor 1b: Apartment owners letting their apartment

There are different rules in the MS for the transfer of the costs of renovations to the tenants. In Germany there is a rule that the investment costs of renovations (including energy efficiency measures) can be transferred to the tenant by increasing the rent up to 11 %. Other countries do not have such possibilities. In NL only investments, which improve the convenience of living can be transferred to the tenant. Lower energy bills are not part of this. In any case, the transfer of costs is limited. If the owner occupies his own apartment he will benefit from reduced energy consumptions and less operating costs after energy efficiency measures have been taken; hence, he might have a greater interest in implementing such measures.

Actor 2: Apartment tenants

The tenants are interested in reducing their energy consumption costs, but have no real influence on the decision of the owners. Measures that affect their living habits (like replacing windows or making changes inside the apartment) might not be favoured by the tenants. However, they have to accept some of these measures.

Actor 3: Property manager

The property manager takes care of the maintenance of the building and the conservation of the value. He proposes necessary changes to the building and prepares the decisions during the owners meeting.

Actor 4: Association of tenants

The tenant association is consulting the tenants. Additionally, it takes part in the preparation of new regulations such as the German 11 % cost transfer of retrofit measures.

Actor 5: Association of apartment owners

This association is representing the owners during the preparation of new regulations and also offers advice regarding their problems.

Actor 6: National authorities

The national authorities set the renting rules and define requirements for the energy efficiency of the building, such as the national implementation of the EPBD. In some

countries this includes upgrades of the energy efficiency of the building (possibly of the building envelope and/or HVAC systems).

Actor 7: Financial institutions

Banking establishments may influence the owners by offering cheap loans for energy efficiency measures. These institutions may be governmental (e.g. the 'KfW Promotional Bank' run by the German Reconstruction Loan Corporation, KfW) or private (e.g. the German 'Ökobank'). In NL initiatives like this are starting on a small scale.

Actor 8: Information sources such as media, consumer organisations, lobbyists

By giving information on energy savings and environmental influences, these organisations can influence the owners to be more positive towards energy efficiency investments.

Actor 9: Insurance companies

Building insurance companies could offer lower insurance rates after energy efficiency measures have been taken. The idea is to reduce the re-insurance rates due to fewer environmental catastrophes like floods or thunderstorms caused by the global warming. This is however still an idea, only and not yet realised for example in German. In NL this is not yet seen.

3 Barriers, possible measures to overcome them and to reinforce incentives

The barriers discussed here are based on the special problem posed by the mixed ownership of this type of buildings. General barriers (such as poor cost efficiency of the measures due to low energy cost rates, insufficient quality of information offered concerning energy efficiency retrofits etc.) will not be touched.

Barrier 1: Difference between the ownership and the usage of the building

In many cases, the owner has let his/her apartment he/she will not profit from the reduced energy costs due to energy efficiency measures. Therefore, the motivation to start this type of retrofit is not very high.

Possible measures to overcome that problem include:

- the legal possibility to transfer the investment costs for energy efficiency measures to the rental (see 11 % rule in Germany)
- national legal requirements for energy efficiency measures (rules for upgrades of building and HVAC elements)
- additional information on possible cost-efficient retrofit measures
- visualisation of the energy quality of buildings/ apartments (e.g. with the EPBD certification) and therefore introduction of the energy quality to the rental market

Barrier 2: Necessary acceptance by all or by the majority of owners

As explained in section 1.2, not all measures have to be agreed upon unanimously or by the majority. Measures that are not subject to this prerequisite may be implemented as if the building was owned by only one proprietor. In other cases, the co-owners must either be

persuaded by the importance of the measure - or the legal situation regarding the acceptance of energy efficiency measures has to be changed.

Possible measures to overcome this problem are:

- Alteration of the legal situation: Two ideas are possible:
  a) Retrofit measures have only to be proven to be energy-efficient in order to be granted exemption from the acceptance rules.
  b) Retrofit measures have only to be proven to be energy-efficient and cost-efficient in order to be granted exemption from the acceptance rules. A defined payback time that should not be exceeded is imaginable. The definition of a specified maximum amount of costs is also possible.

  These ideas have to be elaborated in greater detail in order to prevent misusage.
- Better persuasion of the co-owners.
  a) An important actor here is the property manager, as he is preparing the proposals for the decision.
  b) Information sources and the national authorities do also have a certain influence.

 In NL the procedure for decision-making within the association is different. The measures proposed here would probably not work.

Barrier 3: Insufficient financial reserves provided by the owners

The group of co-owners of the building can not easily obtain additional funding for measures at a bank, as they are not a legal organisation. Therefore, most measures can only be realised if the total investment costs do not exceed the financial reserves kept for the building.

Possible measures to overcome the problem are:

- Legal requirement to keep higher financial reserves (different rate for financial reserves, 2 % or similar  or to begin by setting a minimum in NL)
- Facilitation of common bank loans for measures at co-owned buildings. A common entry in the land register (for example divided according to the value of the different apartments) could be made possible. Cheaper loans (see 1.2) could enforce the application of such measures.
- Third party financing (PPP): a model on how to pay back the third party investment has to be developed. Also here, the possible difference between the ownership and the usage of the apartments is a problem.
- Lower insurance rates (see 1.2) can partly compensate for the lack of funding.

Barrier 4: Measures that only save energy for some of the owners but have to be accepted by all (or by the majority) of the owners will rarely be realised

For instance, a typical case is the addition of insulation to the cellar ceiling or to the ceiling to the attic. The resulting energy savings will only influence a few apartments, not all. Nevertheless, the financial reserve kept by all owners would be used for the investment. To some extent, this problem is linked to Barrier 2, but it has a different starting point.

Possible measures to overcome the problem are:

- National authorities could define requirements to specific building components or HVAC components (upgrade requirements). In Germany, a requirement of this type

has already been imposed: The insulation of ceilings to the attic, if the floor is not used for walking but accessible.

- The development of rules specifying the full or partial transfer of such savings, either to the financial reserves or to the co-owners.

4 Conclusions

This report summarises the specific actors, barriers and possible solutions in the field of privately co-owned apartment buildings. Some of the presented solutions are further described by examples applied in Germany. Partly, the differences compared to the Dutch situation are described.

