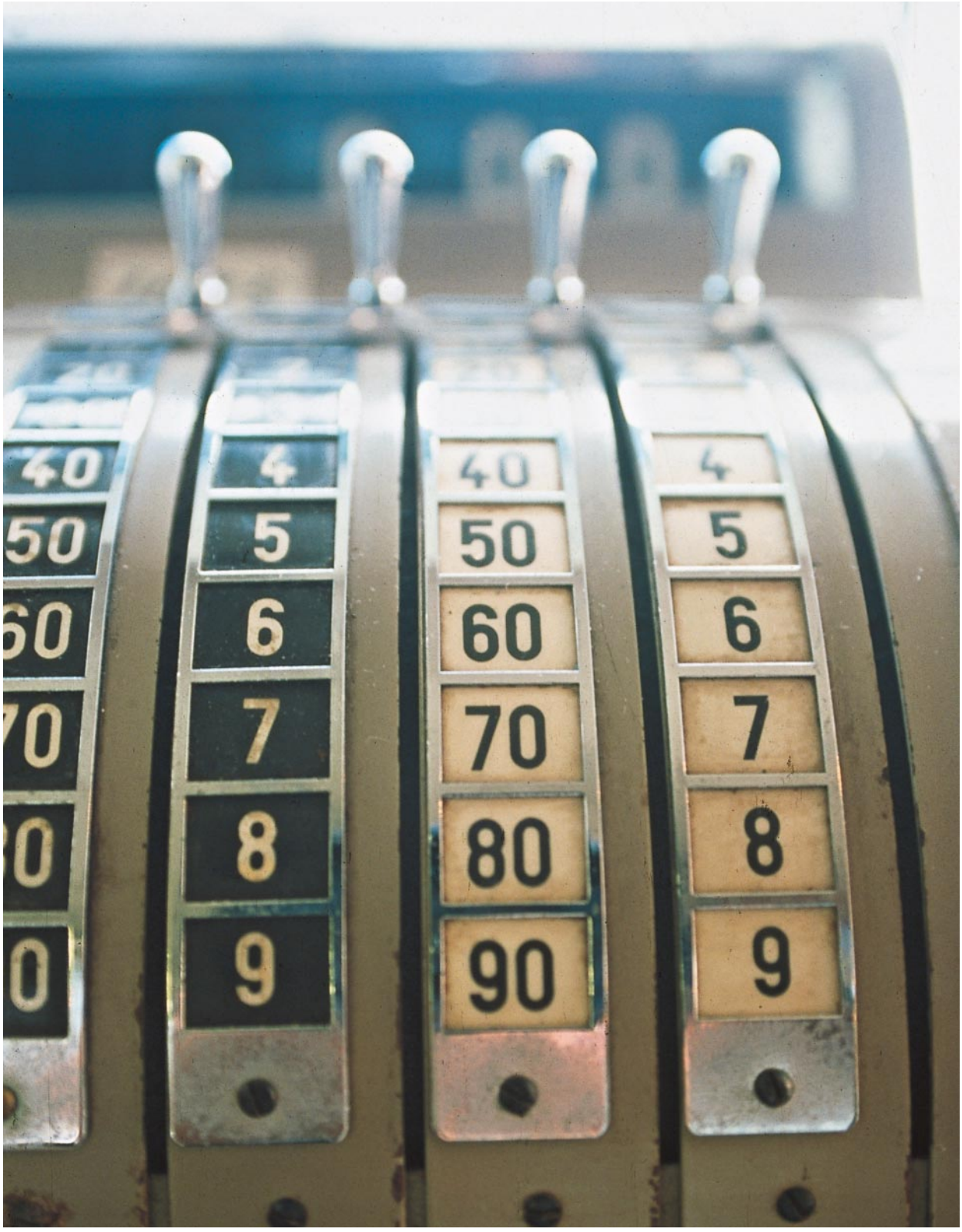
Harnessing the Power of the Public Purse

Final report from the European PROST study on energy efficiency in the public sector



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Final report from the European PROST study on energy efficiency in the public sector

This report is based on the PROST study carried out under the auspices of the European Commission's SAVE programme

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Contents

Acronyms and abbreviations

AC	Air conditioner
Ademe	The French Agency for Environment and Energy Management
EC	European Commission
EEB	Energy efficiency budget
EEMU	Energy efficiency management unit
EPC	Energy performance contracting
ESCO	Energy service company
ESPC	Energy-savings performance contracting
GEEA	Group for Energy Efficient Appliances (co-operation between some European energy agencies)
HVAC	Heating, ventilation and cooling
ICLEI	International Council for Local Environmental Initiatives
IEC	International Electrotechnical Commission
LCC	Life-cycle cost
MEPS	Minimum energy performance standards
MPS	Minimum performance standards
MS	Member State
Novem	The Netherlands Agency for Energy and the Environment
NPV	Net present value
O&M	Operations and maintenance
PA	Public administration
PICO	Public internal performance contracting
PPS	PROST Purchase Specifications
ROI	Return on investment(s)
STEM	Swedish Energy Agency
SHGC	Solar heat gain coefficient
TOE	Tonnes of oil equivalent
TPF	Third party financing
VFM	Value for money

Acknowledgements, description of project team and responsibilities

Acknowledgements and sponsors

"Harnessing the Power of the Public Purse" is the title of the final report delivered by the PROST project. The project was originally conceived as a study on Public Procurement of Energy Saving Technologies in Europe, hence the acronym PROST. Although all of the areas covered in this report indeed are subject to public procurement legislation, the study deals with energy efficiency in the public sector as a whole, ranging from day-to-day product purchasing to building energy management and investments. Consequently, the scope of PROST is defined as "energy efficiency in the public sector".

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Project team

The following partners participated in the PROST project:

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Politecnico di Milano, Italy; *Lorenzo Pagliano* and *Andrew Pindar*

SOLPROS, Finland; *Heidrun-Faninger Lund* and *Peter Lund*

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Jeffrey Harris, head of the Washington DC office of Lawrence Berkeley National Laboratory, was closely involved in the whole study as a special expert

Other experts employed by the project group:

Eje Sandberg, ESAN Energi; *Gösta Westring,* legal adviser, Sweden

Responsibilities and authorship

The PROST study is a result of the truly collective effort by the entire project team. Various parts have specific authors, but all partners have been involved in commenting, suggesting and co-authoring the different chapters. Nevertheless, particular responsibilities were assigned as follows.

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Main report

Chapters 1-7 (Part 1), which summarises findings from the Country studies, was compiled by *Ylva Blume* with assistance from *Nils Borg, Andrew Pindar* (who drafted a number of sections including the summary of the buildings-related chapters) and *Stefan Thomas*.

Chapter 8 was originally written as separate policy proposals by individual members or the project team. The proposals were compiled and edited by *Nils Borg* with support from *Stefan Thomas*.

Chapter 9 was written by *Andrew Pindar* with input from *Herbert Ritter, Wolfgang Irrek* and *Stefan Thomas*.

Chapter 10 was written by *Herbert Ritter*.

Chapter 11 was written by *Andrew Pindar,* who also produced the corresponding appendices 2-6. *Stefan Thomas* provided inputs both for Chapter 11 and its appendices.

Chapter 12 was written by *Heidrun Faninger-Lund* and *Peter Lund,* with assistance from *Adam Gula* and *Arkadiusz Figorsky*.

In Chapter 13, *Andrew Pindar* gathered the information on Internet resources.

Appendices

Appendix 1 (a legal memorandum on environmental concerns in public procurement) was written by *Gösta Westring*, legal adviser and procurement specialist.

Appendices 2-6 were written and produced by *Andrew Pindar*.

Appendix 7 was translated from German by *Stefan Thomas*.

Appendix 8 was written by *Christian Radtke,* Wuppertal Institut für Klima Umwelt Energie.

Executive summary

Harnessing the power of the public purse

How can procurement and building energy management in the European public sector be directed towards buying energy efficient products and making public buildings consume less energy? This is the main question answered by the PROST report.

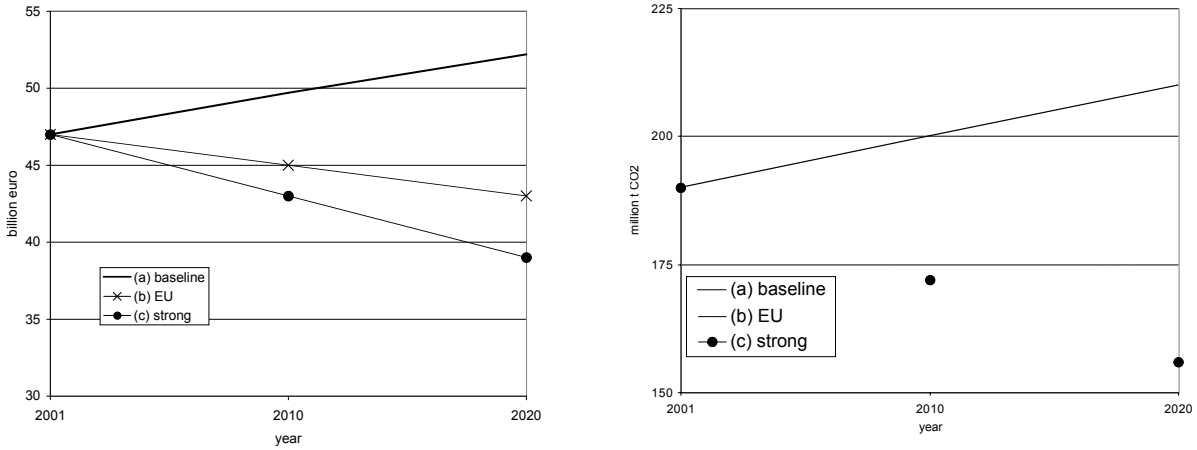
The PROST study was conducted by a seven-country team under the auspices of the European Commission's SAVE programme from early 2001 until the end of 2002. The study team identified barriers and opportunities for public sector energy efficiency. It reports on good examples and describes a set of tools that can be used by public administrations without any particular national or EU policy decision, but it also proposes important policies for the European Union and the Member States. Without such policies, European public administrations will fall short of capturing the full potential of energy and financial savings, and associated greenhouse gas reductions.

The report argues in favour of "harnessing the power of the public purse". By doing so, it emphasises that energy efficiency in the public sector goes far beyond energy savings and climate protection. It is sometimes argued that energy efficiency is a luxury for the public sector. However, the opposite is true: energy efficiency is a strategy to deal with scarce public funds while at the same time addressing serious energy and climate challenges. The question is thus whether the public sector can afford *not* to capture the savings.

The gains to be made are substantial. With additional annual investments in energy efficiency as small as 80 million Euro, energy savings in the public sector worth up to 12 billion Euro per year could be achieved in EU's current Member States (EU-15). Similar gains are possible in the Candidate Countries covered by PROST.

The savings estimates are based on the major opportunities for public sector energy efficiency identified in the PROST study. The public sector typically represents 5-10% of the whole energy use in EU Member States, and its annual energy bill is 47 billion Euro. Public procurement in the EU is growing. Today it is in excess of 200 billion Euro or about 3% of total GDP. Public administrations are thus important market actors in energy issues. This is true for purchased energy, but even more so for the procurement of products, systems and services that influence the use of this energy.

The report outlines a number of policy scenarios for the public sector in the EU to demonstrate how their purchasing and energy management practices could influence energy efficiency. PROST quantifies the potential for energy and cost savings and the greenhouse gas (GHG) reductions that are linked to these savings. To the knowledge of the study team, this is the first time such an analysis has been carried out for the European public sector.



Reduced CO_2 emissions and fiscal savings from public sector energy efficiency in EU-15, compared to the baseline. Whereas the baseline (a) assumes a 0,5% annual improvement in energy efficiency, the EU-case (b) illustrates the outcome from implementing measures already proposed by the EU (a 1.5% annual efficiency improvement). The "strong" scenario (c), illustrates the outcome of a programme for energy efficiency in the public sector, with annual efficiency improvements of 2%. Additional investments of only 80 million Euro can generate savings in the order of 12 billion Euro.

