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# D7
# Financial Strategies for low energy public retrofits in Europe

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# D7
# Financial Strategies for low energy public retrofits in Europe

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## Content

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# Preface

The BRITA in PuBs project is an EU-supported integrated demonstration and research project that aims to increase the market penetration of innovative and cost-effective retrofit solutions to improve energy efficiency and implement renewable energy in public buildings all over Europe. Firstly, this will be realised by the exemplary retrofit of 8 demonstration public buildings in four European regions (North, Central, South, East). By choosing public buildings of different types such as colleges, cultural centres, nursery homes, student houses, churches etc. for implementing the measures it will easier reach groups of differing age and social origin. Secondly, the research issues include a socio-economic research study identifying real project-planning needs, financing strategies, the development of design guidelines, the development of an internet-based knowledge tool on retrofit measures and case studies and a quality control-tool box to secure a good long-term performance of buildings and systems.

Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs is therefore a leading project within the EU ECO-BUILDINGS programme. The ECO-BUILDING concept is expected to be the meeting point of short-term development and demonstration in order to support legislative and regulatory measures for energy efficiency and enhanced use of renewable energy solution within the building sector, which go beyond the Directive of the Energy Performance of Buildings (EPBD).

# 1. Introduction

As already stated in early phases of our project, financial issues, real or imagined, tend to become very important barriers to the realisation of innovative low-energy projects at the minds of many decision-makers or technicians involved in the design and implementation of public buildings.

This is mostly due to the fact that budgets for public building retrofits are often limited, and decision-makers tend to consider initial costs rather than operating, maintenance or life-cycle costs as those significant for refurbishment. Thus it becomes extremely difficult to finance an innovative, low-energy retrofitting project in the public sector, since it is often impossible to provide the additional cost needed in the beginning of the project-and this in spite of the fact that there may be a reasonable cost-benefit ratio and short payback times for the energy conservation systems used.

In fact, as proved by our research, yearly budgets of public authorities throughout the European Union dedicated to public building retrofits are limited and "inelastic" so that it is often impossible to find additional resources, even involving moderate amounts, in order to cover the additional costs of retrofitting energy measures as part of the yearly budget. Supplementary funding to this allocated yearly is usually not available, independently of how reasonable the investment might be. What is more, funds dedicated to cover the initial investment for public buildings are often separate from those dedicated to cover maintenance and operation costs. As a consequence, public authorities cannot take advantage of retrofit measures resulting in a short payback time, as these cannot be realised because of high initial investment costs.

The aim of this report is therefore:

1. to investigate the existing financial mechanisms used for funding retrofitting projects in the public sector and
2. to identify and assess, if possible, successful financial mechanisms for public authorities in the European member countries, in order to assist them in the integrationof innovative renewable energy and rational use of energy systems as part of refurbishment process of public buildings.

At the time of writing these notes also the situation of Greek demoproject presents the same kind of problem and has not yet been definitely solved: the Greek building report is then added at this document but has to be considered as an annex, being the design phase still incomplete in many parts.
In some cases the information provided by the design teams are not yet complete, due to the fact that in these cases the design phase is still ongoing and the final decision on some items has not yet been taken. They will provide necessary information in the final report.

# 2. Methodology

Following a survey among project participants, a certain number of financial mechanisms have been identified in each member-country, some of which can be applied to low energy retrofitting of public buildings. These are analysed and classified in tables according to sources and type of funding, services responsible for administering the funds, name and short description of each programme, duration of the programme and possible inclusion of public buildings in the measures described (Chapter 3.2., Table I).

Additionally, there has been a collection and analysis of financial strategies used in most of our demonstration projects, including comparison of individual measures and experience with incentives, as described and assessed by some project directors.

Another source of information has been the collection of interviews on barriers and incentives for low energy retrofitting in the public sector (D5) conducted in each one of the participating countries, which included a section on economic barriers. This was considered very useful as related information and a summary was included in this report, while representative comments from D5 interviews of each participating country are attached in Annex I.

The results of the procedure described above have been summarized in a second table (Chapter 3.2., Table II) listing the existing financial measures applicable to financing low-energy retrofitting projects in the public sector and assessing them according to the degree of success, reasons for success in some countries of the E.U. and potential for transferability to others, possibly with some adaptations.

# 3. Results

Results of the survey on financial mechanisms used in each country are described below and summarized in Table I. They are followed by a description of financial mechanisms used in BRITA in Pubs demo buildings, and a summary of D5 interviews on economic barriers for low energy retrofitting in the public sector, while an overall assessment of the success and transferability of financial schemes to other European countries is summarized in Table II.

## 3.1. Financial strategies used for low energy public buildings in Europe

### 3.1.1. Germany

*Introduction*

The financial schemes used in Germany can be roughly divided into financial support by the state, contracting by external contractors like specialised companies or banks, and internal financing by starting a revolving fund for special tasks. Additionally there are different kinds of incentives by the state as well as incentives by private companies. This summary deals mostly with the schemes that can be used for public buildings.

*1. Financial support by the state*

*a) Loans by the KfW-Bank (Kreditanstalt für Wiederaufbau)*

Description: A loan with lower interest rates for which a private building owner or a SME can apply for at the Kreditanstalt für Wiederaufbau. There are special loans for the energy-efficient retrofit of buildings and for energy-efficient new buildings. See http://www.kfw-foerderbank.de/DE/Inhalt.jsp

Use: This feature is mostly used by private building owners that build their dwellings. As it requests an improved energy-efficiency it is an offer, which supports the idea of bringing retrofit innovation to application. However public bodies such as city administration are not allowed to take part in this concept. But it is under discussion if private contractors in public buildings (PPP) can gain from this loan.

*b) Research programmes by different German ministries*

Description: The ministries of economy, environment and buildings have created different programmes, which shall support the energy-efficiency in buildings and in building retrofit. As an example can be named: EnSan, a project that included the energy-efficient retrofit of different pilot buildings started in the year 1998. Here the innovative retrofit measures and the implementation of renewable energies was co-financed for about 20 buildings, after the project design was approved by the ministry resp. his consultants. Additionally the measurements that were added after the construction phase were financed in order to assess the efficiency of the measures. See http://www.ensan.de/

Use: Used for different building types including public buildings, but only for very few buildings (pilot studies) with no cost-efficient measures.
The idea was to have these buildings as show cases for the whole building stock in Germany in order to replicate the successful retrofit measures.

*2. Contracting (external)*

*a) Contracting by specialised companies*

Description: Companies offer their knowledge and partly also initial financing of retrofit measures that shall decrease the energy consumption of a building. The building owner signs a contract allowing them to analyse the building and the

plants. The contractor proposes different kinds of no-cost or low-cost measures (mostly at the control system) and is paid by a part of the saved energy costs due to smaller energy consumptions.

Use: This feature is not too common in Germany right now. It was introduced by American companies some years ago. However German companies have started to go to the market, also public building owners are involved. With cities and local authorities having very little money as is the case in Germany right now, it is expected that this kind of financing will be used more often in the next few years.

A problem for public building owners is that a European-wide bidding for the contractor offer is required. This often prevents the realization of long-term offers, since public building owners have to accept the cheapest offer. Therefore a big potential of energy savings is wasted.

*b) Contracting by other companies*

Description: See 2.a). A new trend is that other types of organisations/companies like energy suppliers and banks start to add this branch to their offerings. They overtake for 10 years or longer the complete operation of the building and pay a part of the reduced operating costs to the owner. In some cases the owner joins the measure by paying for additional measures like thermal insulation.

Use: Not really common right now, has just started.

It will be interesting to see if this kind of contracting will increase its share in the market over the next years. An advantage of the energy suppliers and banks is that they have already contact to the building owners and can therefore approach them more easily than the usual contracting companies. On the other hand they either have to find consultants to develop the specific energy saving measures or add a new department with specialists to their organization. As with 2b) for public owners a European-wide biddings for the contractor offer is required. This often prevents the realization of long-term offers, since public building owners have to accept the cheapest offer. Therefore a big potential of energy savings is wasted.

*3. Internal Contracting = Intracting*

See also description and assessment sent by J. Görres, city of Stuttgart, department of environmental protection.

Description: The city of Stuttgart, department of environmental protection has established a special fund for the energy-efficient retrofit of their public buildings. The money is used for the investment in energy-efficient retrofit measures and is paid back with the saved energy costs. With the paybacks the investment for new projects is secured.

Use: This procedure is used successful since about 10 years. For more information on the experience see the special chapter of J. Görres.

*4. Incentives by the state*

There are probably different kinds of incentives such as lower taxes in certain cases but the most famous one right now is the guaranteed price per kWh electricity for feeding electricity created by PV into the grid.

*a) Lower taxes*

Description: Lower taxes for the application of energy-efficient measures in buildings (retrofit or new)

Use: About 3-5 years ago (Niedrigenergiehausprogramm). Not offered right now. Used for private building owners, companies, not for public bodies.

*b) Guaranteed subsidised price for feeding electricity in the public grid*

Description: Defined price for the feed of electricity created by renewables such as PV or by combined heat and power systems (Einspeisevergütungsgesetz). PV is paid higher than other possibilities, up to 48 cents/kWh.

Use: Offered for all building owners. Problems in multi-owned buildings (privately owned multi-family houses). The owners have to start an organisation in order to deal with the energy supplier.

*c) Increased share of investment costs on the rent of apartment houses*

Description: The share in the costs of refurbishment measures was increased to be 11% per year in apartment houses. In some federal states it is allowed to increase the share up to the amount of the proven reduced operating costs.

Use: Often in public and private housing societies. Requires an approval of the public administration. Without the increased share a lot of owners decide that the energy-efficient retrofit measures are not economical, because they can't re-finance the investment costs with the rent. With this political and economical measure it is believed that more houses will be retrofitted.

3.1.2. Norway

Norway does not have many programmes for subsidising the use of renewable energy. This may be due to the availability of clean hydropower. Nevertheless, there is a change towards a greater interest for using new renewable resources.

*Current economic incentives and promoters*

Enova SF is a public enterprise owned by the Norwegian Ministry of Petroleum and Energy. Enova subsidises a number of projects that use new renewable energy sources for heating. The Research Council of Norway provides funding for certain projects that use new renewable energy sources. A foundation for sustainable production and consumption is GRIP, founded on the Norwegian Ministry of Environment.