The actors exerting influence on private apartment buildings include the apartment owners (partly living in their apartment, partly letting the apartment), the apartment tenants, the property managers, the association of tenants, the association of apartment owners, the national authorities, the financial institutions, insurance companies and information sources such as media. The main specific barriers mentioned are:

- The discrepancy between ownership (investment) and usage of the building (energy cost saving)
- The necessary agreement of all (or the majority of) owners
- Insufficient financial reserves provided by the owners and
- Measures that will save energy for some owners only, but have to be accepted by all or by the majority of owners.

Possible solutions include the legal possibility to transfer the investment costs for energy-efficiency measures to the rent, national requirements to measures, increase of information concerning cost-efficient measures, visualisation of the energy quality of a building in the rental market, a change in the legal situation concerning the acceptance of measures (no longer all owners would have to agree), and a higher minimum rate of financial reserves.

Apartment buildings – importance of the division of the heating costs

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1 Introduction

In this case we study apartment buildings. The motivation to improve the energy efficiency of these buildings varies over the different actors (only 1 owner, more owners, renter, associations of owners,…). Also the barriers vary due to the different actors. This report focuses on the possible motivation and barriers in function of the way the heating expenses are shared.
First of all we have to distinguish between:

1) buildings with an individual (local) heating system in each apartment
2) buildings with a collective heating system:
    a. the heating costs are distributed based on the measured consumption (at a precise level using energy meters on the hot water pipes in case of a hydronic system or at a less precise level using 'calorimeters')
    b. the heating costs are distributed according to a certain formula ignoring the measured consumption. The most common formula is based on the floor area per apartment. More sophisticated formulae correct for the position of the apartment in the building (e.g. corner, upper floor, etc.).

The heating expenses of the common areas are mostly distributed following to system 2b, but should in general be negligible compared to the heating expenses of the own apartment.

2 Identification of the actors and their motivation

The actors in this case are:

1. Apartment owners

The apartment owner can be one single person or a company for the whole building or there can be several co-owners of the same building. The owner can either live in his own apartment, or let it.
In Belgium all owners of an apartment in the building are represented in the General Assembly of the building, which decides about maintenance and renovation of the building. Each owner has a number of votes in the General Assembly, mostly proportional to his percentage of surface. There is at least one meeting of the General Assembly per year. Extra meetings of the General Assembly may be organised for urgent matters or on demand of at least 20% of the votes. For current matters the General Assembly decides by majority of the represented votes. For renovation a ¾ majority of the represented votes is obliged.

2. Apartment tenants

The apartment tenant can be owner or can be renting the apartment. In the first case we will consider him as owner.

3. Property manager
The property manager (in Belgium called syndicus), appointed by the General Assembly, is responsible for the technical, administrative and financial management of the building, and gives advice concerning renovation and maintenance works to the General Assembly.

4. Association of tenants
The association of tenants is the consulting and lobbying group for tenants. They have an indirect impact on the preparation of regulations and can have an important information task towards their members.

5. Association of owners
The association of owners is the consulting and lobbying group for owners. They have an indirect impact on the preparation of regulations and can have an important information task towards their members.

6. National, regional and local authorities
The national government is responsible for the fiscal taxation and part of the legislation. Regional governments are responsible for part of the legislation and requirements concerning EPBD, energy efficiency and housing conditions. They also can give incentives, subsidies to support the policy of energy efficiency. Local authorities can have an impact on the urban rules, local taxes and subsidies.

7. Information sources: media, non profit organisations, lobbyistes, etc.
Informing about energy savings and environmental topics is influencing the owners and renters and increases their awareness for energy efficiency.

8. Financial institutions: bank and insurance companies
Bank institutes may influence the investor in energy efficiency by offering cheap loans. Some insurance companies lower the insurance rate after energy efficient renovation. This idea is that diminishing the global warming diminishes the chance on environment catastrophes (like thunderstorms) and hence claims. On the other hand the net value of a building increases after renovation, which also has a (mostly increasing) impact on the insurance rate.

3 Motivations to improve the energy efficiency

Firstly, there is a difference between the motivation to improve the efficiency of the apartment (one individual apartment) and of the building as a whole. Secondly there is a difference between apartments with individual heating systems and with a collective heating system. And last, the way the heating costs are distributed is a parameter.

3.1 IMPROVE THE EFFICIENCY OF THE APPARTMENT

OWNER

The owner's motivation could be financial; since the improving of the efficiency could increase the market value of the apartment and could lead to a higher renting level. It is known that one of the only energy criteria tenant verify before renting a specific apartment, is the presence of double glazing. Nevertheless renovation does not automatically increase the renting level, since renting prices can only be adapted after major renovation works have been done. An energy certification system would give the owner a better rating, and thus a higher chance to let his apartment at a higher price.

Subsidies and tax reduction can stimulate the owner to improve the energy efficiency. For real estate companies, other financial reasons (e.g. deduction of renovation costs lowers the taxes) could play a role.
Individual heating system:
When the apartment has an individual heating system, the renovation cost of the heating installation is rather limited, unless the renovation is about changing into a collective heating system, like district heating. For other energy efficiency elements, this fact does not play a role.

Collective heating system:
The way the heating costs are calculated to the tenant, makes hardly any difference for the owner's motivation.

TENANT

The tenant has direct interest to reduce his energy bill. The tenant is also the one with a direct interest to increase IAQ and indoor thermal comfort or to resolve building physical problems.

Subsidies and tax reductions can stimulate him to improve the energy efficiency.
The situation of the apartment in the building from an energy efficiency point of view can be a motivation (e.g. at the corner under the roof) since this determines his direct benefit. In the latter case there could be scenario's where the reduction of his energy bill is negligible, and hence also his motivation.

Individual heating system:
The motivation of the tenant to invest in energy efficiency improvement of his apartment is that he gets 100% of the benefits of the investments. In this case he also gets 100% benefit from a more energy efficient heating system.

Collective heating system
The tenant's interest in renovating depends on the position of his apartment in the building and the way the heating costs are shared. If the heating costs are based on the measured consumption, the tenant could have a direct interest to increase the energy efficiency of his apartment. If the heating costs are not based on the measured energy consumption of the considered flat, the motivation of the tenant is lower, since he does not get 100% return of the efficiency investment but only a percentage corresponding to the formula.

3.2 IMPROVE THE EFFICIENCY OF THE BUILDING

OWNER

The motivations are the same as for the improvement of the apartment (3.1). The higher his share in the building, the higher is his interest.
For real estate companies, other financial reasons (e.g. deduction of renovation costs lowers the taxes) could play a role.
The way the heating costs are distributed is not a major parameter.