Compared to a "business as usual" scenario, the results of the analysis indicate that public administrations in EU Member States can save up to 20% of their energy use (heat and electricity) by 2020, if a stronger emphasis is placed on energy efficiency aspects in procurement, investment, and energy management routines. The related GHG reductions are in the same order or magnitude, and it is clear that active strategies for energy efficiency in the public sector could contribute significantly to the task of Europe meeting its commitments within the Kyoto protocol (see figures).

Looking beyond the public sector

Perhaps the most important effect of systematic and co-ordinated energy efficiency efforts in the public sector is the possibility of a much larger impact on the market as a whole. Arguably, the market volume of the European public sector is fragmented. But given a common direction, manifested in common practices, energy efficiency targets and purchase specifications applied throughout Europe, suppliers would start to regard all public entities in Europe as part of one virtual entity and adapt to that market. To reach economy of scale, it will be profitable to sell the same efficient products to private companies and consumers as well.

Office equipment is an example of the business potential that could be triggered by energy-efficient public purchasing. The PROST Country studies indicate that around 13% of the electricity savings in the public sector could come from more energy-efficient personal computers and screens alone. This represents public purchasing of more than 12 million personal computers over 20 years, or 600 000 on an annual basis. Valuing a personal computer for 1 650 Euro each, the total value would be 1 billion Euro per year. Thus, if the public sector would purchase products and services with more energy efficiency features, its purchasing power would certainly influence the product range of any supplier wishing to satisfy this demand.

How can we get there? Part 1 of the PROST report actually concludes that the public sector gradually is learning to ask for efficient solutions, but that the efforts are scattered and seldom co-ordinated. The PROST study covered public administrations on various levels in 10 EU Members States, 4 Candidate Countries and 4 other nations. The study identified a number of barriers to broad-scale implementation of energy efficiency in public administrations. None of these barriers are of a truly legal nature: In fact, one of the most hindering factors is the *misconception* that explicit energy efficiency requirements in public procurement would not be allowed. In fact, it *is* allowed, and energy efficient public procurement is practiced by a number of entities who face no legal problems in doing so. The real barriers are related to the absence of clear policies and targets, unclear information, insufficient knowledge, split incentives, lack of motivation and lack of financial and staff resources. These are barriers we can overcome by policy decisions, information, training and development of common methods. It is also necessary to make funds available through a number of financing vehicles; all of them will have positive net benefits on the public sector's finances.

Good examples

The PROST study identified a number of excellent examples from central, regional, and local governments. Among these is the City of Pori in Finland, which has based its "green" purchase decisions on life-cycle cost principles and lists of efficient products for more than ten years. In France, the City of Montpellier has an energy management department, which keeps track of the city's 5 000 or so energy bills and acts to lower them. In Germany, a large number of cities have energy efficiency management units that are saving tax payer's money through a number of innovative ways to organise activities and investments based on low life-cycle costs. The energy manager of the City of Modena in Italy provides a splendid example of how to undertake effective energy management by unifying investment and management budgets. In Sweden, the City of Sundsvall undertook a large-scale procurement to replace 17 000 street lighting luminaires with more efficient ones within a year. In Sundsvall, the city council made a special provision to finance this, knowing that that the life-cycle cost based approach would bring the money back in a few year's time. Finally, and importantly, the UK government has set an annual 1-percent reduction target of CO_2 emissions that applies to all agencies and departments of the central government. The UK government also requires that all government agencies base their purchase decisions on "Value for Money", rather than low first costs.

The US Federal Energy Management Program (FEMP) provides an excellent example for Europe, both in its way to address the complexity of product purchasing for a multitude of products and agencies with different needs, as well as in its focus on buildings and integration with other Federal programmes such as Energy Star. By emphasizing Energy Star and FEMP criteria as a common basis for energy-efficient purchasing, the US has already seen some evidence of market response from manufacturers and suppliers. A projection of several scenarios for energy-efficient purchasing by federal and non-federal government agencies showed energy cost savings of US$1 billion/year in the "most likely" case, based on 18 TWh/year plus 2 million GJ of annual fuel savings. Of this total, 80% of the savings are attributable to state and local purchasing.

Policies and tools

The PROST report describes a number of policy actions and tools needed to harness the power of the public purse. The proposals are made with full regard to the subsidiarity principle. Certain policy tools are relevant

Summary of important focus areas of an EU Directive on energy efficiency in the public sector

The Directive would have to recognise:

- that public administrations are relevant and responsible actors in achieving EU targets for a more sustainable and efficient economy and society
- the importance of structural changes to consider the requests of an integrated product policy
- the importance of principles that allow more sustainable consumption patterns while aiming for "Value for Money"
- that energy efficiency in the public sector is a valuable strategy in achieving EU targets such as the obligations under the Kyoto Protocol
- the need for European policy targets in terms of energy and greenhouse gases in relation to improved public sector energy efficiency

The Directive should oblige:

- the European Commission to assume responsibility for a European Co-ordination Board for Energy Efficiency in the Public Sector
- EU institutions to integrate energy efficiency considerations in their daily expenses and activities
- EU institutions to establish energy-efficient procurement information desks in order to make procurement information available to all their internal purchasers of appliances and cars
- EU institutions to establish energy efficiency management units and carefully consider all relevant instruments that help make building-related measures as energy efficient as possible
- EU institutions to create one or more PICO and/or TPF/EPC (third-party financing/energy-performance contracting) schemes for improving the energy efficiency of their building stock

The Directive should further call upon Member States to ensure that:

- they set themselves quantitative targets for additional energy savings for their central government institutions, and promote the setting of similar targets by the lower levels of state (regional, local governments)
- public administrations in their countries integrate energy efficiency considerations in their daily expenses and activities
- buying agencies in their countries provide information that helps PA:s to make informed choices on energy efficient products
- national public sector energy efficiency information centres are established and given sufficient resources to provide information, and to develop common EU-wide specifications, methods and procedures for integrating energy efficiency in public procurement and buildings management
- the national public sector energy efficiency information centres co-operate with each other
- public administrations establish energy-efficient procurement information desks in order to make procurement information available to all their internal purchasers of appliances and cars
- public administrations above a threshold energy consumption (e.g., 1 000 MTOE/year) operate energy efficiency management units (EEMU:s), and that smaller administrations get access to similar services
- EEMU:s are charged with the responsibility to make refurbished and new buildings respect minimum performance standards, and document the savings
- there are explicit requirements to introduce cost effective measures to improve energy efficiency service contracts (for public administrations that outsource responsibilities)

The Directive should further call upon Member States to promote:

- the creation of energy efficiency budgets in all levels of public administrations in their country. It should at least recommend MS central government and the EU institutions to dedicate part (%) of their normal building/maintenance budget to energy efficiency investments
- the use of third-party financing and energy performance contracting (TPF/EPC) in public administrations in order to overcome existing barriers to energy efficiency in public buildings
- the use of the public internal contracting (PICO) concept in public administrations
- shared savings schemes, which give an incentive to individuals, teams or organisational units to implement energy efficient improvements
- that public administrations link the reform of public administration with actions, incentives, and instruments to improve energy efficiency

for individual Member States and public administrations, and the study team calls upon governments and public administrations to implement these policies, even in the absence of action at the EU level. Other policy proposals would clearly benefit from co-ordination at the EU level. Where this is the case, the report considers how these policies may be introduced into an EU Directive on energy efficiency in the public sector.

In particular, EU-wide co-ordination is important to secure the development of common specifications and methods, but also to ensure that the synergies of the various policies and tools are maximised. The box found in this executive summary as well as in Chapter 8, outlines possible elements of an EU Directive.

The report not only points at the importance of common purchase specifications and guidelines. A large share of the project was devoted to actually mapping, analysing and proposing such common energy efficiency purchase specifications and life-cycle cost methods for "stand-alone" products as well as for buildings. On a principal level, the report discusses when to use energy efficiency purchase specifications and when life-cycle cost methods are applicable. In the area of products and appliances, concrete proposals for EU-wide specifications were developed for IT equipment, cold and wet appliances, street lighting and traffic lights, and cars. In the buildings area, purchase specifications are defined for 13 types of building components.

The report also provides and in-depth discussion on building minimum performance standards, and discusses how and why various target levels can be applied in public administrations, in light of the European Directive 2002/91/EC on the Energy Performance of Buildings. Energy performance standards and purchase specifications are complementary: Purchase specifications make it very easy to identify efficient products and components, whereas building standards (whether target or mandatory) give skilled designers and energy managers freedom to develop energy-efficient systems and buildings as long as the specified levels are met.

It is important to note that the policy tools shall be seen as a package, where each tool addresses different barriers and hence creates synergy effects with the other tools. The following is a very short overview of the policy toolkit offered by the PROST study:

Setting policy targets An EU Directive must define clear policy targets for Member States. These are quantitative targets for additional energy savings in each Member State's central administration, but also a requirement for Member states to promote that all public administrations set up similar targets.

Creating a European structure based on national programmes National programmes in each Members State should be established and co-ordinated by *national public sector energy efficiency information centres*. These centres will most likely be existing structures, which are given a clear mission and sufficient resources to carry out their work. A *European Co-ordination Board for Energy Efficiency in the Public Sector* shall be established to co-ordinate the work on a European level, and the national information centres are the natural contact points in each Member State. This European structure shall be responsible for developing and updating common, EU-wide *energy efficiency purchase criteria and life-cycle cost methods for products and buildings*. The national information centres shall also work in close co-operation with the *central buying agencies* in the country.

Structures and actions within public administrations Within public administrations, the function of *energy efficient procurement information desks* must be secured. In the area of buildings, *energy efficiency management units* (EEMU:S) shall be established. These have a host of policy tools at their disposal: *Energy efficiency budgets, third-party financing and energy performance contracting, public internal performance contracting (PICO), sharing savings,* as well as the opportunity to *bring energy efficiency to outsourcing*. The report also takes a closer look at the possible *links between energy efficiency and public administration reform*.

Leading the way

Everyone has a responsibility for implementing energy efficiency in the public sector: The European Union and its institutions, Member States and Candidate Countries, individual public administrations on all levels, and employees working in all these institutions. The role of the EU institutions deserves to be highlighted. No other energy and environment policy area offers such an obvious opportunity to provide leadership by example than this one. Any Directive asking Member States to ensure that the public sector becomes energy efficient, should also spell out mandatory requirements and actions for the European Union's own institutions.

Part 1

Energy efficiency in the public sector today

1. Introduction

1.1 It is possible, allowed and practised

How can the day-to-day procurement and building energy management of public sector entities in Europe be directed towards buying energy-efficient products and making public buildings more energy-efficient?

This is the main question, which the PROST study sets out to answer. But why bother about the application of energy-efficient technologies in the public sector? Obviously, there is the double benefit of reducing life-cycle costs of energy using equipment and buildings, and of reducing negative environmental impacts through increased energy efficiency. But perhaps the most important effect of systematic and co-ordinated energy efficiency efforts in the public sector is the potential of an overall impact on the market. If the public sector all over Europe were to systematically procure energy-efficient products and buildings using very much the same performance criteria, the market transformation towards more efficient and sustainable products and building practices of the whole market beyond the public sector would be boosted significantly. This in turn, would have beneficial side effects on energy use, environment and climate as well as employment [1] in all sectors. A systematic and forceful programme would thus not only help the public sector do its part of the job to reduce energy use and greenhouse gas emissions, but would also make it easier for other parts of the market to achieve the same thing.

In the best of worlds this would already be happening on a broad scale, but it isn't. The study rests on a few assumptions:

- we do not live in the best of worlds: Even cost-efficient technologies and good energy management practices are far from being applied universally in the public sector and a large potential remains untapped
- there are significant – real and perceived – barriers, which prevent energy-efficient public procurement and sound energy management from being generally applied
- however, these barriers are not impossible to overcome, and in fact, many good examples exist within the current legal frameworks
- one way to overcome the barriers is guidelines, simple instructions and model language based on existing labelling and classification systems. These are not always commonly accepted across Europe but could form the basis for Europe-wide recommendations
- life-cycle cost analyses are needed for larger investments, i.e. the public sector needs to become better at assessing what is economic to own over a period of time rather than at what is cheap to buy today. Specific financing mechanisms and accounting routines are often needed to make this possible.
- policy measures on European and national level are needed to tap the potential

On the other hand, a number of good and relevant examples in Europe and elsewhere exist, which make it possible to claim that public procurement of efficient products is possible today, and that it is being done.