*1. Enova – a public enterprise aiming to achieve national energy policy goals*

In 2001 the Norwegian Parliament approved the establishment of a new agency for promoting energy savings, new renewable energy and environmentally friendly natural gas solutions. The name of the new agency is Enova, located in the city of Trondheim, and owned by the Government, represented by the Ministry of Petroleum and Energy. The establishment of Enova signals a shift in the policy of energy savings and renewable energy. By gathering strategic policy responsibilities in a small, flexible and market oriented organisation, Norway intend to create a pro-active agency that has the capacity to stimulate energy efficiency.

*2. GRIP – the foundation for sustainable production and consumption*

The Norwegian Ministry of Environment founded GRIP and provides GRIP's basic financing, whilst participating companies finance many of the projects. GRIP promotes and supports

sustainable production and consumption patterns. GRIP bases itself on the realities of the industries and cooperate with private and public organisations. The EcoBuild Programme was administrated by GRIP. The programme, financed by the authorities and the building trade with 50 % each, was established in 1998 and was terminated in 2003. The aim of the programme was to increase eco-efficiency by introducing guidelines and support to the building and real estate sector.

*3. Financial means on national level*
For existing buildings it is less appropriate to control the energy use with regulations. Financial support schemes through public subsidies, grants from energy saving funds or cheap loans from, for example the Norwegian State Housing Bank, are more rational methods to cut the energy use and promote the use of renewable energy. According to the principle of green taxes, the level of taxes for technology should reflect the real loads on the environment. However, up to now, proposals to increase tax on traditional energy sources such as hydropower and oil, have not received much political support. 'Environmental taxes' on established energy carriers will be an important tool in the promotion of renewable energy (green certificates).

*4. Local financial support schemes*
Local authorities in different parts of the country support individual projects. Examples are:
Oslo Energy Saving Centre (Oslo Enøk AS)
Renewable energy systems are subsidised based on the normal rates which are 40 % of the annual kWh production x 0,43 Euro/kWh, up to 40 % of the investment.
Akershus Energy Saving Centre (Akershus Enøk AS)
The centre has a financial support scheme for installation of alternative energy sources.

*5. Effects of financial support schemes on r.e. market*
Research programmes and pilot projects contribute to the development of new technology, but are not, to a great extent, increasing the position of renewable energy on the market. The market for renewable energy would certainly increase if the authorities were given a special responsibility for contributing to disseminate the new technology, and if public building projects could be used for demonstration purposes. The financial support schemes largely affect the market. Especially when a scheme is discontinued, a clear decline in the number of installed renewable energy systems is noted. The effects in the beginning of a scheme are not so obvious, because it usually takes one to two years before a scheme is introduced into the market. This is due to the time needed to plan and carry out a building project.

The market has a tendency to over-react to the signals given by authorities. When a scheme is ended, negative signals are sent out to potential customers. Sales numbers may often fall below the level, which is expected for a certain technology, even without subsidies of any sort, and it takes time to rebuild the market. Short-term schemes may have a negative effect in the long run as they may make it difficult to maintain normal market developments. The local schemes, such as Oslo's energy saving fund, have been able to somewhat moderate turbulence on the market.

3.1.3. Italy
*"Photovoltaic roofs" Programme*
Description: Public contribution of 75% of the investment is designed to install building integrated solar-chips systems with power from 1 to 20 kWp in connection with the electric distribution network. The programme is directed both to public and private subjects.
Success/problems: All the initially allocated funds have been used to finance only a part (160) of the presented projects (588, a lot of them from the south of Italy). The Ministries of

Environment and Regions have allocated new resources for the remaining project, with contribution of 50% of the investment. However, the allocation of funds is discontinued (now the scheme is closed)

*Best architectural photovoltaic integration*
Description: Public contribution of 85% of the investment is designed to integrate photovoltaic plants in public buildings of high architectural value. The larger contribution (85 instead of 75%) is due to the higher costs of a real integration (not only superimposition) of photovoltaics in architecture.
Success/problems: Resources have been allocated for the realization of photovoltaic plants of about 22MW.

*"Solar Thermal" Programme*
Description: Public contribution up to 30% of the investment is designed to install solar thermal systems for low temperature heat production.
The programme is directed to Public Administrations. The subsidised projects include production of sanitary hot water, swimming-pool water heating and indoor heating through radiant panels for building and sports complexes.
Success/problems: The scheme is open until the end of the allocated resources. The programme has been extended to all Public Administrations while the initial scheme was only for Local Administrations with more than 50.000 inhabitants. Moreover, the new scheme reduced the minimum size of collectors from 20 to 6 $m^2$ in case of applicants presenting different projects with 20 $m^2$ of minimum total surface.

*Bando "Isole Minori"*
Description: Public contribution up to 80% direct to the realisation of energy saving and use of renewable energy projects (3,6 million euros) and green mobility (2,6 million euros) in "Isole Minori" ("small islands").
Success/problems: With the allocated resources it has been possible to subsidise 5 projects in the energy sector (12 submitted) and 3 in the mobility sector (7 submitted).

*Decreti Efficienza Energetica ('Energy-efficiency law')*
Description: The aim of the law (July 2004) is to save 2.9 Mtep in a five years' time, in the part of electric power/natural gas distributors.
Starting from January 1st 2005 (for 5 years) the distributors with more than 100.000 end-use customers must reach a target of annual energy-saving (a number of 'Energy Efficiency Titles' or 'White certificates'). To do that, distributors (directly or through the ESCOs) have to provide actions for energy savings by improving energy efficiency or rational end-uses. Otherwise they can buy the EET "on the market".
Success/problems: This will significantly help in order to reach the national reduction of greenhouse gas emission under the Kyoto Protocol target, and will result to a lower energy bill for the users. On the other hand, the procedures to implement this law are still under definition.

*Conto Energia ('Energy Bill Scheme')*
Description: Under this scheme (w.e.f. August 2005), you can sell electricity generated by your own photovoltaic plant to the electricity network, with a very convenient price (about three times the electricity purchase cost, depending on the size of the plant), and swap it with the energy that you buy from the network.
Success/problem: The call for the scheme is published four times in a year. The approval should be done within 3 months and you have to realize the PV-plant within 6 months from the approval date.During the first call (September 19-30/2005), unexpectedly more than 3500

applications have already been received and the maximum limit fixed for the first phase of the scheme (100MW) has already been reached, an indication of a great success of the scheme.

3.1.4 U.K.

*Funding programmes*

There are several regional and national funding programmes for the UK. A good source of information is the Energy Saving Trust (EST) 'practical help' website (www.practicalhelp.org.uk/), although this site does have a domestic property bias.

*Other sources of funding currently available include:*

DTI Solar Grants programme for PV systems (www.solarpvgrants.co.uk)

Clear Skies Renewable Energy Grants (communities, schools/universities, households) for solar thermal, small wind, hydro, heatpumps and biomass heating (www.clear-skies.org)

From 2006 the two programmes above will be replaced by the Low Carbon Buildings capital grant programme (details not yet available)

The Energy Saving Trust's Community Energy Programme for heating systems (www.est.org.uk/commenergy/index.cfm)

*Enhanced capital allowance (ECA) scheme*

Enhanced Capital Allowances (ECAs) enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery. There are three schemes for ECAs:

Energy-saving plant and machinery (including air to air energy recovery, automatic monitoring and targeting, boilers, CHP, compact heat exchangers, compressed air equipment, heat pumps for space heating, HVAC zone controls, lighting, motors, pipework insulation, refrigeration equipment, solar thermal systems, thermal screens, variable speed drives, warm air and radiant heaters).

Water conservation plant and machinery (including flow controllers, meters, leakage detection, efficient toilets, efficient taps, rainwater harvesting equipment).

Low carbon dioxide emission cars and natural gas and hydrogen refuelling infrastructure

Businesses can write off the whole of the capital cost of their investment in these technologies against their taxable profits of the period during which they make the investment. This can deliver a helpful cash flow boost and a shortened payback period.

*Soft loans*

Energy-Efficiency Loans (administered by the Carbon Trust) are designed to save an SME money when replacing existing equipment with a more energy-efficient version. Small or medium-sized business can borrow £5,000 to £100,000 at 0% fixed interest (for up to a four year loan period) to fund the purchase of equipment. Products include: air conditioning, boilers and heating controls, building insulation, lighting, pipe insulation, solar thermal systems). Info at http://www.thecarbontrust.co.uk/energy/pages/page_72.asp

*Energy use survey (not really a financial scheme, but a no-cost service)*

The Carbon Trust (www.thecarbontrust.co.uk) provides free surveys to organisations with energy bills greater than £50,000 per year. Consultants identify energy-saving opportunities and provide practical advice on how to achieve these.

3.1.5. Denmark

*Funding support programmes*

There have been several funding support programmes in Denmark, mainly for the supply side, that is solar heating, heat-pumps, replacement of electricity for heating and solar cells. Currently, there is no support programme, but negotiations are going on to create a new

funding support programme for solar cells – a follow-up programme to the "Sol 1000" (http://www.sol1000.dk/) which will be called Sol 5000. These programmes are parallel to "Solar- Roof" programmes in other countries, e.g. Germany and Italy. The programmes generally work in the same way – by paying either a certain percentage of the investment cost (with a given maximum) or by paying in support a certain amount per installed kWpeak.

*Special high prices for PV-produced electricity with shared ownership*
An initiative has just started in Denmark based on experiences with shared ownership of wind machines. The basic idea is the owners / investors of a solar cell (PV) area are guaranteed a certain high price for the electricity produced which will assure that they get a proper return on their investments. Similar schemes have been very successful in other countries as well, for example in Germany. More reading (in Danish) in the website: http://www.solcellelauget.dk/index.htm.

*Special $CO_2$ - loans for municipalities*
Generally, the Danish municipalities have to work within certain frames of investments allowed for each year. But if they prove that an investment is meant for the implementation of energy-saving measures of a reasonable payback time, they are allowed to borrow extra money (at rather low interest rates) for these investments. So, for some municipalities this can be a way to raise additional money for planned refurbishment projects.

*Third party financing / contracting*
This is not yet a common way for funding of energy efficiency projects in Denmark. It has been offered by the electrical utilities companies for e.g. municipal buildings (typical schools) for change of lighting installations. So, the utility company and the municipality have to agree that a certain payment for electricity is fixed over a certain period of time. After this time the installation is paid off and it is owned by the municipality.

*Revolving funds*
Some Danish municipalities have established a special fund for the energy-efficient retrofit of their buildings. The money they earn from the energy savings on the first projects is reinvested in energy-efficient retrofit measures in the following projects and then again the savings from these projects is reinvested in new projects. This scheme is often used in combination with a deal with the users of the individual buildings, for example a kindergarten, that they get to keep a certain fraction of the savings – to keep their motivation for obtaining the potential savings.