TENANT

According to the position of the apartment in the building and the way the heating costs are shared, the tenant can have an interest or not to support works improving the energy efficiency of the building. There are scenario's where the reduction of the energy bill is

negligible, and hence also his motivation; especially in buildings with collective heating systems.

3.3 Motivation of the actors according to their origin:

Non-profit housing associations are judged to be a group with a very positive attitude to implementing energy improvements. The residents have influence via residents' participation in decision-making processes concerning the property, resources are systematically set aside for continuous maintenance and improvements and the investments benefit to the residents through subsequent energy savings.

Housing cooperatives are judged to have a relatively positive attitude to implementing energy improvements. Cooperative housing is often in a better energy condition than owner-occupied flats or private rental flats. Residents benefit from investments through subsequent energy savings. It varies from housing cooperative to housing cooperative whether resources are continuously set aside for maintenance and improvements. But it is possible to raise a loan collectively in the housing cooperative.

Energy saving measures will be at the benefit of the individual flat owners. But owners are judged to have a stronger focus on individual improvements of their own flat than on improvements of the common property. It plays an important role that the investment in energy efficiency measures for each flat individually can be expected to give a return by an increased sale value at a possible subsequent sale.

Extensive legislation exists to regulate housing conditions in private rental housing. The owner decides and should be able to see the benefit of investing in improvements. Investments in energy improvements can lead to increased rent in accordance with the rules about 'added value of the rented property'. The residents enjoy the subsequent energy savings.

4 BARRIERS TO IMPROVE EFFICIENCY

4.1 IMPROVE THE ENERGY EFFICIENCY OF THE APPARTMENT

OWNER

When the owner is letting the apartment, he does not pay the energy bill and hence he does not get the pay-back return of his energy efficiency investment. Normally he does not have the right, neither the guarantee to increase the rent. Only very drastic renovations could lead to a rent increase. On the other hand renovating the building can be synonym of increasing expenses: higher insurances rates, higher taxation rates,…
Certification is still not obliged for existing residential buildings in Belgium, although it will be introduced in the Flemish Region in 2008.
There are no legal requirements concerning the energy efficiency of existing rented apartment buildings in Belgium.
If the renovation changes the structure or the outside of the building or common parts, the owner needs the agreement of the General Assembly.
Even with agreement of the General Assembly, urban regulations can be another obstruction for energy efficiency investments. Regulations can force all windows to be equal or prescribe the minimum distance between the façade and the street which can limit e.g. the possibilities of outside insulation of the facades.

TENANT

The tenant is not the one who decides. Either he needs the agreement of only the owner (when the renovation does not touch the common or structural parts), either the agreement of the General Assembly.
Tenant's investments are not reflected in a lower rent. And investments are considered acquired by the owner when the tenant leaves the apartment. The pay-back time of most investments is longer than period covered by the renting contract.
The time span of and discomfort during the renovation works can be a barrier.
In case of an individual heating system, the barrier for the tenant to change the heating system is lower. Nevertheless he can only indirectly recuperate his investment by his lower energy bill and the investment is acquired by the owner.
In case of a collective heating system and cost distribution based on the measured consumption, the barrier for the tenant to invest in energy efficiency of his apartment is lower. Nevertheless he can only indirectly recuperate his investment by his lower energy bill and the investment is acquired by the owner.
When the heating cost distribution is not based on the measured consumption, the advantage of the investments goes to all apartments, while the investment is 100% his own; this is a real barrier for durable investments.

4.2 IMPROVE THE ENERGY EFFICIENCY OF THE BUILDING

OWNER

The barriers are very similar as for the renovation of the apartment. If the renovation changes the structure or the outside of the building or common parts, the owner needs the agreement of the General Assembly. This General Assembly is a quite heterogeneous group with different interests. There are professional investors versus non-professional investors. The owners do not all have the same financial possibilities, neither the same intrinsic energy efficiency awareness. Older owners have a shorter time perspective than younger ones and do more easily accept existing situations.
Even with agreement of the General Assembly, urban regulations can be another obstruction for energy efficiency investments. Regulations can force all windows to be equal or prescribe the distance between the façade and the street which can limit e.g. the possibilities of outside insulation.

TENANT

In some cases, for the tenant, the investments will not have any energy efficiency improvement for his apartment. When the costs are not based on the individual energy consumption, the return for the individual tenant is only a small percentage of the overall return, which decreases his motivation.

5 POSSIBLE MEASURES TO OVERCOME THE BARRIERS

5.1 FINANCIAL STIMULI

- Fiscal stimuli and tax reduction are stimulating all actors, both owners and renters.
- A system of guaranteed energy savings could help to enhance energy efficiency investments. An existing example of such a guarantee is the Guaranteed Solar Results scheme which is sometimes applied by installers of solar systems (thermal or PV) guaranteeing a certain profit and a financial compensation in case this is not reached.

5.2 REMEDIATE THE CONFLICT BETWEEN THE OWNER AND THE RENTER

Several measures play a role, all establishing a relationship between the investment and the renting level or value:

- Introducing energy certification will increase the intrinsic value of energy efficient buildings for the owners.
- In order to stimulate the owners it is important to introduce the possibility of increasing the rent when energy efficiency improvement investments are done. Nevertheless it is important for the renter that the renting level does not increase more than his possible energy saving.
- In order to stimulate the renters to invest in energy efficiency, it is important to introduce the possibility of decreasing the rent. The amount of the decrease should be in relation with the investment and the extra intrinsic value of the apartment for the owner at the end of the renting contract.
- Installing rules about how the investment and the savings can be shared between the owner and the renter.
- Another useful instrument would be the installation of an authority which proposes and finds solutions in which both the tenant and the owner could benefit. These authorities could to some extent be subsidized by the governments.

5.3 REMEDIATE THE CONFLICT BETWEEN OWNERS

As mentioned above, all measures touching the common or structural parts of the building need to be agreed by a ¾ majority of the represented votes at the General Assembly. This makes that most co-owners have either to be persuaded by the importance and benefit of the energy measurements.