Thus, there seems to be a large potential, which the public sector leaves untapped. Negative environmental impacts and unnecessary expenditure is the consequence. The barriers were known in principle, but which were the most important ones in the eyes of the procurers and energy managers?

Further, even if the size of European sector public procurement is rather well known, the energy-related part of it remained unclear, and it was not well known to what extent the public sector does procure efficient products. The combination of these two issues equals the energy and cost saving potential for the public sector, which is quantitatively estimated for the EU and Candidate Countries for the first time in this study.

It should be noted that the study makes no attempt at estimating the positive energy and CO_2 effects that could be reached through a wider market transformation, although these effects may be significant.

1.2 Methodology and scope of the study

In order to understand these issues, interviews have been performed in most European countries (as well as in a number of countries outside Europe to get some additional references). The aim has been to get an overall picture of energy use in public institutions, the rules and practices that govern it, and to identify the barriers

[1] **The employment benefits of energy efficiency in the public sector is beyond the scope of the study, but several studies indicate that energy efficiency investments have a positive impact on overall employment.**

that stop it from reaching its energy efficiency potential. But equally important, the interviews also served to identify the good examples and learn from those public administrations that practice energy-efficient procurement and energy management. This includes both public building construction and management practices and public procurement practices of products and appliances.

The resulting Country studies are based on detailed studies and interviews with various key persons involved in public procurement and management of buildings and facilities in various countries. They represent a valuable source of information for the policy-oriented and concrete recommendation parts of the PROST project, through the thorough descriptions of the procurement practices and the presentation of qualitative and quantitative data.

Institutional agencies of different countries and organisational levels are structured in various ways and have relatively complex connections of laws and regulations that regulate public procurement. Efforts have been made to summarise these structures. However, considering the significant diversity of the public sector throughout Europe, it is difficult to see clear patterns.

In total 18 countries were studied: 15 in Europe plus the USA and Japan. The report concentrates on summarising the situation in the eight project partner countries (see Table 1.1 below). Though not covering all EU Member States the study is nevertheless felt to be generally representative of the whole of EU in that it covers most of the larger countries and a cross section of "active" and "less active" states. Unfortunately the study does not cover Denmark, a country that is known to have matured considerable experience in the field of "green procurement" and energy-efficient procurement, especially through the Danish Electricity Saving Trust.

Outside EU, important experience from the USA and Switzerland is highlighted throughout the report. Japan has also developed practices and programmes that provide significant and relevant experience for the EU.

This PROST report is divided in three parts:
Part 1 serves to provide background information for the whole work presented as a survey of cross cutting international experiences. The information is gathered through interviews with public procurement officials, as well as energy managers in the public sector and through review of the relevant literature and is presented in Country studies provided as annexes to this report. The synthesis of the Country studies aims to:

- identify cross-cutting experiences
- provide a description of the situation in different countries. The survey thus serves as the foundation on which the continued analysis and Policy recommendations of Part 2 rests

Part 2 is policy oriented, in the sense that it aims at developing a number of concrete policy proposals for the European Commission as well as for national governments. It includes:

- a summary of the most important policy conclusions from Part 1
- a summary as well as a detailed description of the proposed policy instruments
- a short justification for the various tools available for policy intervention
- transferability and feasibility of innovative methods for organising and financing energy-efficient refurbishment of buildings
- methods and model guidelines for integrated planning of buildings, lighting and HVAC systems (including benchmarking and target values)
- energy-efficient product procurement

Part 3 includes developed energy and greenhouse gas mitigation scenarios for public sector procurement and energy management activities.

The Annexes include Country studies (see above), detailed guidelines for energy-efficiency in buildings and public procurement of transports.

1.3 What is the public sector?

If programmes defined for the public sector do not have any specific targets, it is difficult to make evaluations and necessary amendments. First, the public sector has to be defined. This is of great importance when outsourcing, privatising and deregulation are major

Table 1.1. Countries covered in the report.

Countries covered in detail in the synthesis – PROST partners	Other countries covered in the synthesis	Countries studied but generally not called upon in the synthesis
Austria	Japan	Estonia
Finland	Switzerland	Greece
France	UK	Hungary
Italy	USA	Ireland
Germany		Slovakia
Netherlands		
Poland		
Sweden		

trends in Europe. The public sector concept is a complicated matter that needs to be thoroughly analysed.

The EU directive on public procurement (93/38/EEC) defines public authorities as the State, regional or local authorities, bodies governed by public law or associations formed by one or more of such authorities or bodies governed by public law.

A body is considered to be governed by public law where it:

- is established for the specific purpose of meeting needs in the general interest
- is not of an industrial or commercial nature
- has legal personality
- is financed for the most part by the State, or regional or local authorities, or other bodies governed by public law, or is subject to management supervision by those bodies, or has an administrative, managerial or supervisory board more than half of whose members are appointed by the State, regional or local authorities, or other bodies governed by public law

This EU definition includes the residential multifamily buildings, that in some member countries are today huge parts of the "public sector", although large shares of this stock is rapidly being privatised.

One definition to consider is the public sector defined as activities that are publicly financed, such as public administration, healthcare, schools and public service. In this context, privatised utilities such as electricity companies that are financed by the consumer's fees do *not* belong to the public sector. On the other hand, private schools that are mainly public financed, represent a part of the public sector. Thus there is a wider public sector as defined in EU procurement legislation, and a narrower public sector of the central state, regional, and local public administrations. This study generally covers the wider public sector except where indicated otherwise. The notion "Public Administration", PA, is used throughout the report, covering all sorts of public bodies.

1.4 Barriers

The Country studies report several barriers for good energy management practices and procurement of energy efficient products:

- *Insufficient Priority:* The lack of priority results in the absence of clear mandates to staff to procure energy efficiency, which is considered by top management (at times political level) principally as an environmental and not an economic issue. This in part may be understandable; annual energy costs generally account for only 1 to 2% of annual budgets of typical public administrations, whereas personnel costs might account for something in the region of 60%. Thus reductions in energy use, even significant, result in only marginal annual financial savings compared to total annual budgets. However, though relatively small, in absolute terms the energy savings can be significant, for example; a city of 200 000 inhabitants can save some 10 million Euro a year through energy efficiency, and by doing so meet several environmental aims at no cost.
- *Lack of information of energy efficient solutions and their evaluation:* Staff charged with procuring need independent, clear information on the full range of efficient solutions and standard cost benefit analysis procedures to determine the nature of the energy savings that they provide.
- *Legal uncertainty – insufficient knowledge of national and international procurement legislation:* The interpretation of procurement legislation is difficult. There is need for interpretation of national and EC procurement legislation in accordance to the implementation possibilities of green purchasing practices including energy efficiency aspects. This concerns in particular the interpretation that the "economically most advantageous tender" should be the one with the lowest life-cycle costs.
- *Split incentives to managers* to invest in energy-efficiency due to the more or less standard procedure of managing public sector finances by dividing investment and management budgets across different departments (considered in detail in section "Product purchasing, building investments and financial management"). The standard practice is a disincentive to the user departments, which cannot keep the return from investments in energy efficiency in their buildings, and a non-incentive to those in charge of managing the investments.
- *The lack of investment culture:* Public administrations invests in society in the wider sense. Its mission statement is directed by service provision. Investments aimed at yielding direct future economic returns are not a natural part of this culture. This is reflected at the decision level, where priority is directed to improved service levels, and within administrations, which often lack the skills to undertake simple cost benefit analyses.
- *The complexity of public procurement:* Public procurement is complex and increasingly decentralised. Procurement officials work in an environment of conflicting policy objectives, extensive regulations and a variety of pressures. The complexity tends to favour relying on past practices, avoiding risks, which consequentially stifles innovation.

Other problems are occasionally stated. Apart from being less commonly reported than the barriers identified above, they are to some degree consequential to them. Problems are:

- lack of funds, particularly in building maintenance – this may present a major problem, at least in some countries
- lack of personnel resources and time – it is difficult to spend time to reach what is perceived as marginal savings
- lack of motivation

- too much and unclear information (a lot of information is not understandable and practical for every-day use)

1.5 Considerations on improving energy efficiency

Presented here is a collection of procedures that the interviewed purchasers in various public authorities feel might help to overcome problems for energy efficient procurement. Comments received were:

- the promotion of energy efficiency in public procurement needs a well-balanced mixture of voluntary efforts, guidelines, regulations and legislation
- the environmental factors must be transmitted into economic factors additional to direct energy cost savings (However, this would most likely require internalisation of environmental costs, and is beyond the scope of this report.)
- requirements according to a label classification will be preferable to LCC for all products that use energy less than x kWh/year and for which there is adequate EU-wide labelling
- target values or standards also for main installed techniques in buildings (lighting systems, ventilation systems and electrical heaters and coolers), have to be implemented in the national building regulations on either a function or system level
- in order to promote a common European market for top-efficient products, there is a need of common example calculation prices for gas and electricity recommended when procuring appliances or setting energy efficiency standards for building installations
- some procurement officials stated that it would be good if price examples would include external costs
- there is a strong need of a national infrastructure, for example a national organisation or programme for energy-efficient public procurement

There is also a need for:

- clear, specific policies and concrete guidelines at all levels
- simple examples of available tender documents
- tools and data for specific product and product groups
- e-commerce tools that allow inclusion of energy efficiency aspects
- bundling the management and financial responsibility for investments in building energy efficiency and for energy

The policy tools needed to achieve this are presented in Part 2 of this report.

2. National targets, policies and programmes

This chapter sets out to describe national energy reduction and climate targets that are relevant for the public sector. The chapter then goes on to describe various policy programmes within the public sector. Since several of the programmes that were found cover more than the public sector, the policy programme section also covers some general national programmes.

2.1 National targets and strategies

Almost all countries covered in the study have national CO_2 related targets. However, few countries have decomposed these targets in sectoral and sub-sectoral levels. Practically none of the countries has indicated specific interim targets for the public sector. Exceptions to this is the UK, where central government departments has a goal of 1% reduction per year in CO_2 emissions for government estates.

Germany, the UK and Switzerland have set clearly defined quantitative targets for reducing CO_2 and energy consumption in central (federal) administrations. In Switzerland, the cantonal and municipal authorities are also committed to the reduction targets. In Germany, the municipalities have not yet followed and no information is available regarding lower tiers of the public administration in the UK.

Finland and Italy have imposed energy efficiency obligations; but these obligations are not linked to global performance criteria or national objectives, nor are they monitored.

- In Finland, the Ministry of the Industry imposes specific minimum efficiency standards for new and restructured buildings to be used by the public sector
- In Italy, public administrations consuming more than 1 000 TOE/year are required to identify a "manager for the conservation and rational use of energy"

Where objectives or clear targets are absent, the country studies have identified voluntary commitments to reduction targets. This is more common among local administrations. These commitments may be made as self-declarations by single administrations to respect national Kyoto reduction targets, or participation in the co-ordination of national or international programmes; for example the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection Campaign or Climate Alliance Network, which has a long-term target of 50% CO_2 reduction, not only for the operations of the participating municipalities themselves, but for all energy consumption in their territory. In Switzerland, the new "Association of Major Energy Consumers in the Public Sector" ('Energho', including hospitals, cantonal buildings, large federal government energy consumers) plans to reduce the energy demand by 10% within the next ten years.

Table 2.1. shows energy reduction targets for some partner countries for which central (or federal) sector commitments have been identified. The table is not exhaustive and needs to be complemented with targets from all participating countries.