*Leasing*
Leasing is a business agreement for renting of equipment of a certain capital costs for a defined period. This will in many cases be very similar to third party financing (TPF). Generally two kinds of leasing arrangements are considered: Operational and Financial leasing.
1. Operational leasing which designates the situation where a producer or dealer rents a product to the costumer. This means there are 2 partners in this transaction - for example a company that sells solar heating systems and the costumer, which can be a municipality. Instead of buying the solar heating system the municipality leases the system for a certain period, say 8 years and during this period it has the benefit of the energy produced, but pays a fixed amount of money to the seller. After the leasing period is over, the municipality may pay an insignificant amount to take over the ownership of the system.
2. Financial leasing, where a leasing company buys a product for the consumer by the dealer or producer and rents it to the costumer. This means that 3 parties are involved in this type of transaction, but the leasing arrangement is solely between the leasing company and the

consumer. In this case the leasing company acts very much like an energy service company (ESCO). The difference lies in the responsibility for maintenance of the product.

3.1.6. Czech Republic

*General Financial schemes*

There are two national programme focusing on energy performance of retrofitted public buildings in the Czech Republic:
National programme of energy savings and use of renewable energy sources
ČSOB Fond PHARE of energy savings

*1. National programme of energy savings and use of renewable energy sources*

This Programme (further only Programme) is administered by the Ministry of Industry and Trade through the Czech Energy Agency. The programme is announced every year with different deadlines for submitting proposals in different categories, and is itemized into several subprogrammes of which No. III.1. deals with the support of measures leading to an increase of energy efficiency in buildings.
Subprogramme No.III.1. is divided into 4 main chapters with several subchapters:

*Programme III.1: Reduction of energy intensiveness in buildings*

III.1.1. Complex measures to reduce energy intensiveness in industrial buildings
III.1.2. Complex measures to reduce energy intensiveness in public buildings
a) Using heat recovery from technologies and building systems to be used for heating and DHW. Energy recovered from waste heat must make up for minimum of 15% of the total energy for heating. Resulting consumption of energy for heating in heating season will be min. by 35% lower than the current directives No. 291/2001 require.
b) Using renewable and secondary sources of energy for building operation with final annual energy consumption reduced minimum by 40%. Resulting consumption of energy for heating in heating season will be min. by 35% lower than the current directives No. 291/2001 require.
c) Performing retrofit of heating system and/or heat supply. At retrofit of heat supply, combine heat and electricity production will be prioritized unless the energy audit shows a better solution. Resulting consumption of heat will be lower than the current directives No. 291/2001 require.
III.1.3. Complex measures to reduce energy intensiveness of lighting – with energy savings min. 25%.
III.1.4. Construction and retrofit
a) of a low-energy residential house with resulting specific thermal energy consumption for heating in the heating season lower than 50kWh/$m^2$a with an average size of apartment max. 220$m^2$.
b) of a passive residential house with resulting specific thermal energy consumption for heating in the heating season lower than 15kWh/$m^2$a and consumption of primary energy including DHW and electricity max. 120kWh/$m^2$a.
c) of public buildings like schools, hospitals, social houses and public administration buildings in regions affected by natural disaster, with final specific thermal energy consumption min. by 20% lower than the current directives No. 291/2001 require.
In all cases III.1.1. to III.1.4 governmental subsidy can reach max.15% of the total investment costs for saving measures but max. 3 millions of CZK (equivalent to approximately 100 thousands of Euro).

*2. ČSOB Fond PHARE of energy savings*

The Fund, purely national, provides specific financing for small and medium energy saving projects with the aim to reduce costs that the proposer of the project has to pay for energy. This scheme is appropriate namely in the following cases:

High thermal losses due to extensive energy consumption in technological process
High thermal losses in the distribution and use of heat and DHW
Thermal losses due to heat transmission in buildings
Pollution of the environment
Investment costs are available in the range from 2 to 50 millions CZK also in cases that the project is composed from several subprojects. Loan maturity is from 4 to 10 years including time of realisation. Loan must be min. 60% of the total investment costs. Financial participation of the proposer is required in the amount of 20% of the investment costs. Energy savings must make min. 40% of the total savings reached by the project.

3.1.7. Greece

*1. Introduction*

Under the EU burden-sharing commitment, the Kyoto agreement overall target for Greece is to increase greenhouse gas emissions by only 25 per cent by the year 2010 in comparison to 1990 levels. To meet this target, the Ministry of Development introduced two general directives as a framework to development:
Reduction of environmental emissions and
Sustainable development

Within this framework, the Operational Energy Programme launched by the Ministry of Development with E.U. co-financing, turned out to be an effective means of promoting environmentally friendly energy investments (RES, ES or RUE) as well as for reducing $CO_2$ emissions.

*2. Financial schemes for implementation of low energy measures in the public sector*

The most successful instruments for financing low energy measures in public buildings are the following:

a. The Operational Programme for Energy (1994-2000) and the Operational Programme for Competitiveness (EPAN) (2000-2006), both comprising energy conservation subprogrammes and co financed by the European Community Structural Funds (Community Support Network), constitute the main tool for implementation of the national energy efficiency policy, hence reflecting the main energy efficiency strategy approved by the Government and the European Commission. Both programmes provide funds primarily for the support of energy efficiency and renewable energy investments and secondarily for the development of legislation, studies and other supportive soft actions.

Overall results on cost and energy savings for the Operational Energy Programme:
Total investment for the period 1996-2000:162,8 million US$ for energy efficiency
280,0 million US$ for RES
Total estimated energy conservation at the end of the Programme (2000):
280 ktoe/year = 11.72 x 106 GJ/year from energy efficiency investments
255 ktoe/year = 10.67 x 106 GJ/year from RES investments
Cost effectiveness:
13,89 US$/GJ saved/year for energy efficiency investments
26,24 US$/GJ saved/year for RES investments

b. Development Law #1892/1990
Total investment for the period mid 1993-end 1998: 25,0 million US$ for energy efficiency investments.
Contribution to energy efficiency aims and targets.
Total estimated primary energy conservation:
306 GWh/year = 1.10 x 106 GJ/year from energy efficiency investments

Cost effectiveness:
22,73 US$/GJ saved/year for energy efficiency investments

c. Other successful instruments are:
Regulation on thermal insulation for buildings
Energy efficiency standards for boilers
Energy efficiency standards for refrigerators/freezers
Legislation on energy labeling of domestic appliances
Law 2244/94, which gives incentives for electricity production through RES and CHP.

For these instruments the relative total investment, impact and contribution to energy efficiency aims and targets is very difficult to estimate.

*3. Other financial mechanisms*
Third Party Financing (TPF) is a key financial instrument for energy efficiency investments especially in the public sector. It is very difficult to promote, however, because of its complexity, the investment ownership status problems and the lack of experience in Greece. The Ministry of Development is trying to prepare and issue specific legislation on this subject to overcome these barriers.

3.1.8. Finland
*Financial Schemes*
In Finland the major part of financial schemes for low energy retrofits is developed under the National Climate and Energy Strategy. The new strategy is at the moment in drafting progress under the management of the Government's ministerial working group for climate and energy policy and will be put as a report before Parliament in autumn 2005.

*1. Financing by the Ministry of Trade and Industry (MTI)*
The Ministry can grant energy aid for such investments in the energy sector and such surveys mapping out investments that are aimed to develop the country's energy economy to a more environmentally friendly direction. The subsidies granted also aim to promote the take-up of new technology, to increase the security and versatility of energy supply, to increase the use of renewable energy sources and to reduce the environmental hazards arising from energy production and consumption. Energy aid is discretionary. It can be granted to companies and corporations, such as municipalities, within the spending limits of the State Budget. The Ministry can also subsidise information dissemination activities related to energy conservation, efficient use of energy and the use and production of renewable energy. This financing is mainly directed to Motiva (the national agency for promoting of energy conservation and the use of renewable energy).The Ministry also grants aid to promote the activities of such corporations of general interest that support the objectives of the Government's energy policy. The focus is on supporting such corporations with limited financial resources that are engaged in long-term activities promoting energy conservation and the use of renewable energy.

*2. Other financiers*
a. The National Technology Agency Tekes provides financing via Technology programmes, which are used to promote development in specific sectors of technology or industry, and to pass on results of the research work to business in an efficient way. In the autumn 2005, a total of 25 extensive national technology programmes are under way. In 2004, Tekes provided 171 million euros to financing technology programmes. Thanks to the programmes, many new successful products have been developed also for the improvement of building energy efficiency. The most important ongoing programmes related to building energy retrofitting

are:
ClimBus - Business Opportunities in the Mitigation of Climate Change Technology Programme
CUBE - The Building Services Technology Programme
DENSY - Distributed Energy Systems Technology Programme
Sara - Value Networks in Construction Technology Programme

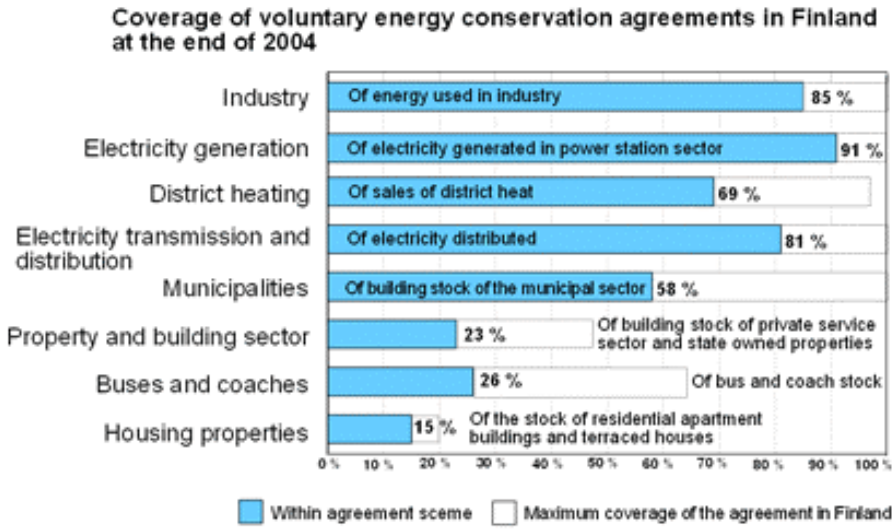
b. Various ministries can also finance energy projects within their own administrative sectors
The Ministry of Agriculture and Forestry grants aid for management of young forests and for harvesting of energy wood. It also grants the so-called chipping aid. Aid can also be applied for the energy projects of rural entrepreneurs.