Possible remediation for this problem is:

- Changing the legislation concerning co-ownership in order to favour energy efficiency measures. Several ways are possible, but should be carefully studied in order to avoid abuse:
    - The decision to retrofit is taken by a smaller majority (e.g. 30%) if the measures are proven to be energy-efficient. A minimum majority is still needed in order to avoid misuse.
    - The decision to retrofit is taken by a smaller majority (e.g. 30%) if the measures are proven to be both energy-efficient and cost-efficient. A defined payback time that should not be exceeded is imaginable. A limit to the investment made by this decision could be imposed.
- Creating a better guidance to persuade the other co-owners
    - The property manager has to advice more actively and should give a neutral advice.
    - Information sources and national or local authorities do also have a certain influence.

Another problem could be the financial possibilities of some or all owners. Juridically they do not have a status, which makes it hard to get additional funding as a group of co-owners.

Therefore the financial provision for renovation (which was not legally imposed in Belgium until recently) is often limiting the investment costs. Possible measures to overcome this problem are:

- A legal obligation to have financial reserves which are substantially high enough.
- Facilitate common bank loans for energy efficiency improvements in co-owned buildings. The cheaper the loans, the higher their impact. A common entry in the land register (e.g. divided according to the value of the apartments) could make this possible.
- Third-party financing (TPF) for residential buildings: a third party is investing in the energy efficiency improvement of the building against the payback benefit during a certain time period. A detailed analysis should be made to overcome the conflict between the owners (intrinsic value and investor) and the renters (obtain the pay-back effects)
- A lower insurance rate can compensate for the missing funding. Also a strong increase of the insurance rate due to a higher intrinsic value of the building after renovations, should be avoided.
- It should be avoided that due to energy efficiency improvements, the government increases the rentable value of the Building.

5.4 AN HONEST DIVISION OF THE INVESTMENT COSTS AND THE BENEFITS OVER ALL OWNERS AND RENTERS

Some apartments are benefiting more than others from certain investments, depending on the way the energy costs are shared.
Therefore a solution should be found at:

- Development of rules of how to transfer the savings partly or fully into either the financial provision or to the co-owners (or renters if they invested too).
- The authorities could define requirements for specific building components or HVAC components (upgrade requirements)
- Introducing corrected cost sharing based on the measured energy consumption but corrected for the position of the apartment in the building. This would give a better spread of the benefits over all owners and enhance investments on the building level.

5.5 INFORMATION

- To make sure an energy certification scheme is effective, an information campaign on the meaning of the certificates and on the available energy-efficient technologies are fundamental. Target groups are both the owners and the renters.
- The association of tenants and renters should also inform their members about energy efficiency possibilities and promote demonstration projects.

5.6 LEGISLATION

The government can stimulate investments in the energy efficiency of rented apartment buildings by:

- Introducing a renting range which is related to the energy efficiency level of the apartment, at least starting with the social apartments.
- Improvement and introduction of minimum requirements for letting an an apartment, including at least minimum energy efficiency levels.
- Increasing and stimulating or imposing the energy auditing of apartment buildings in order to make sure that the legislations are followed and to stimulate energy efficiency measures.

- Avoid too strict urban planning rules. It will be very difficult to renovate buildings if there is no exception made on the current rules concerning the distance between the building and the public domain.
- Introducing a tax on real estates being a result of the level of the energy label of the energy certification: High energy performance, low tax.

A concern should be that renting levels may not be too fixed, since then the owners and investors could be losing their motivation to invest in rental buildings.

6 Conclusions

This report summarises the specific actors, barriers and possible solutions in the field of apartment buildings with different methods of sharing the heating costs.

The main actors are the owners and the tenants in different combinations.

The main barrier for energy efficiency investments in apartment buildings is the conflict of interest between who has to make the investment (mostly the owner) and who is benefiting from the investment (directly the tenant by a lower energy cost, indirectly the owner by increased property value).

Several solutions are proposed to overcome these conflicts by improving rules for decision making between co-owners and renters, for adapting the rent, by information and legislation.

Rented office buildings

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1 Introduction

Rented office buildings are an important part of the non residential building stock. There are two main categories of actors to distinguish:

- First, there are all the *real estate investors* (including insurance companies and pension funds) renting out office buildings for the purpose of financial profits. This category is widely spread in all European member states. The tenants define the office building they use as a facility necessary for their primary process. They don't need to invest in a building and are able to use their capital for their primary business. Their housing needs can vary through the years and the office space has to comply with these changing needs. For these organisations, renting an office building is a sensible choice to create flexibility in housing. A frequency of 3 to 5 years for moving from one building to another is not uncommon. During uncertain economical times the share of real estate in an investor's portfolio usually increases. In general the share of real estate in investment portfolios is reasonably consistent.
- Secondly, there are *large organisations* with offices at many locations (banks, insurance companies, semi governmental organisations, etc.) that decide to outsource their real estate management to a separate business unit with the specific objective to provide cost efficient office buildings of a good quality. In general these companies operate mainly or exclusively for the mother company by renting out the offices and thus having much more extended time frame for real estate management; far over 5 years. Strictly speaking they are professional renters as well. Still, this is a smaller section of the office building stock than the first category.

2 Real estate investors

2.1 Identification of the actor

The real estate investor is the owner of the real estate. The investor acquires a building and subsequently rents out, manages and exploits the building during a relatively long period of time. His aim is to realise a profit on his investment. The profit is determined by the combination of yearly takings and the value development of the property during the investment period. This category of renters, including insurance companies and pension funds, is by far the most important. They operate mainly in the office sector and secondary in the retail and catering sectors.

2.2 Management process

In many cases the actual building exploitation of the stock is outsourced to separate organisations. Often there is a division in the technical approach of the building management and the strategic approach. The latter is mainly based on financial considerations. The owner of the buildings negotiates contracts with building exploitation organisations and is in the position to determine the conditions, which form the basis for the building exploitation and the execution of maintenance and renovation activities. The way these building exploitation tasks are commissioned can vary considerably and range from steering from a distance based on budgets to steering on operational level, for which technical guidelines are issued and there are frequent meetings. The owner and possibly the manager in general have a professional attitude to their approach of the building stock and are well aware of the financial aim of the organisation, which is: making profits. Investments always are linked to either increase of the value of the property or increase in the profits from rent or decrease of the exploitation costs as far as this is beneficial to the renter. In some cases the organisation has databases available that can be used as input by the energy consultant. This usually concerns building data like drawings and figures on energy consumption.