2.2 Energy efficiency policies and programmes in public administrations

Energy efficiency policies seem to be generally sporadic and based on voluntary agreements. However, there is a trend of raising awareness for energy efficiency in national policies and some interesting examples may serve as inspiration for further policy-making.

In Switzerland, a quality label for advanced energy policy for municipalities has become widely accepted. UK has incorporated energy efficiency into public procurement for central Government departments, which has resulted in a considerable decrease of energy use in these organisations.

Policy programmes including energy requirements and eco-labelling in public procurement appear in some of the studied countries. Guides for environmental criteria exist in Austria, Germany, France (under development), Ireland the Netherlands, Japan and Sweden. US policy programmes provide support to federal, state and local agencies to comply with energy-efficient purchasing requirements.

Some policy programmes include financial incentives for energy-efficient measures. Examples given are Hungary, where support is given by preferential credits or non-reimbursable grants, the Netherlands, Poland and Sweden (investments for municipalities). Energy efficiency investments are also funded in Slovakia, however symbolical, compared with EU member countries.

The presented examples include policy programmes with activities such as analyses of office equipment, the

Table 2.1. Examples of CO_2 and energy reduction targets for central (or federal) government.

Country	Kyoto CO_2 National Reduction Targets (burden sharing)	Central (Federal) Administration Target	Targets for other public areas
Finland	0%	10-20% improvement in energy efficiency by 2010	10-20% improvement in energy efficiency by 2010
Germany	-21%	25% CO_2 reduction between 1990 and 2005 for all federal agencies	some states same target; some municipalities similar targets
Poland		medium-term objectives (by 2010): reduction of energy consumption per GDP unit by 25% against the year 2000 level[1)] long-term objectives (by 2025): reduction of energy consumption per GDP unit by 50% against the 2000 level	
UK	-12.5% (with voluntary goal of achieving -20%)	1% per annum reduction target for CO_2 from 2000 onwards. Previously 20% energy efficiency target w.r.t. 1990	limited
Switzerland	-8%	10 % of CO_2 reduction below 1990 levels between 2000 and 2010.	The objectives of the "SwissEnergy" programme has been adopted by the federal, government, all cantons and all municipalities.
USA	-	Reduce energy intensity by 30% in 2005 and 35% in 2010, compared with 1985 levels. Reduce greenhouse gas emissions from facilities and other operations (mainly vehicles and "weapons platforms") by 30% in 2010, compared with 1990 levels. Reduce energy intensity in industrial and laboratory facilities (based on appropriate floor space or output indicators) by 20% and 25% in 2005 and 2010, respectively, compared with 1990	

[1)]Achievement of energy consumption indicators expressed per GDP unit and per production volume in individual production sectors (expressed as production physical volume or production value) as well as energy consumption indicators in major household equipment and appliances not exceeding the average indicators in the OECD countries.

development of interactive information systems, education, research and investments. Common policy tools are energy management units, procurement guidelines and building regulations.

In the following chapters, we have tried to summarise some of the most striking examples of policy programmes for energy efficiency presented in the national reports. It may still not be an exhaustive summary, i.e. some important programmes might have been left out. The aim is to provide an overview of recent trends and provide a starting point for further discussions.

2.3 Policies and programmes in EU

2.3.1 Austria

Policy programmes in Austria include projects targeting district heating, power generation, living, mobility and city administration. Other items are environmental purchasing criteria and a best practice competition for municipalities, targeting organisational structures and renewable energy sources.

The Climate Protection Programme of Vienna (KLIP), a programme prepared by the municipality of Vienna,

was introduced in 1996. It includes 36 sets of measures in the sectors of district heating, power generation, living, mobility, city administration and companies. Each of the measures comprises single projects.
Some of the points of the programme are:

- climate protection in municipal authorities: reduction of the heating energy by at least 10%, stabilisation of the power consumption; reinforced changeover to district heating, renewable sources of energy and natural gas
- "mobile municipal authorities" i.e. investments to exchange the vehicles used by municipal authorities to the best fuel-saving models
- integration of environmental protection when planning and tendering performances of the City of Vienna
- total ban of fluorinated/chlorinated hydrocarbon-foamed building materials
- reduction of material flow, use of reusable products, recycled and renewable raw materials

The Vienna Climate Protection Programme also formulated the necessity to offer purchasers an instrument for eco-friendly procurement, which resulted in environmental criteria for products, materials and services.

The "*e5-Landesprogrammen*" for energy-conscious municipalities is a best practice competition. It was commissioned in 1998 by the government of the province Vorarlberg and is managed by the Energy Institute of Vorarlberg.

The targets of the programme are:

- promotion of energy-efficiency
- increase of the use of new, renewable energy sources
- organisation and maintenance of structures and processes that guarantee sustainable energy policy

2.3.2 Finland

In Finland, a framework agreement between local and national administrative levels has been signed by a significant number of authorities. It includes energy-auditing and follow-up activities and aims is to reduce energy consumption by 15% until 2010. Energy conservation in Finland is part of the *Finnish Climate Change Strategy*, and not a programme co-ordinated separately.

The voluntary framework agreement on energy conservation was concluded between the Association of Local authorities and the Ministry of Trade and Industry (MTI) in 1997. In 2001, approximately 50 municipalities had signed energy conservation agreements with the MTI and approximately 52% of all building stock owned by municipalities and local governments were covered by the agreement.

The objectives of the agreement are to:

- cover as much as possible of the municipalities' activities
- reduce heat consumption from 1990 by 10% until 2005 and 15% until 2010
- stop the increase of energy consumption in buildings and bring it to decrease before 2005
- perform energy auditing and follow-up activities in 80% of the public buildings in municipalities until 2010

2.3.3 France

In France, a policy programme aims to integrate environmental concerns in public administrations' activities related to issues like buildings, energy management and environmentally friendly procurement. Important tools are information, training and environmental criteria for public procurement.

The general objective of the *Administration Greening Programme* is to integrate environmental considerations into the activities of public administrations and includes eight fields of activity:

- buildings
- developing a management function for the environment reaching all staff members and activities
- undeveloped sites
- energy management
- water management
- waste management
- environmentally friendly procurement
- vehicle fleet

The Programme focuses on information and training, with the objective of changing the general administration organisation and raising awareness in environmental themes. It is co-ordinated by the Ministry of Environment and Land Management, which is now preparing a study targeting 36 product families to establish essential environmental criteria for each family and guide public procurement services.

Apart from this national programme, ADEME (the French Agency for Environment and Energy Management) has set up various activities to support public administrations in their energy efficiency activities, including funding of energy audits and building refurbishing.

2.3.4 Germany

In Germany, there is a number of activities that provide energy efficiency information to all public administrations and some incentives for local authorities from the state (Land) level. Examples are guidelines for green purchasing, energy agencies and information services to schools. These activities are, however, not integrated through a comprehensive programme on energy efficiency in public administrations.

- The Federal Environmental Agency (Umweltbundesamt) issues a comprehensive guidebook on "green" purchasing, including energy efficiency criteria as priority in the area of appliances, cars, and buildings (see under 5.2.3)
- the energy agencies of several States offer advice and

consulting to local authorities, e.g. energy audits for existing buildings, consulting on energy efficiency and efficient energy supply for new building projects
- there have also been a number of incentive programmes from the Federal States to local authorities for energy audits, creation of energy management units, school energy efficiency projects, and investments in energy efficiency
- in the framework of the project *"Energy School NRW – Saving Energy Thought Improved building Use"*, the energy agency of North Rhine-Westphalia (NRW) offers services such as advice and information to schools and school administrations

2.3.5 Greece

In Greece, a policy programme that accentuates the use of renewable energy will include institutional and financial incentives for sustainable development.

The *Action Plan Energy 2001* is the main action in Greece to comply with the European Directive on reducing carbon dioxide emissions through building energy efficiency programmes (Directive 93/76/EC). The action plan stresses the use of renewable energy sources as a basic prerequisite for sustainable development. The anticipated measures are combined with institutional, administrative and economic incentives, especially in the retrofitting of existing buildings.

2.3.6 Ireland

Ireland has policy programmes that include eco-labelling, green procurement and Building Management Systems for public buildings. A number of EU energy programmes have been promoted by the Irish Energy Centre, who co-ordinates and implements national energy policies and provides research and advice related to energy efficiency.

A programme that include green procurement in Ireland is "*Comhar – the national sustainable development partnership*" – which was established in 1999. The programme is the forum for national consultation and dialogue on issues referring to sustainable development. The 25 members of Comhar are drawn from a wider range of representative bodies across Irelands economy and society. Examples of issues that may be examined by Comhar are eco-labelling, eco-auditing policies and green procurement.

The *State Building Programme* was drawn up in 1994 and outlined the framework for the implementation of action within public buildings. The last ongoing development of the programme is the installation of a Building Management System, which enables the Office of Public Works to monitor energy consumption in a number of public sector buildings.

The *Irish Energy Centre* (IEC) is considered as the main instrument for Ireland's energy efficiency policy. Together with the energy utilities, the IEC co-ordinates and implements national objectives and policies relating to energy efficiency and renewable energy sources. In the period of 1994-99, the IEC has promoted a number of EU energy programmes. Examples of tasks of the IEC are to carry out research relating to consumption of energy and to advice the government and ministers on measures for economically sustainable use of energy.

2.3.7 Italy

In Italy, the 1988 *National Energy Plan* (NEP) has, with the principle objective of increasing national self-sufficiency, identified the rational use of energy as the first of five strategic national objectives. The application of these requirements predates the concepts of sustainability formalised with Agenda 21 and subsequently the Kyoto reduction targets.

The NEP resulted in legal requirements for public administrations to appoint energy managers, apply energy efficient solutions and evaluate energy saving potentials. The Federation of Energy Managers (which groups public and private sector energy managers) undertakes various activities to support the energy managers, such as training courses, consultancy and programmes.

Post Kyoto, a national policy programme in Italy identified rational use of energy as one of the most important tools for meeting the national Kyoto targets (to cover roughly 30% of the total objective). However, no specific targets were set for the public adminstration on a national level. Where CHG reduction objectives exits within the public sector, these have been developed autonomously by local government (for example by the Turin City Provincial Administration).

Otherwise there are a number of sporadic activities underway by local government; for example voluntary agreements between local councils and schools that attempt to overcome split incentives in energy reduction have been tested in the City of Modena and the Provincial Administration of Bolzano.

2.3.8 The Netherlands

Policy programmes for energy efficiency in the Netherlands consider environmental management systems, operated by public administrations, as a starting point for the implementation of green procurement practices. They also include financial incentives, purchasing guidelines, advice and a toolbox with environmental specifications for public procurement. There is a general consensus of Dutch public administrations as models for environmentally sound behaviour.

In the first *National Environmental Policy Plan* (NEPP) in the Netherlands, issued in 1990, the government explicitly acknowledged public procurement as an instrument of approaching environmental problems. According to the plan, public administrations should set example for environmentally sound behaviour. Environmental Management Systems (EMS) were considered to provide a good starting point for the implementation of green procurement practices. The government has provided financial incentives to stimu-

late compliance with the policy plan. Acknowledgement of the environmental potential of public procurement was backed up by an attempt to set up a product information centre (which unfortunately failed).

Duurzaam Inkopen (Sustainable Procurement Programme) was set up to draw up purchasing guidelines and to provide advice on public procurement, which is given in the form of information (non-compulsory guidelines) about available energy-efficient appliances. Duurzaam Inkopen was established by two national Ministries (the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs) in order to encourage energy efficient procurement in public administrations at governmental, regional and local levels.

The core of the Sustainable Procurement Programme is a web site providing a toolbox with environmental specifications (http://www.inkopers.net). It is largely based on a bottom-up approach centred on the idea of exchanging experiences between procurement officers.

The objectives of the programme are to:

- set an example for others
- achieve direct environmental benefits
- influence the market by creating a demand for environmentally less harmful products and to stimulate product innovation

2.3.9 Sweden

In Sweden, voluntary programmes provide financial support, training courses and information to municipalities. Other tools are green procurement activities and a labelling system including targets for low energy consumption.