The Ministry of the Environment grants energy aid to residential blocks of flats and terraced houses for measures improving heat insulation or for take-up of renewable modes of energy. Aid is also granted for renewal or repair of ventilation and heating systems and their functioning.

c. Motiva also promotes energy-saving activities.
Motiva's main forms of activity are information dissemination, development of energy auditing and promotion of the take-up of energy-saving technology. Motiva's operations are focused on energy conservation. Its primary objects of activity are housing, transport, private services, small and medium-sized industry and public services. Motiva can support, for example, information dissemination projects with its own inputs in the projects. Motiva is a state-owned company and its principal financier is the Ministry of Trade and Industry.

*3. Voluntary energy conservation agreements*
Energy conservation agreements are framework agreements concluded by the Ministry of Trade and Industry (MTI) and various sector organisations. Most of them are valid until 2005. Motiva is responsible for administration and monitoring of the agreements. The voluntary agreement scheme was launched in Finland in November 1997 not just for industrial companies but also for buildings and the energy, transport and public sectors. The energy conservation agreements are framework agreements by which branch associations undertake to further energy conservation and their members' accession to the energy conservation agreement.
Companies and municipalities, which join the agreements, undertake to carry out energy audits or analyses at their properties and production plants, to draw up an energy conservation plan, and to implement cost-effective conservation measures. The MTI supports energy audits and analyses, as well as energy conservation investments fulfilling certain criteria. With regard to housing properties, responsibility for audit subsidy rests with the Ministry of the Environment.

The coverage of various agreements at the end of 2004 is shown in the figure below. The coverage of all agreements is presented as the shares of the respective sectors to facilitate comparison of the shares. The figure also presents the maximum coverage of the agreements in the respective sectors in Finland.




Companies or municipalities, which have entered into energy conservation agreement, undertake to start up energy audit or analysis operations and to compile a plan on increasing the efficiency of energy use. The government subsidies for companies within voluntary agreement scheme on energy audits are 50% and 40% for companies not in the agreement scheme. The effect of saving measures implemented through energy conservation agreements of industry has been substantial.

In the National Climate Strategy and the associated Energy Conservation Programme, voluntary energy conservation agreements play a central role in the implementation of energy efficiency. The objective is that a total of approximately a quarter of Finland's targeted greenhouse gas reduction in 2010 will be achieved by energy conservation measures. Measures increasing the use of renewable energy are expected to account for another quarter of the reduction.

*4. Subsidies for energy audits*

With the exception of the energy conservation agreements of the transport sector, one of the main objectives of the agreements is to expand energy audits and energy analyses to the greatest possible extent. In most sectors, the agreements have had a significant impact on the increase of energy audits in the last few years. In industry and the property and building sector, the agreements have greatly increased the volume of energy audits. Still, it is a major challenge to reach the coverage target set for energy audits by the end of 2005.

Energy audit is a systematic procedure that evaluates the existing consumption, identifies and scales the cost-effective energy saving opportunities and reports the findings. Today there are nine official Motiva energy audit models in use. The Ministry of Trade and Industries (MTI) is subsidising the implementation of audits following these models. However, it should be noted that in industry and in the energy sector, audits are conducted also without MTI subsidies.

The subsidy is usually 40% of the audit costs. For municipalities and federations of municipalities that have signed the voluntary energy conservation agreement with the MTI, the maximum subsidy is 50%. The subsidy must always be applied for before the project is started.

Energy audit and energy analysis projects associated with energy conservation agreements and supported by the MTI are summarised in the table 1:

**Energy audit and energy analysis projects associated with energy conservation agreements and supported by Ministry of Trade and Industry**

| Year | Agreement sector | Number of applications | Number of objects | Costs of projects, millions € | Subsidy granted by MTI, millions € |
|---|---|---|---|---|---|
| 04 | Industry | 44 | 54 | 1,99 | 0,80 |
| 04 | Energy sector | 4 | 5 | 0,13 | 0,05 |
| 04 | Municipal sector | 42 | 232 | 0,85 | 0,43 |
| 04 | Property and building sector | 12 | 49 | 0,32 | 0,13 |
| **2004** | **Total** | **102** | **340** | **3,29** | **1,41** |
| 98-04 | Industry | 273 | 421 | 13,70 | 6,22 |
| 98-04 | Energy sector | 52 | 115 | 2,19 | 1,03 |
| 98-04 | Municipal sector | 174 | 1.271 | 4,54 | 2,24 |
| 98-04 | Property and building sector | 89 | 485 | 2,64 | 1,12 |
| 98-04 | Transport sector | 3 | 4 | 0,01 | 0,01 |
| **1998-2004** | **Total** | **591** | **2.296** | **23,08** | **10,62** |

The total amount of audit subsidies granted for the sectors associated with energy conservation agreements remained roughly at the 2003 level. Subsidies fell by 8%, but on the other hand, eight of the audit project applications from 2004 were deferred for decision in 2005, due to a budget shortfall. The audit volume of the municipal sector was doubled in 2004 and the number of projects also grew by more than a half. This was partly anticipated, since in 2003, some of the largest municipal authorities did not launch any audit projects. Despite the good results in 2004, reaching the audit target of the municipal sector agreement in 2010 appears difficult. The audit volume of the property and building sector in terms of property volume almost halved in 2004, as it did the previous year, and no more significant audit projects are expected to be initiated in 2005. Consequently, the audit target set in the agreement will not be reached with regard to the whole property stock. Industrial audit and analysis activity clearly increased in 2004 but the audit subsidies granted for the projects fell by 15%. The number of phase two specific analyses in the process industry has been significant in recent years; the analyses included four industrial power plants in 2003.

In the energy sector, the audit volume did not reach to the 2003 level. Three small projects were initiated in power plants, one property audit was conducted in the power transmission and distribution sector and none in the district heating sector. However, particularly in the district heating sector, large number of energy conservation analyses have been conducted without subsidies but there are no available statistics on them.

*5. Investment subsidies*

In its energy subsidy policy, the MTI lays the main emphasis on the introduction of new technology, which saves energy and uses renewable sources of energy. However, enterprises and municipalities, which have joined energy conservation agreements, can on certain conditions also receive investment support within the framework of the MTI's available appropriations for projects using conventional energy conservation technology. Subsidised investments must be verified by energy audits, energy analyses or other similar reports. In 2004, the maximum subsidy for conventional energy conservation investments was 15-20%. Before 2002, the maximum level was 10%. The minimum size of a subsidised project is 25 000 euros and the maximum subsidy to one enterprise is 150 000 euros per year. As regards subsidised conventional energy conservation measures, priority is given to projects which save electricity. Power capacity saving is only subsidised if the corresponding energy saving is considerable or the reduction of emissions is significant. Subsidies are not granted for alterations to heating method with the exception of switching over to the use of renewable

energy sources. Principally, subsidy is granted for investments whose interest-free pay-back-period exceeds two years. Both audit and investment subsidy must be applied for before the project is started.

In 2004, a total of about 7.3 million euros of investment subsidies were granted for 53 projects within the four agreement sectors. Subsidies given in 2004 were about half of the total throughout the agreement term. Since the conclusion of the agreements in 1998, total subsidies of about 14.4 million euros have been given to 169 projects. Thereof, industry received 54%, the energy sector 31%, the municipalities 7%, district heating 6% and the property and building sector 1%. In terms of number of projects, industry accounted for 57%, whereas the share of the municipal sector was 25%, power plants 7%, and district heating and the property and building sector 5% each.Investment subsidies granted by the MTI in 1998-2004 associated with energy conservation agreements are diescribed in the table 2:

**Investment Subsidies Granded by the Ministry of Trade and Industry (MTI) Assosiated with Conservation Agreements**

| Year | Agreement sector | Number of applications | Granted subsidy by MTI million € |
|---|---|---|---|
| 04 | Industry | 31 | 2,98 |
| 04 | Energy sector | 5 | 3,89 |
| 04 | Municipal sector | 13 | 0,32 |
| 04 | Property and building sector | 4 | 0,15 |
| **2004** | **Total** | **53** | **7,34** |
| 98-04 | Industry | 97 | 7,69 |
| 98-04 | Energy sector | 21 | 5,44 |
| 98-04 | Municipal sector | 43 | 1,06 |
| 98-04 | Property and building sector | 8 | 0,18 |
| **1998-2004** | **Total** | **169** | **14,37** |

*6. The ESCO concept*

In general, the enterprises participating in energy conservation agreements are responsible for implementing and financing their own energy conservation investments. Sometimes, the implementation of sensible and cost-efficient conservation measures is hindered by different factors. Examples include insufficient resources for the measures to be taken and the fact that enterprises require a higher profitability of energy conservation investments than of other investments. One alternative to tackle these problems is to order the implementation of energy conservation measures from a third party (the so-called ESCO operations model).

Currently, there are a few ESCOs in operation in Finland. However, they have not become as widely prevalent as expected while the feedback received on the projects implemented ESCOs has been positive. Information on ESCO projects in Finland is available on Motiva's website in the ESCO project register.To boost ESCOs, the MTI has granted investment subsidies to ESCO projects since 2002 and made them equal with demonstration projects for new technology. In 2004, ESCO projects accounted for about 10% of the subsidies granted, in 2003 over 35% and in 2002 about 20%. ESCO projects of enterprises and municipalities participating in conservation agreements have received subsidies of 15-25%, while those outside conservation agreements have received subsidies of 15-20%.