2.3 Attitude towards energy saving

Starting from the point of view of the real estate investor the investment aim with respect to investing in energy saving is mainly looked at from the point of financial benefits. Knowledge and advice on energy saving are sometimes present to a limited extent with this type of customer. This means that additional knowledge is required, in which cases non-energetic benefits will be addressed. In considering taking energy saving measures, the balance of cost and benefit plays an important part, not only for the owners, but for the users as well. More insight in the opportunities for a transparent discussion on the division of cost and benefit is an important element in the decision making process. In general energy saving measures are judged on the bases of investment versus saving in energy cost, thus leaving out relevant additional benefits of energy saving. It is therefore important to clearly state which negative or positive side effects come with the energy saving measures. E.g. an improvement in comfort as a side effect of a certain measure is an important factor in such a discussion.

For larger (professional) real estate investors it is highly recommended to focus attention on the possibility for a more strategic approach of the improvement of the energy efficiency. This way the energy aspect can be included in the strategic stock policy and be part of the regular maintenance and improvement plans. Setting up an energy care system is another possibility.

3 Organisation related real estate managers

3.1 Identification of the actor

This type of actor is characterised by a high level of professionalism and a sound knowledge of the exploitation process and the conditions applicable to the buildings. In contrast to the categories of real estate investors mentioned before there is more attention for the needs of the user and the emphasis is more on providing good housing than on the profit target. However, it is expected that the cost for accommodation are in line with the market. Furthermore it is possible that the user can be more involved with the building and its image.

3.2 Management process

This actor is approaching the management process in a very professional way and often formulates targets on a strategic level that will be translated into execution. Regarding a number of aspects knowledge is available within the organisation, e.g. health and safety issues, energy, installations and construction. Usually key figures (e.g. energy consumption per m2, costs) are available within their own organisation.

3.3 Attitude towards energy saving

Depending on the nature of a company there is a larger or smaller tendency to save energy. For a number of companies the balance between investment in energy saving measures and the core-business of the company plays an important role. Despite the fact that attention is paid to energy- and environmental management, often the financial possibilities are limited. However, there are also companies and institutions that have the explicit policy of integrating energy saving into their management activities, in which case certain types of energy care can be implemented as well. In nearly all cases a professional approach to energy saving opportunities is present. The issue of dividing costs and benefits between owner and user play an insignificant role, or is no issue at all.

4 Interventions in buildings

4.1 Minor and major interventions

Interventions in buildings can be divided in:

- Minor interventions consist of incidental and regular maintenance and limited renovation as well:
  Incidental maintenance being measures in order to fix incidental deficiencies like a leaking roof or replacing a pump in the heating system. They are executed on operational level.
  Regular maintenance planned to maintain the performance of the building like painting, replacing the roof cover, regular maintenance of the installation. These activities are described and budgeted in the exploitation planning of the building, on a tactical management level and executed on the operational level.
  Limited renovation activities aiming at an improvement of the building performance like replacement of a boiler with a better efficiency or upgrading the appearance of the entrance of the building.

- Major interventions only consist of major renovations
  Major renovation of the building in order to improve the building performance (functionality, appearance, comfort, safety, etc.). They are decided on strategic level providing boundary conditions for execution in terms of performance improvement and cost and time planning. These strategic decisions are being transformed into plans that are executed on operational level. Examples of major intervention are:
  - changing the interior plan of the building
  - upgrading the overall appearance of the building
  - expanding the building
  - changing the function of the building
  - upgrading the energy performance

4.2 Interventions in buildings and energy saving

In many cases energy saving can be combined easily and beneficially with both minor and major interventions in a building (these situations are also called: situations of opportunity). In case of the replacement of components energy efficient products can be selected (e.g. energy efficient boilers) or insulation material can be added to building parts when an intervention is planned (e.g. add insulation when the roof cover is renewed, add insulation when the outer appearance is upgraded). If the lay-out of the building is changed take thermal zoning into account and adjust the lay-out of the installations in an energy efficient way. This issue of combining energy saving with building interventions should primary be addressed on tactical and operational level. On strategic level however the intention to save energy should be formulated and the policy objectives concerning energy performance should be outlined together with the conditions.

A general issue is the fact that energy saving is often considered as an investment that should be justified by the reduction in energy cost. Next to the obvious direct cost benefits of energy saving measures, a number of additional benefits can be mentioned that sometimes can be a more important motive to execute measures than the energetic one. These additional benefits are of great importance for the implementation of energy saving as they often are directly linked to the primary considerations of the managers of a building: quality for the user and cost. Examples of additional benefits are:

- A better **air quality** when the ventilation system is optimised
- Improvement of **thermal comfort** (during heating or cooling season) through improved insulation levels and a optimised heating system
- Improve **sound insulation** combined with thermal insulation or improvement of the air tightness
- A **better appearance** through the application of external insulation on facades

5 Reducing the barriers

Most of the barriers are of a general nature and apply not only to rented offices.

5.1 Barrier 1 – Awareness

An important barrier is still the awareness/willingness/interest of the actors on all management levels (strategic, tactical and operational) concerning the possibilities of energy saving. Energy saving is defined as a separate issue that makes things complicated. It is being judged on the basis of a too narrow cost benefit perception.

Approach

- Set energy requirements
- Provide know-how on strategic, tactical and operational level addressing the different actors specifically (giving a broader perspective on the cost benefit issue)
- Show practical examples.
- Let ambassadors from the different groups of actors tell the story.

5.2 Barrier 2 – Split incentives

Split incentives of energy saving due to the fact that the owner invests and the tenant primary gets the benefits.

Approach

- Development of contract schemes that allow financial transfer of investments/benefits.
- Provide financing mechanisms to overcome the pay back time and renting period discrepancies.

5.3 Barrier 3 – Lack of know-how and skills in building industry

Most of the time the building industry (producers and contractors) are not proposing to combine interventions in the building with energy saving measures (lack of know-how and skills).

Approach

- Provide know-how and training
- Financial stimulation of the early adaptors in the building industry
- Provide good examples and promotion material

5.4 Barrier 4 – Lack of innovative solutions

Innovative solutions for this integrated approach of maintenance and energy saving in the existing building stock are needed.

Approach

- Define innovation fields with the actors in the market and support innovative developments

5.5 Barrier 5 – Invisibility of energy saving measures

Because of the invisibility of most energy saving measures the promotional power of energy saving has been neglected; a new kitchen or bathroom is a visible upgrade of a building and therefore is very useful for promotional activities, in contrast with the insulation of a cavity wall which is an upgrade too, though invisible and therefore less suitable for promotional activities. Until recently companies have not associated brand promotion with making energy consumption and energy performance visible in accounts, home pages etc. But if this happens to still more companies, then their estate managers have to reflect on this.