The *Local Investment Programmes* (LIP) has been an incentive for municipalities to make energy efficient investments. Financial support has been available for municipalities awarded after quality control from relevant authorities. LIP is currently being reorganised as the Climate Investment Programme (KLIMP) and entirely targeted towards climate change prevention measures.

A voluntary programme for municipalities – *EKO Energy Programme* – aims to encourage municipalities to improve energy and climate work within municipal properties, administrations and companies. Benefits as training courses, information on energy systems and tools to obtain energy statistics are offered the participating municipalities.

The Committee for Ecologically Sustainable Procurement – EKU-delegationen (active during 1998-2001) was given the task of promoting ecologically sustainable procurement within public administration. It consisted of representatives from various state holder groups, such as local authorities, county councils, government agencies and the suppliers of goods to the public sector. One of the main tasks of the Committee has been to influence EU legislation in order to make environmental requirements applicable on all public procurement. It has also developed an instrument for green procurement (see under 5.3.5).

The Swedish Confederation of professional Employees (TCO) has developed a labelling system – the TCO'95, later revised as TCO'99. The requirements refer to external environment and work environment and include targets for low energy consumption and minimising of chlorinated and brominated flame retarding substances and heavy metals. Although this programme is not targeted towards the public sector it has great impact due to the public sector's large market share of IT equipment procurement.

2.3.10 United Kingdom

In the UK, a policy programme of green procurement includes energy efficiency aspects. However, purchasing of energy-efficient products in Government departments is limited and is only just beginning to develop. In public administrations outside central Government departments, procurement of energy-efficient products is uncoordinated but some authorities have set out procedures, which are actively in operation.

According to the *Second Annual Report of the Green Ministers Committee*, by March 1999, an improvement of 18.9% in energy consumption had been achieved against 1990/01 levels in Government Departments. These have an ongoing target to reduce energy consumption by 1% per annum from 2000/01. They must also comply with the UK legal target to reduce its greenhouse gas emissions to 12.5% below 1990 levels by 2008-12 and reach a domestic goal of 20% reduction in carbon dioxide emissions by 2010. Government Departments must make an annual monetary efficiency savings of 3%.

To meet its targets, the Government has instigated a policy of green procurement in line with *Value for money* (VFM), following EU procurement policy. Within this context, central Government places a high priority on the introduction of environmental issues in purchasing decisions. As part of this rationale, the Government has incorporated energy efficiency objectives into procurement.

2.4 Policies and programmes in EU Candidate Countries

2.4.1 Hungary

A Hungarian action programme for energy efficiency has defined energy saving targets and includes education, research and financial support. A UNDP programme aims to remove barriers for energy efficiency in public buildings and to identify and finance energy efficiency projects in municipalities.

In 1999, a new *Energy Saving and Energy Efficiency Action Programme* was adopted in Hungary. This new

programme defines energy saving and other targets until 2010 and includes a number of specific actions, in the areas of:

- fund rising
- education and awareness promotion
- research and development
- industrial energy audits and energy-related modernisation
- energy management in municipalities, least cost planning
- energy efficiency in transport
- heating system modernisation and promotion of renewable energy sources

The Programme intends to mobilise some 200 billion HUF (750 million Euro) of investments, by providing 50 billion HUF (187 million Euro) of support over a ten-year period. Support is provided either by preferential credit (subsidised interest rate) or as non-reimbursable grants.

In parallel to the Energy Saving and Energy Efficiency Action Programme, the UNDP/GEF *Public Sector Energy Efficiency Programme* aims at helping Hungary to improve energy efficiency in the public sector. The programme seeks to remove barriers to improve energy efficiency in municipal buildings, including schools, hospitals and other public buildings. The Programme, which has a budget of approx. 4.6 million Euro, also intends to reach out to municipalities and local advice centres and networks.

The main objectives of the programme are:

- to improve the development of energy efficiency policy, increase awareness and improve co-ordination of energy efficiency policy
- the identification, development and financing of energy efficiency projects in municipalities
- to improve the knowledge base on energy management and energy efficiency technologies. The Energy Centre is the implementing agency of the project, under the authority of the Ministry of Economic Affairs.

2.4.2 Poland

In Poland, there is no official programme on energy efficiency but a systematic increase of public share (state budget and other funds) in implementation of energy-efficiency-focused programmes. A modernisation fund for energy savings in buildings and a fund for environmental protection supports ecological activities adapting Poland to EU standards.

In 1988, the Polish Parliament established a *Thermal Modernisation Fund* (TMF) to promote energy savings in buildings in 1998. TMF support is granted if an energy audit shows that the investment can be paid back within 10 years using energy savings. The investor is required to contribute 20% of the total project cost, including the cost of the audit. After commissioning of the investment, 25% of the loan is forgiven. Projects in conversion to renewable fuels can also be considered by the TMF.

Additionally, Poland appears to have an efficient way of supporting selected energy efficiency investments by the *National Fund for Environmental Protection and Water Management* (NFOS) and the *Environmental Protection Bank* (BOS). Through subsidies and preferential loans, the National Fund supports initiatives that serve the improvement of the state of nature. Special attention is given to ecological activities adapting Poland to the European Union Standards and fuel conversion from coal to gas and biomass. The National Fund is the largest institution financing environmental protection projects in Poland. The mission of the Fund is to provide financial support for undertakings on a national or interregional scale.

2.4.3 Slovakia

There are not many effective legislative, economic or fiscal instruments to influence energy consumption or reduce energy intensity in Slovakia. The funds allocated in the state budget supporting national energy use are only symbolical, especially compared with EU countries.

The most recent comprehensive *National Policy Plan* of the Slovak Republic was prepared in 1999 and includes targets as:

- transformation of the energy sector
- establishment of the Slovak Independent Regulation Office (regulation of prices, conditions for marketing, issuing permission for fuel conversion etc.)
- increase the use of renewable energy sources and energy efficiency
- decrease the consumption of primary energy sources

Other policy programmes are the *National Programme for Regional Development*, the Programme for the Support of Energy Efficiency and the Use of Alternative Energy Sources (1999).

2.4.4 Estonia

In Estonia, a national policy programme includes certification of building consumption, energy auditing schemes and optimisation of heating systems.

The *Energy Conservation Target Programme* started in 1992 and has resulted in decreased energy consumption from 7.2 TWh/a in 1991 to 5.8 TWh/a in 1998. The new energy conservation target programme was drafted in the year 2000 and is quite in line with the EU SAVE directives and recommendations. The main points of the proposed activities are the following:

- certification of building energy consumption
- energy auditing schemes
- improved energy metering
- revised building code
- boiler testing
- optimisation of heating systems
- training campaigns and international co-operation

2.5 Policies and programmes in other countries

2.5.1 Japan

In Japan, a programme for purchasing and building energy management includes eco-labelled purchasing, guidelines and target values for energy efficiency. Another programme sets targets for energy-efficient products, representing some 70% of the total residential power consumption.

Japan is implementing a *Top Runner programme*, which sets targets for 12 products (passenger vehicles, motor trucks, air conditioners, fluorescent lamps, television receivers, copy machines, computers, magnetic disc devices, video cassette recorders, refrigerators and freezers). These products represent some 70% of the total residential power consumption and about 80% of the total power consumption of office automation equipment. The target values are based on whether a product has the highest energy efficiency of all the products in the same group, which are currently in the market.

The "*Action Plan for Greening Government Operations*" contains regulations for training of officers, a scheme for product databases, guidelines and target values for energy efficiency. The programme, which refers to both purchasing and building energy management, was succeeded in 2001 with the Law on Promoting Green Purchasing (see under 5.1.6).

Examples of actions specified in the programme are:

- purchasing of eco-labelled products
- promoting of use of electronic mail
- installing energy-efficient lights
- utilising rain water
- conditioning appropriate temperature in office space

2.5.2 Switzerland

Switzerland has a policy programme including a quality label for advanced energy policy, the implementation of energy management systems, seminars and energy monitoring systems.

Switzerland has over the ten past years followed an energy policy under the programme "*Energy 2000*". However, only a part of the quantitative goals of the programme have been met, wherefore the *"Swiss Energy"* programme was launched in 2001 in collaboration with cantons, municipalities, industry and environmental organisations. Policy programmes on energy efficiency are a part of the programme, for which the Federal Council exercises supreme authority. The task of Swiss Energy is to fulfil the national climate and energy objectives and to initiate a sustainable energy supply based on innovation and new technologies.

The Federal Office of Energy (SFOE) manages the day-to-day affairs of Swiss Energy and co-ordinates all the activities of the programme nation-wide. It will also implement an environmental management system called "Resource and Environmental Management in the Federal Administration" (RUMBA). Initially, offices, office equipment and official journeys will be analysed in each organisational unit with respect to their direct and indirect environmental impacts.

A part of the Energy 2000 programme – the *Energy Town project* – has become a widely accepted quality label for advanced energy policy. An "Energy Town" has to fulfil specific criteria defined according to a standardised catalogue of energy policy measures. The catalogue comprises six important areas:

- building and planning
- energy supply
- water and heat
- traffic and transport
- public relations
- internal organisation

134 municipalities are members of the Energy Town organisation and 66 of them have received the quality label. In order to achieve the fullest possible participation, the programme will be promoted and further developed under the name "Swiss Energy at the local level".

Swiss Energy also provides other activities to municipalities, e.g. energy conservation weeks, seminars for schools and the implementation of energy monitoring, and accounting systems.

2.5.3 USA

In the USA, energy-efficient purchasing is promoted by a federal programme, providing technical support, design assistance and support to comply with energy-efficient purchasing requirements.

The Department of Energy's *Federal Energy Management Programme* (FEMP) promotes energy-efficient purchasing by helping federal agencies to comply with the energy-efficient purchasing requirements of the 1992 Energy Policy Act (among others). Major elements of the FEMP include facility issues like on-site audits to identify energy- and water-saving measures, technical support in planning and undertaking energy-saving performance contracts, design assistance to help agencies build more energy-efficient and sustainable facilities (see under 7.8.1).

Another programme is the EPA/DOE *Energy Star Purchasing Program*, which encourages similar policies and practices for energy-efficient purchasing by state and local agencies, with the help of the utility-sponsored Consortium for Energy Efficiency.

Table 2.2. Overview of policy programmes for energy efficiency with focus on the public sector

	National Programmes for energy efficiency	Activities
Austria	Climate Protection Programme of Vienna	Measures in the sectors district heating, power generation, living, mobility, city administration and companies
	e5-Programme	Best practice competition
Estonia	Estonian Energy Conservation Target Programme	Certification, energy auditing schemes, revised building code, training, campaigns etc.
Finland	The Government Energy Conservation Programme	Energy efficient requirements for public procurement, voluntary framework agreement on energy conservation
France	The Administration Greening Programme	Training, raising awareness in environmental themes
	The National Programme Against Climate Change	Provide public administrations with best practice, ideas about funding
	The National Programme for Energy Efficient Improvement	Promotion of energy efficient activities and investments
Germany	No specific energy efficiency programme but the Umweltbundesamt guidebook on "green" procurement and energy efficiency activities on the Länder level	Länder energy agencies providing consulting and advice to local authorities
Greece	The Action Plan Energy 2001	Anticipated measures of institutional, administrative and economic incentives
Hungary	Energy Efficiency Action Programme	Education, research, investments etc.
Ireland	Comhar	Eco-labelling, green procurement
	Irish Energy Centre	Research, advice, implementation and co-ordination of policies, advice
	State Building Programme	Building Management Systems
Italy	Energy managers	
	Voluntary agreements	
Japan	Top Runner Programme	Sets target values for 12 products
Poland	No policy programme but a Thermal Modernization Fund (TMF) for energy savings in buildings and the National Fund for Environmental Protection and Water Management	
Slovakia	Energy Policy of the Slovak Republic National Programme for Regional Development Programme for the Support of Energy Efficiency and the Use of Alternative Energy Sources	
Sweden	Climate Investment Programme (KLIMP)	Grants for energy efficient investments
	The Committee for Ecologically Sustainable Procurement	Environmental purchasing guidelines
	TCO'95	Labelling system
	EKO Energy Programme	Seminars, information, education
Switzerland	Swiss Energy	Analyses of office equipment, developing an interactive information system, labelling (Energy Town)

	National Programmes for energy efficiency	Activities
UK	VFM administered by Treasury Circular Government departments requirement	quantified reduction target for central government Government departmental regulation to buy on basis of "Value for Money" (lifetime least cost) "Green Ministers" for each government department with annual review
USA	The Department of Energy's Federal Energy Management Programme (FEMP)	Technical support, facility audits, design assistance, technical assistance, training, recommendations, tracking and reporting
	EPA/DOE Energy Star Purchasing Program	Encourages energy efficient purchasing by state and local agencies
The Netherlands	Duurzaam Inkopen (Sustainable Procurement Programme)	Development of a toolbox for procurement officers including environmental specifications

3. Co-operative purchasing by public administrations

The use of co-operative purchasing varies between different countries and is not thoroughly treated in this report. It has been difficult to extract the needed information for making systematic comparisons and exhaustive summaries for each country.