## 3.2. Tables of financial schemes appropriate for low energy public retrofits in Europe

### 3.2.1. Table I: BRITA IN PuBs, WP1 - Financial Schemes used for Low Energy Retrofitting of Public Buildings in Europe

| Country | Source of Funding | Service Responsible | Type of Funding | Name and Description of Programme | Year Started | Public buildings included |
|---|---|---|---|---|---|---|
| GERMANY | State (National) | Ministry of Economy<br>Ministry of Environment<br>Ministry of Buildings | Grant, Co-financing of innovative retrofit measures (pilot projects) | EnSan | 1998 | Yes |
| | State (National) | KfW Bank (Kreditanstalt für Wiederaufbau) | Loan with low interest rates for energy-efficient retrofitting | KfW-Förderung | 1998 | Possible (through private contractors) |
| | Private | Energy Supply Companies and Banks | Financing of energy conservation retrofits, while overtaking 10 years of operation → Gradually paid back by energy savings | Third party financing | 1995 | Yes |
| | Regional (City of Stuttgart) | Dept of Environmental Protection, City of Stuttgart | Financing of energy efficient measures for public buildings → paid back by energy savings | Internal contracting-Intracting | 1995 | Yes |
| | State | Electricity companies | Subsidized price for electricity production by renewables fed to the grid | | 1998 | Yes |
| | State | Tax authorities | Lower taxes for low energy houses | Niedrigenergiehaus-programme (low energy house programme) | 1996-2000 | No |
| | Public | Building Owner | Increased rent based on retrofit measures | Law on increased share on rent | 1986 | Yes |
| U.K. | Energy Savings Trust | Energy Savings Trust | 0% Interest Loan | Community Energy Programme | | |
| | Carbon Trust | Carbon Trust | No-cost service | Energy Efficiency Loan (for replacing existing equipment) | | |
| | Carbon Trust | Carbon Trust | No-cost service | Energy use survey | | |
| | National | DTI | R.E. Grants | Clear skies Grants for renewable energy systems (esp. P.V.) | | Yes |
| ITALY | National | Ministry of Environment | 75% grant for P.V. installation in connection with grid | "P.V. roofs" programme | | Yes |

| Country | Source of Funding | Service Responsible | Type of Funding | Name and Description of Programme | Year Started | Public buildings included |
|---|---|---|---|---|---|---|
| ITALY (continued) | National | Ministry of Environment | 85% grant for integration of PV systems | Best architectural integration of P.V. | | Yes |
| | National | | 20% grant for r.e. thermal systems | Solar Thermal programme | | Yes |
| | Regional | Local Administration | 50% grant<br>50% loan | Solar Thermal programme installation (for sustainable energy system) | 2000 | Yes |
| CZECH REPUBLIC | State (National) | Ministry of Industry and Trade →<br>Czech Energy Agency | 15% subsidy of total investment costs | Reduction of energy intensiveness in public buildings incl. Retrofits | | Yes, in some cases |
| | State | | Loan (min 60% of investment costs) | CSOB Fund Phare for Energy Savings | | |
| NORWAY | State | Enova<br>(Public enterprise owned by Ministry of Petroleum & Energy) | | | 2001 | |
| | State | Research Council of Norway | | Funding research on S.D. topics | | |
| | State | GRIP<br>(Ministry of Environment) | 50% state | EcoBuild programme | 1998-2003 | |
| | State | State Housing Bank | Public subsidies<br>Grants<br>Energy saving<br>Loans | Financial support for retrofitting of buildings | | |
| | Regional | Oslo Energy Saving Center<br>Akershus Energy Saving Center | 40% subsidies of R.E. systems | Subsidies of R.E. Systems | | |

| Country | Source of Funding | Service Responsible | Type of Funding | Name and Description of Programme | Year Started | Public buildings included |
|---|---|---|---|---|---|---|
| GREECE | State, E.U. | Ministry of Development<br>Ministry of Environment | Grant for low energy retrofitting of public buildings | EPAN<br>Operation Programme for Competitiveness | 2003 | Yes |
| DENMARK | Private | Energy Supply Companies and Banks | Third party financing –could also be arranged as sort of leasing arrangement | Financing of energy conservation retrofits, while overtaking X years operation → Gradually paid back by energy savings | 2005 (?) | Yes |
| | Different municipalities | Dept of Municipal Building Maintenance | Financing of energy efficient measures for public buildings→ paid back by energy savings | Internal contracting-Revolving funds | 1995 | Yes |
| FINLAND | Public | Ministry of Trade and Industry through Motiva | Grant | Energy aid for New Technologies | | Yes |
| | Public | MTI | 50% subsidy | Voluntary energy conservation agreements | | Yes |
| | Public | Motiva | 50% subsidy | Subsidy for energy audits | | Yes |
| | Public | MTI | 15-20% subsidy | Investment subsidy for conventional energy saving measures | | Yes |
| | Public/Private | MTI/ESCOS | 15-25% subsidy to TPF projects | Subsidy to TPF projects through ESCOS | | Yes |

### 3.2.2. Table II: Assessment of financial schemes for low energy retrofits of public buildings

| Name and description | Countries | Success Rating (High / Moderate / Low) | Reasons | Transferability to other countries | Necessary adaptations |
|---|---|---|---|---|---|
| EnSan<br>Co-financing of innovative retrofit measures | Germany | Moderate, limited to few pilot projects | Limited funds | Yes | Target values might have to be adapted (in EnSan: 50% reduction of primary energy demand) |
| EPAN<br>Co-financing of pilot projects (E.U., public) | Greece | Moderate, Limited only to some technologies and functions (Hospitals, schools, island communities) | Limited funds<br>Questionable selection procedure | Yes | Best to have open call for tenders for retrofit projects |
| Intracting<br>Internal contracting-Stuttgart | Germany<br>Denmark | High | Quick decision<br>Revolving funds replenished by savings<br>No risks, no bureaucracy | Yes | Depends on structure of local facilities involved |
| Third party Financing (t.p.f.)<br>Financing of energy efficiency measures, paid back by energy savings | Germany,<br>Greece<br>Denmark<br>England | High | Lots of projects, interesting investment possibility for contracting companies | Yes | Complex legal procedures to have the programme started in most countries |
| E.U. grants for pilot projects | All European countries | Moderate | Financing of innovative low energy projects, including public retrofits, following open call for proposals procedure but limited amount of buildings, high effort for application, reporting, etc. | Yes, even to some non member countries | Often difficult to match e.u. funding through local grants (public or private) |
| -Clear skies<br>P.V. roofs etc<br>Grants for Renewable Energy Systems, esp. P.V. in connection with grid | U.K.<br>Italy<br>Germany | High | Covers large percentage of installation cost for p.v. systems integration | Yes | |

| Name and description | Countries | Success Rating (High / Moderate / Low) | Reasons | Transferability to other countries | Necessary adaptations |
|---|---|---|---|---|---|
| Solar Thermal Programme<br>Grant for installation of solar thermal systems | Italy<br>Germany | High | Covers part of installation cost for solar thermal systems | Yes | |
| Electricity price subsidy for renewables fed to the public grid | Germany<br>Greece | Moderate for Greece<br>High for Germany | Price fixed has to be high enough to act as incentive for electricity production by renewables , as is the case in Germany | Yes | |

## 3.3. Financial Mechanisms used in BRITA demo buildings

3.3.1. U.K. – Plymouth College

What prompted this college to become more environmentally responsible was the existence of EU grants. When the college had a more innovative senior management we had a small group of people dedicated to looking at the available grants and to assess how we might take advantage of them and at the same time deliver some projects we wanted or needed.

In the late 1990s when Plymouth had better access to EU grants we saw the growing focus on the environment. Our first grant enabled us to do a feasibility study into the form of support that the college should give small and medium enterprises in terms of their performance. The feasibility lead to us setting up a small unit dedicated to SME environmental support. It also concluded we should put that unit in an exemplar building. This lead to a scheme for a new building of 2400m2 containing much more than just the SME unit. This sought to demonstrate what could be achieve without extra capital funding in term of good environmental design. We now have the Innovation Centre that contains such technologies as night time cooling through natural ventilation, high mass construction, orientation to control solar gain and glare, good natural light, low energy lighting and controls, heat pump, displacement ventilation, greener material choice etc etc. This was funded by:

* Funding council for the further education sector
* EU grant
* Regeneration grant
* College borrowing.

All the time we were then becoming more and more interested in responsible facilities management. During maintenance replacements we use only low energy lighting and controls, together with tight management of our energy management system. We have installed waterless urinals across all our buildings . These are things we will do now without grant aid but simply because it makes sense. We obtained another grant from land fill tax money to establish a significant waste separation scheme which now extends to both of our main sites. We may not have done this without grant aid although the grant meant the scheme was set up more expensively than it might have been.

In 2000 we were asked by the Finance Director to investigate how we might get grant support to help with the major cost foreseen for the refurbishment of the Tower Block. It was then we had initial contact with IT Power who were recommended by a government department (DTi) to assist with making a grant application for a significant PV scheme to help reclad the tower block. It was clear due to changes in the various grant schemes, especially EU, that our only hope was to do another environmental exemplar. The theory being that once you have one grant you tend to attract others. The application to the DTi was made and failed. IT Power then introduced us to BRITA in Pubs..

With regard to the BRITA in Pubs demo project this will be funded in the following way:
Wind turbines
* BRITA in Pubs (EU6FP Ecobuildings)
* EDF Energy a regional electricity supplier
* Clear Skies grant another one from the DTI (Dept of Trade and Industry)
* Small contribution by the college

Rest of the Demo Project(this is a much bigger project than just the BRITA targets since we are refurbishing the whole of the building not just doing energy saving measures).
* BRITA in Pubs (EU6FP Ecobuildings)
* DTi grant for large PV array, yes we were successful the second time and have been given about 680 000 euro!
* Learning and Skills Council who are the government funding body for the further education sector. We are having lots of problems with them. They have delayed our application process and don't seem concerned if we lose the other grants as a result.
* College funding through loans.
I have to say that the grant regime connected with encouraging energy saving technologies has been effective in promoting good practice at the college. The grants first got us interested and now we are interested away. I have to say for me it has nothing to do with so called Global Warming being the latest international scare. Doing things in a responsible environment way just make good sense and has made my job more interesting.

3.3.2. Czech Republic – Brewery

Besides funding through the Brita in Pubs programme (EU6FP Ecobuildings) as a demonstration building, our project will obtain additional funding in the following ways:

The University asked for additional money from the Czech Ministry of Education and the Regional Government of South Moravia
The University had to postpone some other construction works and to prioritize the Brewery.
The University tried to get some additional money from the National programme of energy savings but the conditions to be fulfilled within this programme (for our case energy savings using recovery system and lighting ) were beyond the potential of measures applied in the Brewery. In fact the requirements are very high on the side of energy savings, almost like in passive house, which can't ever be reached with a public building of this type.
For PV, the supplier (company SOLARTEC) will submit a proposal for financial subsidy from the National environmental fund. Currently the Fund stopped accepting proposals because of lack of money.

3.3.3. Norway – Hol Church

Financing the EU demo project at Hol Church, Norway
The major work at hand includes insulation of walls and roofs, air leakage work around windows at difficult junctions and finally the solar thermal system.