Approach

- Visibility (e.g. applying an energy mirror showing actual and real time energy saving of a building), environmental promotion

6 Conclusions

6.1 Actors and motivation

With respect to energy saving two main categories of actors are considered, both having a specific attitude towards energy saving:

1. Real estate investors:

- motivated by realising financial benefits from their building stock
- typically focusing on a short timeframe (3-5 years)
- knowledge on energy saving is present to a limited extent

2. Organisation related real estate managers:

- motivated by providing efficient office buildings of a good quality
- typically focussing on a more extended timeframe (far over 5 years)
- high level of professionalism, sound knowledge of the exploitation process and attention for energy – and environmental management

When considering energy saving measures both types of actors need a specific approach related to their motivations, level of knowledge of energy saving and their timeframe.

6.2 Barriers

The five barriers mentioned are mostly of a general nature and do not apply to rented offices only. Considering the two categories of actors all barriers apply to the real estate investors and some of the barriers apply to the organisation related real estate managers to a lesser extent.

		Level of relevance to ***(+ = highly relevant, - = not relevant)***	
Barrier	**Name**	**Real estate investors**	**Organisation related real estate managers**
1	Awareness	+	0
2	Split incentives	+	-
3	Lack of know-how and skills in building industry	+	+
4	Lack of innovative solutions	+	+
5	Invisibility of energy saving measures	+	0

Educational buildings

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1 Introduction

School buildings operate during the winter, spring and autumn period and present quite high-energy consumptions and specific indoor air quality problems. Studies in more than 1200 buildings have shown that the energy consumption can be seriously reduced when appropriate energy conservation measures are taken, while indoor air quality problems may be improved considerably using very simple measures.

The running of public schools in Greece is a responsibility of the local municipalities. As it concerns technical matters it is assisted by the National Schools authority, while financial issues are managed by the school council composed by representatives of the parents, the teachers and of the municipality. Thus, we may identify four main actors: a) the Municipality, b) the Parents and c) the professors, teachers and in particular the director of the school and d) the National School Authority

The situation in Germany is slightly different: Schools are managed by the municipalities (not a national, but a city authority). Within the municipalities there are up to three main departments dealing with schools in regards to possible retrofits: the educational administrative department (responsible in general for the school (no focus on the energy consumption other than the costs for the consumption)), the planning department (Hochbauamt) (responsible for all building renovations and for new buildings) and the environmental department (not existing in all cities but for example in Stuttgart, responsible for surveying energy consumptions incl. pointing out and realising possible energy saving measures). The money for a renovation can be initialised from the last 2 administration departments, but is mostly controlled by the planning department. They have to get their proposal accepted by the city council and a short pay-back time for energy saving measures is of course helpful for that.

Additionally there is the school director and the teachers, the care-taker, the pupils, the parents and the national legislation. They can indicate but not really act. The care-taker can reduce the energy consumption due to no-cost measures (turning of lights, better (manual) control of the HVAC system, report high energy consumption and other problems to the administration etc.). The pupils can check for energy-related problems (with the help of a teacher that has interest in environmental things and can contribute to a better user behaviour (e.g. for opening of windows in the winter in a more efficient way, turning off lights, etc.). They can also report on problems to the parents and through them to the city council. The national and also European legislation can announce rules and regulations that influence the energy performance of schools. An example of that is the implementation of the EPBD (in some countries stronger requirements for the energy performance of new buildings and also partly existing buildings and additionally the certificate that shows how good or bad a building is).

In Germany the lack of knowledge for the energy efficient retrofit is not the strongest barrier any more. If a school is renovated a team of experts might be paid for developing energy efficient retrofit measures. There is a lack of money for the retrofit. This is in some cities covered by PPP-initiatives or as described below by a revolving fund.

The main barriers towards a proper running of schools are a) the lack of knowledge regarding the measures to be implemented to reduce energy consumption and improve indoor air quality, b) the dispersed responsibility between the various actors that sometimes make decisions taking a quite complicating procedure and c) the lack of resources especially in low-income areas

2 Identification of the actors and their motivation

As mentioned above, four main actors may be identified:

a. The Municipality. According to the law, municipalities are responsible for the operation and proper maintenance of the school buildings. In every municipality a member of the elected municipal council, is selected and is responsible to follow schools and satisfy a proper operation. The municipal council receives information from the director of each school as well as from the school council. In case of a problem, the municipal council prepares a technical plan and implement it. This technical plan is prepared and carried out either by the technical department of the municipality, or in special cases with the association of the National Schools Authority. There are three conditions for the successful implementation of such a scheme: a) there is a good communication between the municipal council and the school authorities and problems are identified, b) the technical department of the municipality is able to prepare and execute a technical plan and c) the available resources are enough to keep the school buildings in proper conditions. In practice, the plan works quite well in rich areas as well as in small communities. On the contrary, in low income areas nor the technical expertise neither the resources are available.

b. The Parents. The role of the parents is extremely important. Every school has an elected council of parents. They follow the operation of the school, they participate to the school council and they are allowed to propose actions to the Director of the school and to the Municipality. In case they wish to they may contribute financially to the operation of the school. It is evident that the efficiency of this actor is completely related to the ability and the interest of the elected council of parents. There are many cases that parents are very effective as they follow extremely closely the operation of the school, suggest and put pressure for improvements and sometimes participate in the whole set up either financially or by offering personal work. However, this does not happen at every school for the following reasons: a) the elected parents they don't follow the problems of the school properly, b) they don't have the proper knowledge to understand and identify the non evident problems, (i.e. a problem of indoor air quality), and c) they are not able to 'communicate' the problem and find the proper way to convince the Municipality to intervene.

c. The teachers and the professors, and in particular the Director of the school. The role of the staff is crucial. They are living with the problems and given their scientific background they are able to understand and report most of the problems. The Director has the right to make decisions to achieve a proper operation of the school but he has not the right to plan and execute major interventions. However, in association with the council of the parents he may report problems and suggest actions and interventions to the Municipality. There are no barriers regarding the communication of problems, however, the staff of the school in most of the time is not interested on issues of energy efficiency and energy consumption. Once the indoor temperature is at the right level, most of the staff is satisfied. There is an increasing number of teachers and professors interested on environmental issues, thus in many schools actions to improve indoor environmental conditions have been planed.

d. The National School Authority. It is responsible for the construction of buildings, and because of the high expertise on technical issues they may provide assistance to the municipalities and help them to perform major interventions. The major problems for the Authority are: a) Energy and environmental consciousness is low but it increases rapidly. The authority has prepared guidelines on the energy and environmental retrofitting if school buildings and is engaged in the retrofitting of some schools for demonstration buildings, Also, they operate an energy and environmental bus that provides assistance to the municipalities when necessary b) The expertise on energy issues is limited, c) the staff is not enough to satisfy the needs of the whole sector.