Central buying agencies exist in most countries and offer a variety of services. Their aim may be to achieve optimal purchase conditions and the stimulation of product innovation. Others may serve as advisors on procurement issues, buying agencies and operators for the promotion of green purchasing.

It is not possible to distinguish a clear pattern, based of findings from the Country studies, of the actual use of central buying agencies. Some of them have begun to consider energy efficiency in public procurement (Germany, Italy, UK and Sweden). Others refer to green purchasing (Austria), but these activities still seem to be in an initial stage.

With considerable experience of public procurement procedures, central buying agencies could be an important tool for energy-efficiency procurement. A couple of the main barriers for energy-efficient procurement being lack of information and the complexity of procurement procedures, central buying agencies have the potential to help purchasers to overcome these barriers.

The following section exemplifies some of the procurement organisations and central buying agencies. Estonia, Greece and USA are not included in this summary, since public buying agencies have not been analysed in these countries. A brief summary of the central eastern European countries also indicates the absence of public purchasing agencies/organisations.

3.1 EU countries

3.1.1 Austria

In Austria, central buying agencies aim to achieve optimal purchase conditions for public administrations and sets targets and examples for environmentally friendly procurement. A local ecological procurement service is also under development.

The *Bundesbeschaffungsgesellschaft* (BBG) includes product groups for different sectors, for example natural gas and heat energy, cleaning services and transportation. The main target is to obtain optimal purchase conditions for the Republic of Austria. It also aims to set examples, achieve environmental benefits, influence the market by creating demands for environmentally friendly products and to stimulate product innovation.

In the context of the "*ÖkobeschaffungService*" (OBS) – ecological procurement service – common tendering and procurement of products and services according to ecological and economic criteria shall be offered the municipalities of the province of Vorarlberg. A product catalogue based on e-commerce and electronic ordering shall also be developed.

3.1.2 Finland

In Finland, a public-owned network company handles framework agreements, tendering and decision making of some 50% of public procurements, but does not consider energy-efficient procurement.

The *Trading House Hansel*, a public-owned network company, is the buying agency and operator for procurement and materials management in the public sector. The Hansel agency, which also provides tailor-made procurement, handles approximately 50% of all public procurement in Finland. In the frame of the agreements concluded, public administrations can require special criteria for procured products and services and Hansel handles all further tendering and decision making on their behalf.

3.1.3 France

In France, the main central buying agency is not commonly utilised and does not include energy efficiency aspects. There are also some central buying agencies for specific sectors.

The main public buying agency is called UGAP (*Union des Groupements d'Achats Publics*), and is placed under the responsibility of the Ministry of Economy. The agency is not systematically used and has for the last decade concentrated on concerns of public procurement rules.

Other public buying agencies focus on specific sectors. One example is the buying agency of Paris public hospitals. This agency is the only one to be certified by the ISO 9002 norm for its entire market, which aims to ensure the respect of the procurement procedures and a good price for a good service. Energy efficiency is not a part of the agency's mandate, but is sometimes mentioned in the call for tenders.

3.1.4 Germany

Energy efficiency does not yet seem to play a prominent role in the activities of central buying agencies in Germany. However, one federal central buying agency aims to increase energy-efficient purchasing and facility management.

There are several central purchasing agencies within the federal government, of which the largest is the GEBB (*Gesellschaft für Entwicklung, Beschaffung and Betrieb*)– an agency recently founded within the Ministry of Defence. The task of the GEBB is to manage non-military buildings, estates and product procurements and its main aim is to increase energy efficiency in purchasing and facility management.

The *Procurement Agency* (*Beschaffungsamt*), covering 28 product areas and 190 product groups, is the second largest purchasing agency within the federal government in Germany. The Federal Police Force represents about a third of the agency's purchasing volume and purchasers as the Ministry of Exterior and other federal ministries represent some two third.

Co-operative purchasing is not very common among German municipalities. The interviewed municipalities in the German Country study consider themselves as large enough to manage without co-operative purchasing. However, there are several commercial agencies of public corporate purchasing active on the internet (e.g. are www.wegweiser.de and www.cosinex.com), whose size of impact is unclear.

3.1.5 Ireland

Central buying agencies in Ireland provide procurement services to the public sector, but do not target energy-efficient procurement.

The Irish *Government Contracts Committee* (GCC) assists the Department of Finance in formulating overall policy on public procurement. It may also, in certain circumstances, adjudicate on contracts awarded by central government departments.

The *Office of Public Works* (OPW) provides the government and the public sector with services in the area of property, construction and procurement. Among other things, it is responsible for the procurement of supplies and services for government departments. It has also a number of key business units, which operate individually, e.g. the Government Supply Agency, Property Maintenance Services and the Architectural Services.

3.1.6 Italy

In Italy, central government and central dependent agencies are obliged to purchase through CONSIP, an on-line procurement agency, though a significant part of other areas of the public sector also use the agency.

In awarding supply contracts for office equipment, CONSIP is presently applying both the criteria of *lowest purchase price* **and** the *economically most advantageous offer*. In the latter case this is for the moment defined principally in terms of after sales service provision. At the moment contracts do not take into consideration product energy efficiency or lifetime energy costs (though the procurement legislation permits this). However CONSIP is showing interest in developing the issue.

CONSIP's activities are not limited to standard product supply. A public tender is presently in the phase of evaluation for space heating service provision. The total value of the tender is in the region of 160 Million Euro/year, representing roughly 10% of service requirements of the public administration.

3.1.7 The Netherlands

Central buying agencies in the Netherlands provide support for both private and public administrations. Examples of services are advice, information and interpretation of procurement procedures. Energy efficiency is not a target for these organisations.

The *Netherlands Procurement Centre* (*Nederlands Inkoopcentrum*, NIC) is an independent purchasing service for both public and private organisations. NIC has established long-term relationships with clients and gives advice on procurement matters. Currently, the organisation deals with the purchasing of appliances for more than 1 360 million Euro per year.

The *European Union Advice Centre* (EG-*adviescentrum*) offers information services for new tenders that may interest bidders from the EU Official Journal. The centre also provides information, prepare bids and give advice on the interpretation of procedures and prescriptions.

3.1.8 Sweden

In Sweden central buying agencies with offer administrative services, cost-effective analyses and framework agreements. There are special agencies for municipal housing companies and energy procurement.

The *Swedish Agency for Public Procurement* (*Statskontoret*) provides support to government authorities. Among other things, it helps to develop Swedish administrative policy and carries out investigations and cost-effective analyses of state use premises. It is also responsible for the IT use and general agreements in public procurement.

The *Legal Financial and Administrative Service Agency* (*Kammarkollegiet*) has a co-ordinating function, and develops, follows up and co-ordinates the procurement within government authorities. This includes the establishment and development of a framework purchasing system and methods and support for increased procurement competences and practice.

Kommentus Energi & Samköp handles co-operative procurement of energy and other products and services related to municipalities. After the deregulation of the Swedish energy market, a great number of municipalities and other public administrations have accomplished co-ordinated energy procurement with the help of Kommentus.

The HBV is the buying agency for 270 municipal housing companies in Sweden, providing consultancy services, procurement treaties and advice. The members manage a total of 900 000 apartments and are thus an important client for the suppliers.

3.1.9 United Kingdom

In the UK, the main central buying agency for procurement within government departments has a framework for the integration of sustainable development aspects into public procurement, including an advisory body for green procurement.

The *Office of Government Commerce* (OGC) is the principal organisation responsible for procurement within Government departments. OGC Buying Solutions is the department of OGC responsible for purchase of energy-efficient technologies. The OGC integrates sustainable development into procurement issues within the framework set out in the DETR/Treasury Note (see under 5.1.4).

In 2001, the OGC merged the procurement services previously provided by the Buying Agenct (TBA), the Central Computer and Telecommunications Agency (CCTA), Property Advisers to the civil estate (PACE) and procurement units from the Treasury to create OGC-buying.solutions.

There are also a number of advisory bodies responsible for counselling the Government green procurement matters. The *Advisory Committee on Consumer Products and the Environment* (ACCPE) advice the Government on reducing environmental impact of products and services.

The *Procurement Policy and Advice Division* (PPAD) offers guidance and ensures that policy guidance, procedures and standards are up to date.

3.2 EU Candidate Countries

In Poland and Slovakia, there are no known examples of co-operative purchasing or central buying agencies. However, some schools use co-operative purchasing to lower the overall cost of purchasing.

Hungary has a central purchasing organisation with split responsibilities. It is responsible to the Prime Minister for common use purchases, and to the Ministry of the Interior for other items. The central procurement policy organisation – *The Public Procurement Committee* – is supported by a Secretariat and reports directly to the Parliament.

3.3 Non-EU countries

3.3.1 Japan

A green purchasing network in Japan promotes green purchasing in the private and public sector. Activities include seminars, awards and exchange of ideas and practices for green purchasing. Co-operative purchasing is not practised by public administrations but a contact group for government agencies, promoting green purchasing, is being discussed.

The *Green Purchasing Network* (GPN) was established to promote green purchasing among consumers, companies and governmental organisations in Japan. It promotes ideas and practices of green purchasing, and draws up purchasing guidelines for each type of product.

Since 1997, the Green Purchasing Network publishes data books on various products, holds seminars and study meetings and awards organisations that have shown a remarkable performance in implementing green purchasing. The network provides strong support for exchange and experience and enhances the collaboration of industry, municipal agencies, the Environmental Agency and NGO's interested in green purchasing.

The Basic Policy on Promoting Green Purchasing foresees a contact group for government agencies for studies of promotion policies and successful co-ordination of green purchasing. This may be an indication for future co-operative purchasing practices.

3.3.2 Switzerland

In Switzerland, co-operative procurement exists at a local level. A central buying agency for federal procurement provides advice, education and recommendations (but not on energy efficiency).

There are some examples of co-operative purchasing of municipalities and cantons, such as the cantonal central office for printed materials of Zürich, which provides co-operative purchasing of office materials.

The *Federal Procurement Commission* (BKB) is responsible for co-ordinating the federal procurement of products and services. It also offers consultancy and education for federal purchasers, provides information and recommendations, sets standards for contracts.