The Church is financing its 65% of renovation work costs in relation to the EU project through a grant from the local Hol Church Council. In addition a smaller part of the cost might be financed by a grant from the local energy utility. If so – this will “soften” the load on the Church Council. If not – the Council will carry the costs. 35% of the costs are carried by the contribution from the EC through the BRITA in Pubs project (EU6FP Ecobuildings)

A limiting factor regarding finance is the rules related to subsidy.
It makes it difficult to “soften” the financial burden on the Church Council as long as it is illegal to receive “state” support (EU and central national Government funding) covering over 50% of the total costs. This is a limiting factor regardless of whether the solutions at hand are simple (insulation) or innovative (solar air system). In brief : Although it might be possible to achieve financial support for more than 50% of the project, the EC project regulations inhibit and stop the use of such public state-related funds.

Why does the Church take on the costs ?

Churches have so high running costs as a result of rising energy prices that in Norway a great number of them are about to be closed to the public permanently.
Churches are simultaneously important cultural historic buildings. Preserving them is important.

The Church Council has the responsible task of ensuring a proper maintenance of the churches. In order to fulfil this task the Council invests in energy saving measures that can bring down the annual energy running costs.

The Church Council also has another function. To guide and show good examples to the general public so that the Church also positions itself centrally in the debate on climate change and the energy crisis or challenge and points at the solutions of the future.

On incentives
Incentives work. The strongest of all incentives is saving running costs. But this in itself does not make everybody move. In order to reach a broad part of society financial incentives like tax credits or direct money support have to be simple, unbureaucratic and targeted. If not they tend to only be used by the professional applicants, those who are experts at filling in forms and sending applications with the correctly – for the task – chosen buzzwords. Most owners or users of buildings are not.

### 3.4. Summary of D5 interviews on economic barriers

This is a summary of interviews on economic barriers coming from WP1 report D5, entitled "Socio-economic analysis on Barriers and Needs", and is included here as related information. Additional comments from each one of the participating countries can be found in Annex I.

Although in most European countries payback time is an important consideration for low energy innovative solutions in the public sector, decisions on their implementation are mostly based on investment rather than life-cycle costs and are mostly influenced by limited budgets. The latter are insufficient to cover extra initial costs for innovative retrofitting projects, even the most energy efficient ones.

Energy saving returns cannot be taken into account for the planning phase of a project, since
a) they usually belong to a separate account and
b) they cannot influence investment or operating budgets as energy bills are often paid directly by the state.
Therefore there is no obvious advantage towards energy conservation for the public administration or the users. The only way to encourage energy conservation measures in public buildings would be to initiate incentives in the form of an energy saving bonus, for instance, which would allow the department or building responsible for adopting energy saving measures to use some of the funds saved for their own needs. This may in turn stimulate competition among different sectors of a public administration for initiating energy conservation strategies.

For most countries it is difficult for the public administration to achieve a correct evaluation of different energy conservation solutions in terms of energy efficiency and cost, since they lack specialized information and personnel. What is more, energy costs may change unexpectedly throughout a year.

Energy prices do not take into account external factors, such as environmental pollution or climate change, which are negative consequences to the environment directly related to conventional energy consumption. This policy results in low energy prices, which act as a disincentive for energy conservation. The proposed E.U. Emission Trading Scheme involving compulsory mapping of $CO_2$ emissions is a movement in the right direction, and may result in an increase in the price of electricity for the economy as a whole, since companies in the power generation sector are required to take into account environmental factors associated with their operations.

In most countries there is lack of information on financing mechanisms and incentives for the implementation of low energy system in the public sector. Existing financial schemes through the state are often considered bureaucratic and demand considerable effort from a proposer with limited economic benefits at the end, probably because of limited resources.

Innovative low energy systems have been implemented as demonstration projects in many European countries, mostly due to competitive European programmes, where E.C. funding covers a percentage of extra investment cost for energy conservation systems and renewables. Results from these projects are not disseminated widely enough so that they can act as pilots and have a marked effect on new and existing buildings both in the public and the private sector.

# 4. Innovative financial schemes for low energy public retrofits in the European Union

As analysed previously in this report, different types of financing measures have been developed and applied throughout the EU in the past. These range from traditional subsidy schemes to reduce the initial investment costs (grants) through tax relief and exemptions, to more innovative schemes such as Third Party Financing and Energy Performance Contracting.

The European Commission, through the programmes SAVE and ALTENER supported actions for the development and application of new financial schemes, which included Third Party Financing (TPF) and Energy Performance Contracting/Intracting, feasibility studies for the creation of Energy Service Companies (ESCO's), incentive schemes related to Demand Side Management (DSM) measures and investment funds for energy efficiency & renewable energy sources. These financial schemes should be linked, as a market tool, to the concept of energy service, guaranteeing the improvement in energy efficiency.

A more thorough analysis of two of these schemes which have been proved successful for financing low energy public retrofits in EU countries follows.

## 4.1. Third Party Financing (TPF) / Contracting

4.1.1. General description

Normally, the government or local authorities purchase e.g. natural gas, heating oil or electricity to provide space heating and hot water for public buildings. Along with the respective building, the public authority also owns the heating system, so it is in charge of operation and maintenance.

In heat delivery contracting, a so-called energy service company (ESCO) invests in facilities used for energy conversion at the client's. For example: The ESCO installs a combined heating and power system in a public building, e.g. an indoor swimming pool, and acts as the government's heating and energy supplier, which means the ESCO provides the necessary fuels. In addition, the services provided by the TPF company also comprise the operation and maintenance of the installed systems. The settlement of accounts is based on the delivered heat and electricity volumes. Local authorities will be particularly interested in an out-sourcing of energy supplying services, if this turns out to be a way to reduce building management costs.

While in heat delivery contracting the focus is on energy supply; during an energy performance contracting project, the ESCO aims at a reduction of energy requirements. Such a reduction can be realised by all kinds of methods to increase efficiency. In energy performance contracting, the contractor's remuneration is based on the cost savings achieved.
Theoretically, any measures can be implemented that produce enough in terms of savings to refinance the investment expenses for the installed facilities and components within their technical life span. Throughout the course of the energy performance contracting project, energy management costs are made up of:
(reduced) costs for energy supply and
the TPF rate

Upon the conclusion of the contractual relation, the TPF rate ceases to apply. The client then profits fully from the cost savings achieved. It can be agreed that the client already receives a share in cost savings during the term of contract (see Figure 1).

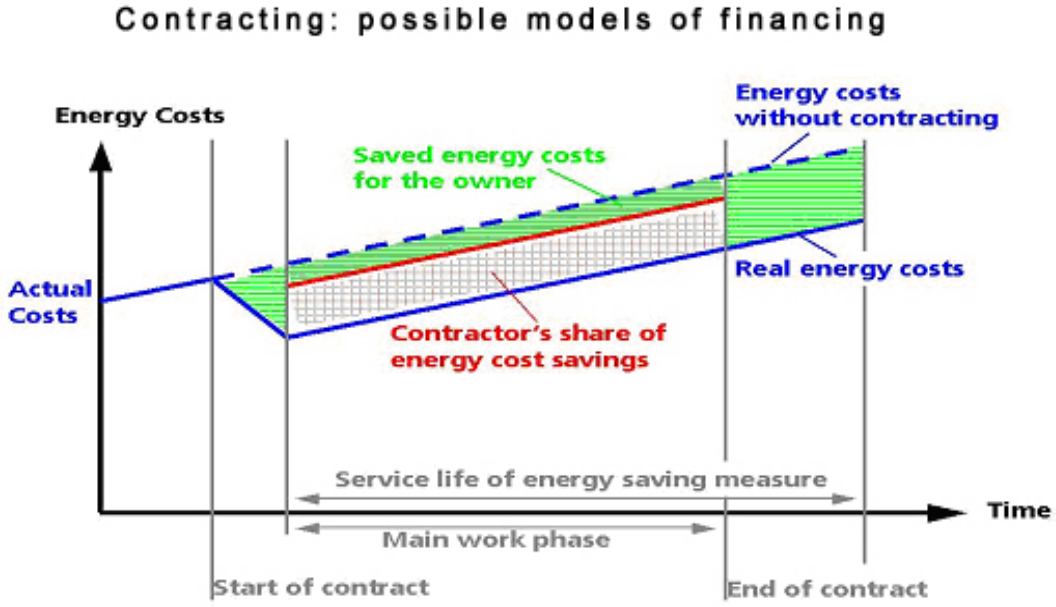



Figure 1: Financing model for energy contracting

In order to reach a maximum reduction of the energy management costs for public buildings, it is recommended that the energy performance contracting partner is chosen by means of a tendering procedure. This is the only way to guarantee that the client will be able to profit from the advantages of a competition of prices and ideas.

4.1.2. Advantages of TPF schemes

An energy performance-contracting project has numerous advantages for the public authorities:

There are no capital requirements for the client. Energy performance contracting can therefore be a solution in those cases where no capital is available for the implementation of energy efficiency measures. Besides the planning, implementation and financing of energy saving measures, the range of services offered by TPF company comprise operation and maintenance, among other things. For all these services, the authorities now have one and the same contact partner (Figure 2).

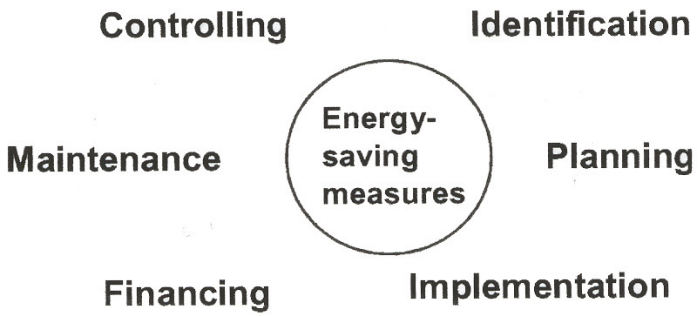



Figure 2: Range of services offered by a TPF company

The reduction of energy management costs eases the burden on the public budget. The

contractor's remuneration is calculated on the basis of actually achieved savings. Thus, the energy service company will assume responsibility for unforeseeable events in the areas of technology and financing.

4.1.3. Identification of suitable investments

In energy performance contracting, all expenses of the TPF company are covered by the savings made in terms of energy costs. The energy savings achieved during the implementation of the energy-saving investments must therefore be high enough to provide coverage for interests and repayment of investment costs, as well as for the expenses accrued by the TPF company in connection with services such as operation and maintenance.