3 Barriers, possible measures to overcome them and reinforce incentives

In the above the main barriers have been identified. Possible measures to improve the existing situation are:

a. The Technical staff of the municipalities has to be informed and educated on energy and environmental issues. Information on practical issues has to be given. Guidelines on technical problems have to be available. This can be achieved through seminars, distance learning, etc.

b. A rating scheme for schools involving energy and environmental aspects has to be applied on a National basis. Under demand of the National School Authority, such a rating scheme has been prepared by NKUA. This is based on energy data collected from 1200 schools. When the scheme is going to be applied, exact information on the conditions in each school will be available to the school society. Thus, the problems would be easily identified and solved. Such a rating scheme is associated with a certification procedure that it has to be applied in the near future.

c. The energy and environmental standards for schools have to be improved and applied. Actually, the standards suggest an appropriate indoor temperature, the lighting levels as well as the necessary air flow rate. However, there is no control and in practice the standards are not followed especially the air flow part. It is proposed to extend the regulations in order to describe the whole set of the indoor environmental parameters, and also to apply an Requirements compliance check. For sure this is not easy, but municipalities have the means to prepare a set of equipment and educate at least some of their technical staff to visit and check the environmental conditions in schools.

d. Actually, almost all schools are connected to the internet on a continuous basis. If a proper site is organised, all information, knowledge, on line help and advice may be offered. Such a site may be organised by the School Authority. Good examples have to be advertised. The rating score of each building has to be public in order to create a kind of competition inside the local society.

e. Teachers and students have to be better informed on energy and environmental issues. Practical information has to be offered on how they can improve the indoor environmental conditions and save energy.

f. A major retrofitting program for high energy consumption schools has to be defined and implemented on a national basis. For each school a specific plan of interventions has to be defined. This implies a serious increase of the available resources for school buildings but according to the existing studies may be amortised in less than 5 years. In Germany some cities have created so-called revolving funds. It is a special fund that is used for the energy efficient retrofit of buildings that consumed a lot of energy before. If the fund is spent, then they have to wait for the pay-back of the money due to energy cost savings. By that the total amount of money used can be controlled. For example the city of Stuttgart is using this kind of instrument and calls it “intracting”.

Public buildings

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1 Introduction

Within this report, public buildings are interpreted as buildings owned by the public, e.g. by communities, the state, or similar. As the ownership strongly influences the type of barriers inhibiting energy-efficient retrofits, buildings with public access (often also interpreted as public buildings) are not considered here. The number of public buildings is very high; Germany, for instance, has about 100,000 buildings owned by the public. However, these buildings are owned by various communities, which have to face more or less strict financial limits regarding investments in energy-efficient retrofits. Also, the structure of the administration might be differing between countries (and even between different communities within the same country). Renovations are mostly realised because of building defects or damages; sometimes also because the function of the building is changing. These types of renovation work do not originally focus on energy efficiency; mostly, they are managed by the planning department of the community. In some community administrations there is a special department dealing with energy consumption and environmental impacts. If this department (or a similar group within the planning department) is involved in the design phase and more, the energy efficiency will be included as a renovation side effect, at least.

1.1 Identification of the actors and their motivation

Actor 1: Planning department of the community

The planning department is responsible for developing the design and surveying the realisation of the renovation. In some communities they also have the financial control of the measures, in others this is done by a separate financial department. They might be supported by external planners in the design and realisation phase.

Actor 2: Energy/ environmental group or department of the community

Some communities have established special departments in their administration, which are responsible for environmental and energy efficiency tasks. In other communities, persons with a specific knowledge of these tasks might have been integrated in the planning department, even the enlistment of external consultants is possible. In any case, they focus on the correct energy-efficient retrofit design and realisation, which makes them important contributors to the renovation process.

Actor 3: External planners (architects/ engineers)

In bigger renovation projects, external planners (like architects and engineers) take over the design, the planning and the survey of the realisation phase. Their influence on the possible

energy-efficient retrofit measures grows with their responsibility and working part within the project.

Actor 4: Building users

Building users influence retrofit measures by complaints about bad comfort situations, which are mostly linked to the energy efficiency of the building. After the realisation of the retrofit measure they contribute to the success of the measure by acquiring the correct user behaviour.

Actor 6: National authorities

The national authorities define requirements to the energy efficiency of the building, such as the national implementation of the EPBD. In some countries this includes upgrades of the building's energy efficiency (possibly, of the building envelope and/or HVAC systems). Of course, the rules are also valid for publicly owned buildings.

Actor 7: Financial institutions

Banking establishments may influence the owners by offering cheap loans for energy efficiency measures. These institutions may be governmental (e.g. the 'KfW Promotional Bank' run by the German Reconstruction Loan Corporation, KfW) or private (e.g. the German 'Ökobank'). In Germany, the KfW Promotional Bank has now started a programme offering cheap loans for energy efficient retrofits that is targeted at communities.

Actor 8: Information sources such as media, consumer organisations, lobbyists

By giving information about energy savings and environmental impacts, these organisations can influence the people working in the administration and the society to be more positive towards energy efficiency investments.

Actor 9: Public

Public buildings can be used as prime examples for increasing the awareness of energy efficiency within the society. Therefore, they should be progressive and persuade the people using or visiting the building to think about similar energy-efficiency measures that might be performed at their buildings. Of course, this process can also work vice-versa: public expectations may more or less influence the communities so as to launch energy-efficient retrofits to improve buildings of poor energy quality.

1.2 Barriers, possible measures to overcome them and to reinforce incentives

The barriers discussed here are based on the special problems posed by publicly owned buildings. General barriers (such as poor cost efficiency of the measures due to low energy cost rates, insufficient quality of information offered concerning energy efficiency retrofits etc.) will not be touched.