Table 3.1. Overview of public buying agencies/public procurement organisations

	Co-operative purchasing or common buying agencies	Level	Product Groups	Objectives/Services
Austria	Bundesbeschaffungs-gesellschaft (BBG)	Federal	Power, natural gas, heat energy, tele communication IT services, cleaning services, car fuels, and transportation	Optimal purchase conditions, environmental benefits, stimulation of product innovation
Finland	Trading House Hansel Ltd			Buying agency, operator
France	UGAP Co-operative agencies for public hospitals and secondary schools	All levels	Several catalogues	
Germany	Several purchasing agencies within the federal agencies	Federal government		Increase economic efficiency
Hungary	Central Purchasing Organisation			
Ireland	The Irish Government Contracts Committee	Governmental		Policy-making, adjudication etc.
	Office of Public Works	All		Various services
Italy	CONSIP	Obligation on central govern-mentand central dependent agencies. Widely used by other sectors (for example local government)	All, including for example heat service provision	
Japan	The Green Purchasing Network (GPN)	All levels	15 product categories	Promote green purchasing
The Nether-lands	The NIC (Netherlands Procurement Centre)	Public and private administrations		Give advice on procurement
	The EG-advisencentrum (European Union Advice Centre)			
Poland	No organisations for co-operative purchasing			
Slovakia	No organisations for co-operative purchasing			
Sweden	Kommentus Kammarkollegiet	Municipal Governmental		Promote cost-efficient and objective procurement, provide general agreements
	Statskontoret HBV	Governmental Municipal housing companies		Consultancy services, procurement treaties and advice
Switzerland	Federal Procurement Commission	Federal		
UK	Office of Government Commerce (OCG) Various advisory bodies	Governmental		

4. Energy management in public administrations

The discussion on energy management has concentrated on building systems and envelope. Though good energy management is applicable to all energy-consuming products and components, considerations on improving the efficiency of products, for example office equipment, are made elsewhere in this report. This is for two reasons:

- In practice "energy management" schemes where they exist generally tend to concentrate on building systems and envelope, though no explicit mandate may exist in this sense. This is probably because of two reasons:
  a) with such limited resources dedicated to energy efficiency in the public sector, improvements to building systems provide at the moment the greatest benefit/cost ratio.
  b) usually improvements to building systems can be achieved by dealing with a limited number of relatively technically well informed actors, usually the facilities department in the public sector. However, achieving improved product efficiency requires reaching out to a large number of staff who is unaware of the technical possibilities.
- Report composition and style: energy management is such a global term that it could effectively entitle the entire report, including considerations of product management.

4.1 Aims of energy management

Good energy management aims to optimise (in terms of investment vs. running costs) building shell, lighting, heating, and HVAC systems through a process of:

- energy monitoring by building
- optimisation of the building operation (e.g., closing down HVAC systems outside times of use)
- training and information on energy efficiency for the public administration staff
- building energy audits
- identifying saving potentials
- actions to improve end-use energy efficiency
- reporting on the development of energy consumption and energy efficiency successes
- benchmarking of building energy consumption within/between public administrations
- possibly also managing the energy purchases

Below, Germany is highlighted as an example of a country with successful energy management programmes in public sector buildings. The experiences on cost-effective energy savings achieved have been widely disseminated, and have created a "critical mass" and a general trend to introduction of energy management. However, even Germany is far from having comprehensive energy management schemes in all public administrations.

4.1.1 Germany

Germany has a history of successful energy management programmes in public properties. The voluntary activities were originally triggered by the second oil price crisis of the early 1980's. They were then further promoted by the climate protection agenda during the 1990's, including the success of the Climate Alliance and the recent self-commitment of the federal government to reduce CO_2 emissions (cf. Chapter 2). The activities have also been fostered by the International Council for Local Environmental Initiatives (ICLEI), benchmarking activities and a kind of "competition" within the communities of local authorities and the states, respectively. There are, e.g., regular "grass root" conferences of municipal energy managers.

Most of the states (Bundesland) have building energy monitoring systems in place. One example is North Rhine-Westphalia, which was successful in reducing specific heating energy consumption in 2001 by 3,3% compared to 1998, and by 26,5% compared to 1980, (the year before the energy monitoring was introduced).

Similarly around 71% of municipalities have energy management schemes, with 65% already implementing space-heating energy saving actions. Furthermore, 60% of federal government institutions have identified energy efficiency "managers"; with 40% of them systematically implementing energy efficiency measures in HVAC and lighting further than what is implicit in normal maintenance. Normal maintenance also leads to some energy efficiency improvements, since the new systems and components usually are more energy-efficient than the old systems and components they replace. However, much higher energy efficiency gains are possible if, at the moment of maintenance and refurbishment, the new systems and components are systematically optimised.

4.1.2 Other countries

However outside of Germany widespread application of good energy management is perhaps performed in a less systematic and comprehensive fashion. More often in PROST partner countries energy management equals improving utility supply side contracts, possibly involving load shifting, with no or only marginal actions dedicated to rationalising end use consumption. This also in spite of attempts to define energy management in some countries through regulation or legislation. French authorities issued a circular in 1991 requiring all ministries to appoint a civil servant to be in charge of energy efficiency, which however had little practical effect.

In 1991, Italy set out a legal requirement for all public administrations consuming more than 1 000 TOE/year to identify "Managers for the Conservation and Rational Use of Energy" with the responsibility of:

- developing company energy balances with which to
- develop actions, interventions and procedures necessary to ensure the promotion of the rational use of energy

However, in implementation both the quantity of managers employed and the quality of measures undertaken falls significantly short of the intentions of the legislator.

Even where effective energy management is practiced, activities in most partner countries tend to concentrate on improving the efficiency of heating systems. As the figures show above, this is the case in Germany and France, where heating systems improvements account for the greater number of actions by the central government (one fourth of state buildings).

4.2 Technical focus areas

Activities aimed at improving energy efficiency of heating systems, artificial lighting systems, and building shells are all important focus areas, but improvements in *heating system efficiency* have perhaps received most of the attention.
Some of the advantages of this focus area are:

- specific energy consumption (kWh/m^2 year), which is roughly a factor of ten greater than other end uses (for example typically around 150 - 200 kWh/m^2 year compared to lighting in the region of 20 kWh/m^2 year)
- significant and relatively easily achievable saving potentials (for example installation of a single new condensing boiler as opposed to the substitution of multiple light points)
- a single institution generally technically well prepared interface in the guise of the facilities department
- a relatively easy defined service level (20°C), allowing administrations to turn to external service providers

Activities aimed at improving energy efficiency of *artificial lighting systems or improving building shells* are still generally not standard activities in the public sector, though there may be specific programmes and actions. Only in Germany there is evidence of systematic improvements in lighting systems with 40% of Ministries having implemented energy efficiency measures in HVAC and lighting. It is however unknown how comprehensive these measures have been.

Also it is to be highlighted that many actions in improving *building system energy efficiency* are the work of specific motivated individuals working beyond their immediate remit, often with facilities departments. Though laudable actions, real across-the-board energy efficiency improvements requires structured programmes.

4.3 Barriers for energy management

The failure to implement consistent energy management even where defined by legislation indicates significant barriers to effective energy management. In short, these are commonly identified as:

- *Insufficient priority:* Energy efficiency is considered by top management (and sometimes even the political level) principally as an environmental, not an economic issue. Public administrations have failed to develop clear unequivocal mandates on the issue to direct procurement of energy efficient energy services.
- *Insufficient information:* Procuring offices need clear, independent information on:
  - energy efficient solutions and their evaluation
  - national and international (EC) procurement legislation.
- *Insufficient funding* for additional energy efficiency investments or even for normal refurbishment and maintenance in buildings.

Other problems often identified are:

- split incentives to managers (i.e., responsibilities and budgets are split between different departments)
- the lack of investment culture
- the complexity of public procurement procedures and rules

The issues are discussed in more detail in the section "Product purchasing, building investments and financial management" (Chapter 6).

4.4 Energy management units

Traditionally energy management units, where they exist, play a consultancy role to energy consuming departments and institutions of public administrations. Though they may identify and highlight energy related

cash flows from within the total annual budget and attempt to influence these, the ultimate responsibility for system investment and energy purchase costs remains with other departments (for example the facilities and accounts department).

There are, however, a few recent examples in which energy management units have stepped beyond the traditional consultancy role to obtain direct control of energy related costs, whether totally or partially. The City of Modena in Italy and the City of Montpellier in France are two examples, which have adopted similar procedures for nominally attributing investment and energy costs to departments and dependent institutions (e.g. schools). This may increase accountability, but actually assigns control to energy management units. In these cases the energy use of the public administration becomes the responsibility of a single department, which is directly challenged to reduce energy costs by the searching for the optimal mix of running and investment costs. In the case of Montpellier (see under 7.2.1), the energy management unit also writes specifications and oblige for example schools to buy specific glazing when replacing windows. However, top management still needs to assign sufficient priority to the issue in order to define objectives for energy management units, and ensure that other departments collaborate in achieving the energy savings.

At a conceptual level the introduction of these new energy management units alters somewhat the standard management paradigm for energy. The energy management units become new actors translating raw energy into energy services to be supplied to the many departments and institutions.

4.5 Problems and solutions

4.5.1 Lack of resources in small administrations

Problems of split incentives (e.g. different budgets for investments and operational costs, or the fact that the owner of the equipment does not pay the costs to operate it) are maybe less evident in smaller administrations. Often investment and running costs are considered globally as a single entity by top management. In smaller administrations this could well be a single individual, for instance, the mayor of a small town or the director of a hospital. These managers are generally aware of the need to reduce costs, and can implement an investment strategy with relative ease provided a suitable rationale. On the other hand, particularly for hospitals (at least in Germany), there is the barrier of the dual funding system. The owner of the hospital is responsible for investments, while the running costs are included in the fees to be paid by the health insurance system. However, even if there is an understanding for the need to develop an investment strategy, smaller bodies lack the resources with which to develop dedicated energy management units. Italian legalisation requires only those public administrations consuming more than 1 000 TOE/year to appoint "Managers for the rational use of energy". This leaves significant portions of the public sector lacking the skills with which to achieve marginal but nevertheless cost effective efficiency improvements. For example, even if fully implemented, Italian legislation would cover only 900 of the more than 8 000 town councils (actual implementation is far less).

Smaller bodies also have to manage a wide range of activities, where energy is usually not the priority (e.g. hospitals, which manage huge budgets and should make savings, but have difficulties doing so because the weight of these savings is not enough compared to the total budget and limited staff).

France has experience of smaller cities, which collectively pay the costs of "energy managers". However, in smaller administrations it becomes ever more evident that good energy management can only be achieved by influencing the standard purchase and operating practices.

4.5.2 Renting properties

The fact that much of the space used by public administrations is rented rather than owned properties, represents another important barrier to good energy management. Again incentives to ensure the procurement of energy-efficient energy services are split between the building owners (responsible for investment costs) and building users (who normally pay the building energy costs). Though not yet the most common practice, there is a notable trend in the direction of selling or outsourcing publicly owned properties to separate publicly owned facility managing companies (public companies that own and sublet buildings to various public administrations).

Examples of this trend are:

- in Germany, the state of North-Rhine Westphalia founded a real estate building construction and management company (Bau-und Liegenschaftsbetrieb NRW) to which it transferred ownership of almost all of the state's buildings in 2001
- in 1991, Finland Senate Properties was entrusted with the responsibility for managing almost half of the Finnish state's property assets

On the one hand, these companies are no longer tied to the restrictions of traditional public budgeting, which potentially could make it easier to realise energy efficiency measures. However, increasing investment costs to ensure energy-efficient properties (systems and shell) in order to decrease their tenants' energy costs, does not represent a natural business plan, unless there is a kind of "Third-Party Financing" procedure allowing the company recovery of the investments from the energy costs saved by the client.

4.5.3 Regulatory schemes

To ensure optimised energy management, a regulatory scheme is required. In Finland, Senate Properties is obliged to follow the guidelines set down by the Ministry for Trade and Industry (guidelines based on guidelines made by the Ministry of Finance for the management of public owned properties). The guidelines aim to introduce energy efficiency and sustainability in both new construction and renovation projects belonging to their administrative responsibility.

Senate Properties gives target values that have to be met by the planners. New buildings use about 50% less energy than average in the existing building stock managed by Senate Properties. In new construction, the heat demand of public buildings comes down to approximately 15 kWh/m^3/year compared to the average heat demand of 45 kWh/m^3/year in existing public building stock.

Senate Properties has also unique experience within the public sector in Europe by introducing lifetime costs into the building commissioning process. Two recently finished university buildings were partly tendered based on life-cycle costs: In addition to general investments 5 years of full operational costs (incl. energy) were included. Senate Properties is also planning to introduce life-cycle tendering to elevators and lighting systems.