In the course of an energy performance contracting project. the contractor makes investments in energy-saving measures carried out at the client's. As a consequence, the client's expenses for energy supply are reduced. In return, the TPF company receives, in most cases, at least 80 % of the savings in energy costs achieved over a period of time that is to be agreed upon. This share in savings must be high enough to cover all project-related expenses (Figure 3) accrued by the TPF company. Only under this precondition can the energy performance contracting project be viewed as efficient.

What has to be taken into consideration in the project calculation in particular - besides the refinancing of investment costs- are the comparatively high (monetary) efforts required for the other services rendered by the TPF company in the course of the project. The TPF company will try to compile a service package that can be offered for the object in question by means of energy performance contracting -and therefore economically sound under the prevailing conditions.

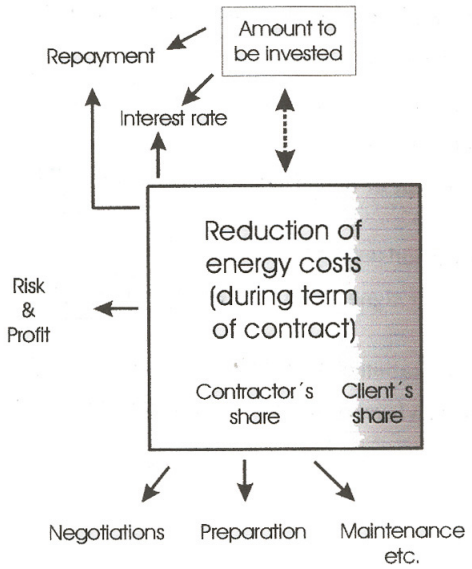



Figure 3: Project-related expenses in energy performance contracting

4.1.4. Assessment of a Building Energy Saving Potential

A building analysis tells the extent of the economic energy-saving potential. In the course of a building analysis, the possibilities of technical improvement are identified and economically assessed. Measures are considered efficient if the cost savings are sufficient to cover investment costs over a certain period of time.

If an Energy Consumption Analysis for a public building does not exist, it is recommended to assess the building according to selected building-specific energy indicators. Based on these

indicators (in particular: surface-related energy of heat consumption per year) one can assess, in a relatively simple (and therefore both time-saving and cost-saving) way, whether a building offers favourable conditions for an energy performance contracting project. The energy indicators of the buildings in question might be compared to the respective desired value. The desired energy values for the thermal and electric use of energy in old and new buildings can be found through national standards or based on national benchmarks for each country.

## 4.2. Intracting: A financing tool for energy efficiency

In times of budgetary constraints, the financial bottlenecks experienced by many local authorities prevent implementation of energy-saving measures, regardless of whether such measures are cost-effective or not. Because such measures generally also save costs in addition to reducing energy consumption, Stuttgart developed in 1995 a model approach for public facilities to finance cost-effective measures. In this internal contracting – "intracting" – approach, the City Treasury makes financial resources available to the Energy Department in the Office for Environmental Protection, in order to provide advance financing for energy- and water-saving measures. The host department where these measures are implemented commissions the city's Construction Department to carry them out in the usual way. After the measure has been implemented, the energy costs saved are returned to the Environment Department until the original investment has been recouped. Afterwards the facility can keep the savings, as shown in Figure 1.

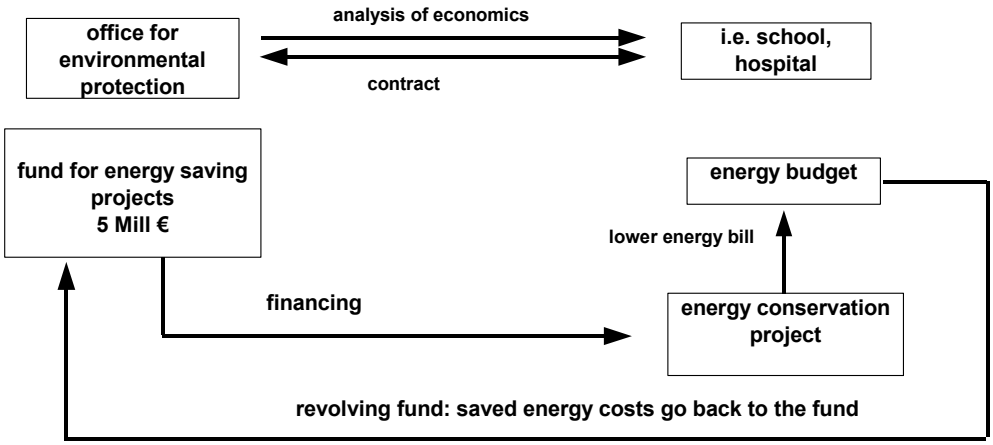



Figure 1: Intracting scheme.

Between 1995 and 2004 about 250 individual projects have been started with a total of 4.5 million Euros of investment. The average capital backflow time during the first years was 6 years. It is assumed that this time will increase since investments are planned into building envelopes and electrical power consumption reduction. The total of all realised projects until 2004 result in an annual energy cost reduction of 930.000 Euros, in a reduction of 14.600 MWh heating energy, of 1.800 MWh electrical power consumption and of 36.200 $m^3$ water consumption. Additionally in some projects the focus is not only on energy savings, but also on the reduction of peak loads.

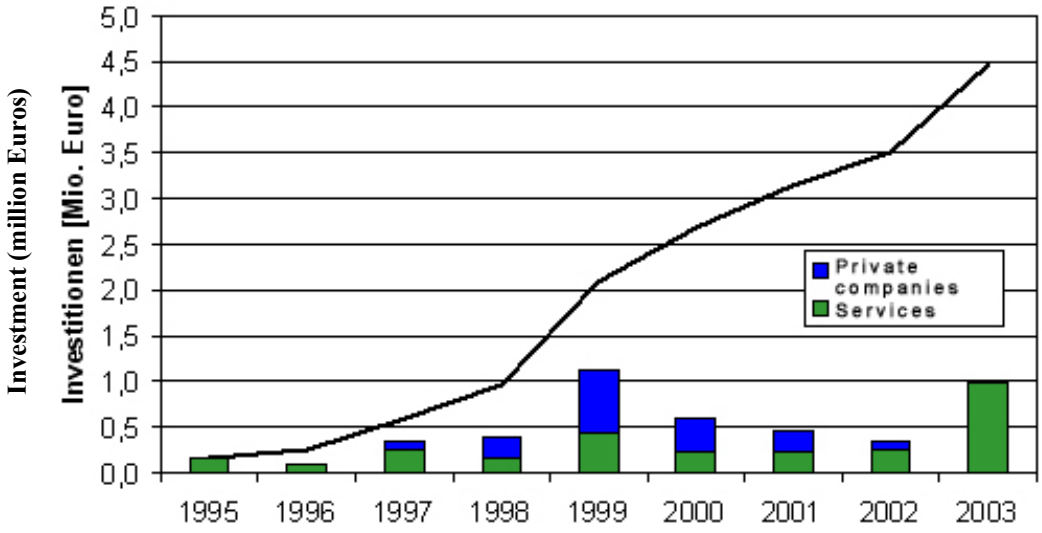



Figure 2: Internal contracting investment in Stuttgart.

More than 200 individual projects concerned with saving heat, electricity and water of variable sizes have been implemented. Examples for the projects are the thermal insulation of roofs, new digital controls for lighting or heating systems, frequency controls for pumps, water saving appliances in public pools, highly efficient heat recovery systems, biomass boilers and cogeneration plants.

In the first two years of the scheme, financing agreements were concluded exclusively with the city's departments. In 1997, the City Treasury extended the scheme to include the municipal enterprises (Eigenbetriebe – "autonomous undertakings"). Here, however, capital recovery cannot take place in the same way, and is structured as a grant instead. The capital provided for the scheme was increased accordingly.
Figure 3 shows annual and cumulative savings. The average capital recovery period is just below 5 years. This explains why total savings have reached more than Euro 3.5 million. The initial capital has now been through the investment cycle once, and has been invested again.

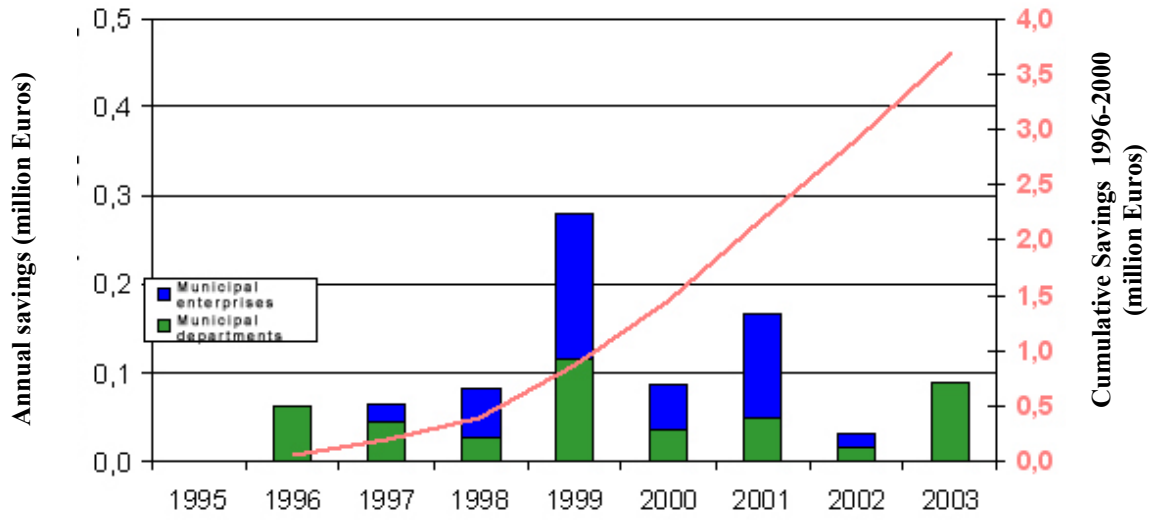



Figure 3: Savings generated through internal contracting.

In view of this success, the capital was increased over the years 2002 to 2005 by 750,000

Euros each year. It has thus now become possible to realize further and more intensive projects. For instance, in 2003 the construction of a wood-chip-fired heating system was financed. A wood-fired heating system with a thermal capacity of 600 kW was installed in a school. With this system, 85% of the heat requirement (2 million kWh) shall be produced in future from wood, a renewable energy source. The wood chips are sourced from landscape management activities carried out within the city, and tipped by truck into a 160 m³ hopper. From there, they are conveyed by a fully automatic system to the boiler. The investment for the entire installation amounted to about 600,000 Euros. Annual energy cost savings figure about 62,000 Euros, and are returned to the Environment Department as set out above. The installation saves 400 t $CO_2$ emissions annually. This example highlights that, in addition to consumption and energy cost savings, this approach also makes an important contribution to environmental protection.