Barrier 1: Limited budget for renovation of public buildings

As pointed out in the introduction, there is a huge number of public buildings, and in any country plenty of them are in need of renovation, let alone of energy-efficient retrofit. For instance, the status of buildings at the time of the reunion of Germany (West and East) in 1989 showed that in many West German cities the buildings looked nicer as they had been

externally renovated before (by applying new plaster or simply new paints or cleanings); the energy efficiency, however, was often found to be similarly poor in both parts of Germany. Admittedly, the budgets of cities and communities are limited and only a small part thereof is available for renovation purposes. Therefore, it is mostly the remedy of defects and urgent reorganisation measures that can be financed. Often, energy-efficient measures are not considered or even cut during the planning phase because of the budget limit. Also, most communities cannot realise a holistic retrofitting approach, because their budget does not allow financing the full renovation of one object in parallel with all other necessary renovation works in the rest of the stock. Therefore, the renovation activities are mostly "patchwork", conducted over several years. This causes the problem that the financial benefits resulting from synergy effects (such as smaller new heat generation systems in combination with insulation measures at the building envelope) cannot be obtained.

Possible measures to overcome this problem are:

- Common bank loans for measures to be performed at publicly owned buildings: In the beginning of 2007, the German 'KfW Promotional Bank' has launched a programme that is targeted at communities, offering cheap loans for energy efficient retrofits.
- Third party financing (PPP = Public-Private-Partnerships): Communities may start PPP-contracts for improving the energy efficiency of their buildings. The PPP company will analyse the building and realise cost-efficient measures to reduce the energy consumption. The investment and labour costs of the PPP company will be covered by the reduced energy costs, hence there are no investment costs for the community. It has to be added, however, that – almost always - PPP companies only realise measures pertaining to the HVAC system (and there mostly at the control systems), as these measures result in lower investment costs, shorter payback time and higher financial gains compared to insulation measures at the building envelope.
- Revolving funds for energy-efficiency retrofit measures: Instead of using external PPP companies, some communities (e.g. the city of Stuttgart, Germany) have started to build revolving funds. For that, a limited amount of the budget is set aside for energy efficiency measures to be performed at community-owned buildings. The fund pays the required investment and this money will be paid back from the energy costs saved due to the successful measures. Once the total fund has been spent, the community has to wait for the paybacks before a new energy efficient retrofit measure can be started. In this way, control of the money spent is ensured.
- Motivation of the public building owner by visualisation of the energy quality of the building, e.g. with the EPBD certification. Public buildings are supposed to serve as shining examples for increasing the energy efficiency awareness of the society.

In the Netherlands, an example of an instrument to overcome this barrier is the subsidy scheme BANS (Bestuurs Akkoord Nieuwe Stijl) Climate Agreement that supports local authorities and provinces setting up local climate policy. Within the framework of BANS, authorities e.g. set up agreements with all kinds of stakeholders related to energy saving. On three levels (active, advanced, innovative) there is also attention for existing public buildings:

Active level:

- In case of renovation, all fixed and cost-neutral energy-saving measures of the Nationaal Pakket Duurzame Utiliteitsbouw (National Package Sustainable Non-Residential Building) have to be applied.

- Application of energy management in all buildings owned by the local authority.

- Active energy purchase policy (attention for origin of source).

Advanced level: - In case of renovation, 30% of the non-cost neutral energy-saving measures of the Nationaal Pakket Duurzame Utiliteitsbouw (National Package Sustainable Non-Residential Building) have to be applied.

- A minimum of 15% of the own electricity consumption of the local authority is produced by sustainable energy sources.

Innovative level: - A minimum of 40% of the own electricity consumption of the local authority is produced by sustainable energy sources.

Barrier 2: Low energy tariffs for municipalities and government agencies

The public authorities mostly get special (lower) rates for the energy carriers supplied by the providers, because of

a) the great number of their buildings and correspondingly high consumptions
b) the relations between the community, the agency and the energy supply company (cities are often owners or associates of the supply companies).

This situation deteriorates the economy of the measures, which makes it more difficult to convince the decision makers of the benefits of energy efficient retrofits.

Possible measures to overcome the problem are:

- Creating a law on demanding the same energy tariffs from all energy users, including the communities. This is, however, a rather far-fetched idea that probably will not be realised in the different EU Member States.
- Motivation of the public building owner by visualising the building's energy quality, e.g. with the EPBD certification. Public buildings are supposed to serve as shining examples for increasing the energy efficiency awareness of the society.

Barrier 3: Separate budgets for renovation investments and life-time energy costs

In some countries, the budgeting of community costs has been rearranged in the last years; at least, the decision makers in communities are allowed to have a broader view on retrofit investments and possible paybacks by reduced energy costs. Many countries or communities, however, are still facing the problem that those who are responsible for taking decisions on renovations only see their budget and will neither obtain any improvement in the financial situation (part of pay-back or similar) nor any feedback on the results. This is why they try to realise those renovations that are most urgent, on account of non-energy related reasons.

Possible measures to overcome the problem are:

- Alteration of the 'separate budget' situation: Common budgets within the cities or (partial) payback of the saved energy costs to the investment budget.
- Training of the decision makers to acquire a broader view: Making them realise that the budget of the community is more than their part only, investment in the energy efficiency will have a payback, energy efficiency is important not only financially, but also for the environment and for the security of the future energy supply. This can be enforced by internal orders issued within the community.

2 Conclusions

This report summarises the specific actors, barriers and possible solutions in the field of public buildings. Some of the solutions presented here are further described by specifying examples applied in Germany and the Netherlands.

The actors who exert influence concerning public buildings include the different departments in the community administrations, external planners, the building users, national authorities, financial institutions, information sources and the general public. The main specific barriers mentioned are:

- the limited budget for renovation at the communities' disposal,
- low energy tariffs for communities, therefore less economic benefits from energy-saving renovation measures and
- the separate budgets for renovation investment and life-time energy costs.

Possible solutions include bank loans that are offered also to communities (examples: the new KfW-programme in Germany and the BANS subsidy scheme in the Netherlands), third party financing or revolving funds within the community, motivation by visualisation of the energy quality of public buildings (public buildings as shining examples), and a modification of the separate budgetary situation plus training of the decision makers in order to prioritize environmental and energy problems.

3 References

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