Compared to contracting with external partners, internal contracting has a number of advantages: On the basis of agreements adopted within the local authority, energy saving measures can be financed and implemented quickly. As opposed to external financing, no mark-up for business risk and profit or for interest on capital deployed by external companies is incurred. Part-financing is also possible, for instance for heating system retrofits; so, too, are very small projects, such as pump replacement. The effort required to monitor and implement projects across their entire duration is much smaller than when entering into a contracting arrangement with an external company. Similarly, there is no need for legal advice when drawing up the contract. Prerequisite for this model is that the municipality has its own know-how on energy saving and is able to finance the start-up of the project.

This financing scheme supports municipal energy management greatly. Energy costs for municipal buildings can be reduced without the city's departments and enterprises needing to apply for money to the City Treasury. As a result, proposals made by energy managers to cut energy or water consumption can be implemented in the swiftest possible way.

# 5. Conclusions

Based on the analysis of financial strategies discussed in the previous chapters, we can reach the following overall conclusions:

Although in most cases funding comes from the state, either at a national or at a regional level, there are some instances of private funding for low-energy retrofitting of public buildings, either through a bank or through a third-party financing (t.p.f.) mechanism sponsored by energy supply companies, who can often propose and implement a series of energy-conservation measures for public buildings and agree to be paid within a period of several years only by the operating costs saved by the project. Although this is a rather new possibility, mentioned only by a few countries (Germany, Denmark and Greece) it certainly has a lot of advantages for the low-energy retrofitting of public buildings throughout the E.U.

The possibility of internal allocation of funds (intracting) by a public enterprise, in order to apply energy efficient retrofitting measures to its own buildings is also quite promising. In fact the initial fund is always replenished by the energy savings from the measures implemented – as is also the case with t.p.f. projects. This is a financial procedure established by the department of Environmental Protection in the city of Stuttgart and has been successfully used for the last 10 years, as described in Chapter 4 of this report.

Special, mostly state-funded, programmes exist in most countries for the financing of low-energy public buildings. These are used as pilot projects to demonstrate the efficiency as well as other advantages (internal comfort, clean operation, low operation cost, esthetics) of selected innovative technologies. In these cases, as in our demo buildings, the project is funded by a combination of public subsidies and grants coming from different sources, including the E.U. Implementation procedure is usually a public call for tenders. A monitoring period follows the implementation of the project, while dissemination of the results is quite important for public opinion to be reached.

Finally many countries offer quite ambitious programmes of P.V. integration in buildings. In Italy there is even a programme placing a special emphasis on architectural integration of P.V. systems. These programmes are funded by a combination of public and E.U. grants for P.V. installation and integration, provided electricity produced is fed into the public grid.

In this case it is interesting to note that there is often a subsidized price for electricity production created by renewables if supplied to the public grid. This may act as an extra incentive for public buildings, as the amount of electricity supplied, if measured at this special prize, can constitute a considerable asset for a public building, which can be used for many other needs.

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# 7. Annex I: Comments on economic barriers from WP1-D5 report

# Annex I: Comments on economic barriers from WP1-D5 report

1. Norway

The impression from the interviews is that decisions are based on Life cycle Cost, including both investment costs and operating- maintenance costs. Pay back time is important. The politicians are very concerned about energy use, so energy saving solutions are very welcome if they save a lot of energy and thereby costs. Evaluation of different kinds of solutions and their profitability and pay back time can be hard to achieve since the energy prices (electric) are changing.

The final decision is done by the politicians, but the priorities are set by the Property management department. Saving costs is one of the important arguments to choose this kind of solutions. But as one of the interviewed said "you have to believe in it – then it gives results".

Incentives: They all know about ENOVA (Governmental firm whose goal is to stimulate market actors and mechanisms to achieve national energy policy goals trough financial instruments and incentives), but have mixed experience. Their impression is that it is hard to make the project fit the ENOVA system, and that it is a lot of paperwork and little money to get. Those who have succeeded, stress the importance of having good and interested consultants. One of the interviewed persons even mentioned that a criteria for choosing a consultant is if he knows about incentives. The general impression is that they think it is hard to have an overview of incentives. Ways to get information is through internet, energy centres and networks or directly from those who give the incentives (ENOVA, Husbanken etc.).

2. Denmark

"The budgets are not big enough/marginal and small extra costs to energy friendly solutions are not preferred, both on political reasons, budgets, or other focus. Loans and other financing instruments are not good enough or well known. The client doesn't know enough about innovative solutions and energy saving potential, and is afraid that it will give extra cost compared to regular solutions.

The economic possibilities for different kinds of financing and funding models vary a lot, not only between countries but also from city to city. Economy is often seen as the main barrier but the budget is also seen in relation to the expected output of the project. In other words: if an energy efficient solution should have the possibility of being funded, energy must be one of the main focuses of the project before numbers are mentioned. The reliability of energy saving measures is very important as they can not exceed the maintenance costs and must also be based on a reliable estimate of savings.

The economic aspects therefore coexist with other political and legal aspects in a complicated matter. Specific solutions are often found in the single building project and good examples must be presented for each country and function as inspiration for the cities which have not worked on this topic yet.

As the introduction of energy efficient solutions demands a new way of structuring the working process the time aspect is seen to be the heavy economic factor, in spite of the fact that savings from new technologies might be financially efficient. The economic aspect is therefore closely connected to the organization structure of each public facility or institution.

3. Germany

Most of the answers show that life-cycle costs are the basis of the decisions, yet one answer points out that because of focusing on investment costs, the implementation of energy saving solutions is problematic as the savings will show up in a different budget. As projects have to be accepted by the city councils there is also a limit for the investment costs, so sometimes a bit more expensive energy-efficient measures are cancelled even if the life-cycle costs show that they are cost-efficient. In cities the decisions are split between first political (city council) and second technical (planning departments).

Incentives can't be used for the government buildings and only partly for the buildings of the cities. PPP-solutions are offered by one of the interviewed persons organisation, the cities have many problems with those and partly started a self-financed internal contracting. However the interviewed persons seem to have a good overview on possible incentives.

4. United Kingdom

The barriers to energy efficiency and renewable energy use in buildings are well understood and documented. These barriers are perpetuated by a system which provides a disincentive to energy efficiency and embedded generation with renewables and by an information asymmetry which ensures energy users are unlikely to invest in profitable energy efficiency and renewable energies and engage in socially optimal energy conservation. The main factor could be the fact that externalities are not reflected in the price of the energy. Energy consumption produces negative externalities, pollution inflicted on society, the environment, climate change; which is not reflected in the price of energy. These externalities distort the real price for energy which along with tariff structures that encourage consumption contributes to impeding energy efficiency and embedded generation.

The proposed EU Emissions Trading Scheme, due to commence in 2005 and involving compulsory mapping of carbon emissions, employs market mechanisms to minimise overall costs. The scheme covers the power generation sector which is likely to result in an increase in the price of electricity for the economy as a whole as generators are required to take into account the environmental externalities associated with their operations. It also covers the direct emissions from some of the energy intensive industrial sectors currently involved in Climate Change Agreements (CCAs). The UK is committed to developing a smooth transition to the EU scheme and ensuring that energy efficiency savings achieved by companies currently in CCAs are maintained when they move their direct emissions across to the EU scheme.

However, other barriers have been detected by this team. They are a result of organisational and societal behaviour, economic and regulatory disincentives as well as inadequate information. Base on this we interview decision makers, building occupants and building owners to verify their views.

Among professionals there is a widely held view that the financial costs associated with the high investment cost in the first year, with financial savings only in the following years cannot be recouped in investment yields. There is no culture to analyse the total lifecycle costs as a basis for the decision process and the present scenario of financial indicators does not help to change that culture. What is more, there is lack of information regarding financial incentives for choosing innovative energy saving and renewable energy technologies

The interviewees were in favour of financial incentives, they felt that the UK government should take the lead in creating financial incentives for greening the property industry.

Financial support, e.g. in the form of Carbon Trust's small business loan scheme are expected to generate substantially increased uptake of energy efficiency measures. However, unless these incentives are widely disseminated it is doubtful that they would have a marked effect on new and existing buildings given the barriers discussed above.

Well-designed financial incentives (or disincentives) can achieve high leverage in situations where there is a relatively small price difference between the energy efficient choice and the standard option. Bridging the gap with a subsidy (or a charge on the inefficient alternative) could induce a significant behavioral response, provided that the market is restrained from absorbing the subsidy or charge within an adjusted price structure.

5. Italy

The impression from the interviews is that decisions should be based on Life cycle Cost but, generally, they are based on the investment costs.

Both politicians and external project leaders are not very concerned about energy use, so energy saving solutions are not adopted generally. The final decision is made by the politicians, but the suggestions have to be made by the project leader. Saving costs would be one of the important arguments to choose this kind of solutions. Some of them know about incentives (generally from internet but also from internal energy managers, colleagues and bulletins).

6. Czech Republic

Decisions about energy savings measures are based almost solely on investment costs. Life cycle hasn't been a prioritized concern so far. The basic problem is in budget.

Cities miss a more elaborated system of subsidies from Regions, state and EU, a wider system of bank loans etc. In case of more expensive investments, a political decision must be taken. For small investment actions, there is a National programme of energy savings and use of renewable energy sources that has very limited resources and very strict conditions to fulfil.

7. Lithuania

For most reported interviews high investment cost in the first year seems to be a problem. The main idea for a problem solution is to get government assistance and additional loan rebate for these kinds of projects.

All interviewed persons think that both investment costs and the total lifecycle cost are basis for the decision process. The political decision of investors on using economically more expensive investments is the most important. Economical incentive for choosing an innovative energy saving and renewable energy technologies for most of the reported are special loans, subsidies or potentially reduced energy bills.

8. Greece

Investment costs are always used as a basis for the planning phase of a project, as saving returns are difficult to pinpoint and take advantage of, because of the fact that energy bills for public buildings are often paid directly by the state –so there is no direct advantage in energy conservation measures for the building administration or the users in terms of an energy saving bonus for instance.

Innovative low-energy systems have been implemented mostly in pilot buildings in the public sector, where specialized studies have been assured by consultants and extra investment cost

has been financed by an extra source (E.U., Ministry of Energy and Development e.t.c.). The problem is that these examples cannot be repeated in mainstream projects since both cost and legislation present very important barriers in their implementation