5. Laws, regulations and guidelines for energy efficiency in the public sector

In EU Member States, national law applies for public procurement below the threshold values. For public procurement above the threshold values, public procurers have to follow the procurement rules of the European Community and the World Trade Organisation's GPA agreement.

Switzerland has recently implemented new procurement laws and regulations and the bilateral treaty with the EU, which will lead to further changes. The Public Procurement Act of Estonia, which entered into force in 2001, is in full compliance with the EU directives.

A thorough comparison of the national rules governing public procurement goes beyond the scope of the PROST project. Further comparisons require additional data and analyses of the legal systems and interpretation of laws. However, the examples in the following sections indicate some variations in the formulation of the recommended procurement criteria related to energy efficiency (although this does not illustrate how they are actually applied).

5.1 Laws on energy-efficient procurement and energy management

Although the criterion of the "lowest cost or the most economically advantageous offer" has been incorporated in public procurement regulations of Member States, the criterion applied in the evaluation of tenders is generally the first cost. One of the most important exceptions to this is in the UK, where the Treasury in its effort to move procurement towards efficient goods and services has obliged all government departments to purchase based on the principle "Value for Money" (or economically most advantageous).

Most countries in this study have no legal requirements for energy-efficient public purchasing. One exception is Italy, where Law 10, 1991, obliges the public administrations to implement energy saving solutions where they can prove technically and economically feasible. In reality, the public administrations in Italy have failed to implement the requirement. However, it may turn useful, once the reasons for failed implementation have been resolved.

Energy-efficient purchasing touches many areas, and is also closely linked to laws regulating budget issues and other financial concerns, which may be as difficult for public purchasers to handle as public procurement.

In France, the difficulties lie within the way the budget can be used, whereas finding money to fund energy-efficient measures seems to be less problematic. The Law on Public Finance was modified in August 2001, and gives central administrations and local authorities wider possibilities to distribute their budgets more freely to their management units. This means that it will be easier to transform investment expenses into operating expenses, and vice versa. Thus, money resulting from energy savings can be kept by the management units and used as desired.

Another example of financial regulation that affects public procurement is the Swedish Local Government Act, which includes a paragraph (section 8, 4§) about balanced budgets. It prevents municipalities and county councils from having a deficit in their budget from one year to another. This makes it more difficult to invest in energy efficiency measures that may be profitable in the future.

Below follows highlighted examples of public procurement legislation related to energy efficiency from France, Germany, UK, the EU Candidate Countries and Japan.

5.1.1 France

French procurement law includes possibilities of environmental specifications but lack of knowledge hampers the implementation.

The new Public Procurement Code of 2001 includes the possibility of social environmental specifications in the procurement process, though this is still difficult to implement. A reason for this is lack of knowledge of energy-efficient products or eco-products available on the market and of the integration of environmental specification in the call for tenders.

5.1.2 Germany

German law allows environmental requirements and requirements of specific production processes in the call of tenders.

In Germany, 64% of the Federal authorities have integrated environmental criteria into their purchasing according to national legislation, which regulates the tender process in product procurement.It goes beyond the EU Directives and allows requirements of specific production processes in the call for tenders or in the award criteria. Environmental requirements can be applied if explicitly mentioned in the specification of

tender or if providing economic advantages. Since there is no generally acknowledged method of calculating external costs in the EU, it is usually easier to explicitly include environmental requirements in the specification of tenders.

5.1.3 Italy

Italian law requires public administrations to appoint energy managers, apply energy-efficient solutions and to evaluate energy saving potentials. However, the compliance of the requirements is low and energy use is still increasing.

End use energy efficiency within public administrations in Italy is administered by three legislated requirements.[2)] These requirements are born out of the 1988 National Energy Plan, which outlined the framework in which to develop national energy policy.

More precisely the law requires:

- managers for the Conservation and Rational Use of Energy (commonly referred to as Energy Managers) to identify actions, interventions and procedures necessary to ensure the promotion of the rational use of energy
- the public sector to meet its service requirements by the application of efficient solutions in proprietary or rented properties where these prove technically feasible and economic
- for regional and city authorities (with populations greater that 50 000) to evaluate energy saving potentials in the wider economy and to formulate objectives in order that these may be met. More recently the law has attributed to provincial administrations (which lie between the regional and city/town administrative levels) the voluntary task of developing programmes with which to realise the energy savings in accordance with the regional plans

There are problems specific to application of all three themes. Common to all is the less than complete compliance with the minimum terms of the law. This is at its most pronounced with the nearly absolute none compliance of implementing efficient solutions were these prove technically feasible and economic.

Generally it can be said that the public administration has failed to translate the potential offered by the requirements into measurable energy savings. Electrical energy consumption in the public sector in Italy is currently growing at around 3,5% per annum, roughly 1% above the total national growth rate.

5.1.4 UK

UK law requires the Value for Money approach, for which tools to determine life-cycle costs of purchases are needed. Guidelines for energy-efficient procurement have also been developed.

In the United Kingdom (and Ireland), the HM Treasury Note "Environmental Issues in Purchasing" states that all purchases are value for money The Value for Money approach requires a number of tools in order to determine life-cycle costs of equipment. Guidance Procedures have therefore been implemented for departments, of which the main guidance is "Greening Government Operations Green Guide for Buyers". It includes an action sheet on energy efficiency including information on energy savings that can be achieved by buying energy-efficient equipment. The guide also recommends purchasing of eco-labelled products, such as Energy Star, Nordic Swan and Blue Angel.

The UK Country study has identified a clear need for guidelines of how environmental and energy efficiency considerations can be applied. Even though there are no legal barriers for energy-efficient procurement, such aspects are often not a matter of first priority. Public procurement rules are usually difficult to interpret and energy-efficient procurement is often a matter of motivation and financial resources.

5.1.5 EU Candidate Countries

EU environmental policy for Candidate Countries tends to get harmonised with the EU environmental objectives. The present legal framework is not much different either. Nevertheless, certain adjustments are necessary. Enforcement of the existing environmental law is another problem, which needs improvement. Due to financial shortages, the actual state of the environment does not meet the standards required by respective law.

Poland

In Poland, there are no special instructions on environmental or energy efficiency aspects in the public procurement of products and services available. However, these aspects are included in the requirements of the building and planning law. Still there is a lack of useful instruments and tools applying directly to public procurement, but as Candidate Countries join the EU all the norms and requirements will eventually apply to them.

With respect to both the labelling Directive and the Directive on energy efficiency standards for household appliances, Poland has recently implemented regulations that bring it close to fulfilling the respective EU requirements. The Polish regulations even impose the obligation to label the consumption of energy and to achieve certain minimum standards of energy efficiency to a broader set of appliances than required by the EC Directives. Of course, the labels applied are not yet EC Labels. Some adaptation of the Polish regulations may thus be required, which is, however, not expected to lead to insurmountable problems.

1) **Directors for the conservation and rational us of energy (commonly referred to as Energy Managers): Law 10, 1991, Article 19, Purchase of Efficient Products and Components: Law 10, 1991, Article 26, comma 7 and Energy Plans: Law 10, 1991, Article 5**

Hungary

In Hungary, the law on public procurement passed in 1995 requires that, all other aspects being equal, preference should be given to environmentally friendly products. The power of this law is rather limited as it seldom occurs that all other conditions, apart from environmental characteristics of products, to be compared are equal. If any references are made to environmental issues at all, the requirement, as a rule, consists in meeting existing environmental regulations and not to go beyond them.

5.1.6 Japan

In Japan, the law requires ministries and governmental institutions to implement green procurement and encourages purchasing of energy-efficient products.

The Law on Promoting Green Purchasing, which came into force in 2001, makes it obligatory for ministries, agencies and governmental institutions to implement green procurement. Similar obligations apply to local authorities. The law required the national government to define a Basic Policy on Green Purchasing, which was released in 2001.

Furthermore, the Law concerning rational use of energy encourages purchasing of energy-efficient products. The Top Runner Approach standards of energy efficiency were introduced with the amended Law concerning rational use of energy and came into force in year 2000. They set standard levels that meet the highest level of energy efficiency that can be achieved among currently commercialised products (see more about the Top Runner programme under 2.5.1).

Table 5.1 illustrates some of the above-mentioned examples of national public procurement regulations and other related rules.

5.2 Building specific regulations

Only Italy has explicit specific regulatory requirements for promoting energy efficiency in the construction of new public buildings and the refurbishment or the maintenance of existing buildings in the public sector. In Germany, there is a number of voluntary guidelines, which however are used by many municipalities and states and sometimes even have been declared mandatory.

In most countries, there are a number of non-public sector specific guidelines, which aim to promote energy efficiency in new construction, refurbishment and maintenance of buildings. These are, however, in part voluntary applied by segments of the public sector. The guidelines tend to be directed at ecologically sound construction, in which building energy efficiency is only one issue covered, though there also are energy specific guidelines.

In Finland and Germany, there are specific public sector guidelines promoted by state or regional government administrations.

Where guidelines are not compulsory there is increasing, though still far from complete, adhesion by the public sector. It is difficult to determine the exact extent of application. In Finland the ecologically sound construction is increasing in importance. Furthermore, approximately 41% of all building stock owned by local governments and 43% of all public buildings now participate in voluntary agreements with the Ministry of Trade and Industry to ensure energy efficient building maintenance.

In Switzerland, the MINERGIE guidelines are gaining acceptance both by the public and private sectors. The private building sector is developing widespread tools with which to support MINERGIE. In France, the voluntary use of the HQE guidelines in the public sector is still very limited and in Italy, the application of the legal obligation introduced in 1991 for all public properties to install "energy efficient solutions" where these prove economical, is negligible.

The actual form of the guidelines varies from simple overall target values, to more prescriptive solution recommendations. Guidelines may also be termed recommendations; a term generally used when promoted by government agencies.

In the following, a short overview is offered of those

Table 5.1. Examples of national laws with reference to energy-efficient public purchasing of products and appliances.

	National law for public purchasing	Other rules with reference to energy-efficient purchasing
France	The Public Procurement Code	The Law on Public Financing
Germany	The Government Procurement Agreement, The Ordinances on Contract Procedures (VOL, VOB, VOF)	German Law of Basic Principles of Public Budgets
Japan	The Law on Promoting Green Purchasing	The Commercial Code, The Law Concerning Rational Use of Energy
Sweden	The Public Procurement Act	The Local Government Act
UK	HM Treasury Note	

guidelines/recommendations existing in the more active countries. The overview is not meant to be exhaustive, but attempts to give some feeling for their general content, and is seen as good examples that could serve as inspiration for others.

5.2.1 Finland

The Ministry of the Environment and the Ministry of Trade and Industry have jointly established guidelines for new construction and renovation complying with energy-efficient and sustainable development in the public sector. A principle aim of the guidelines is for public administrations to set a good example for other sectors.

The recommendations that consider the correct installation and correct use of procured machinery and equipment has a major impact on energy efficiency. An example of a typical recommendation concerning lighting reads as follows:

1. acquire only office lighting fixtures with fluorescent lamps
2. if the lighting quality is not impaired and the solution is macro-economically cost-efficient, replace bulbs of incandescent lamps by screw-based fluorescent lamps
3. choose fluorescent lamps with high lighting intensity that meet the colour rendering requirements set by the duties concerned
4. prefer long-life lamps with low luminous flux maintenance factors

The guidelines recommend that energy efficiency be considered at every stage of renovation and new construction projects. In new public construction projects, a higher energy efficiency level than that required by the building regulations should be achieved. For renovation building projects it is recommended to raise energy efficiency to the level required by the building regulations governing new constructions. Furthermore, public construction is encouraged to promote innovative building projects in an unprejudiced way. In building design, the increased use of natural light and exploitation of passive solar energy should be considered.

5.2.2 France

The new French building code targets new constructions and includes requirements and specifications of lighting and heating systems and insulation.

The building code RT 2000 (thermal regulation for new buildings) has been operative since 2001. It is presented as one of the means to fulfil the French commitments according to the Kyoto Protocol, the building sector representing 19% of the green house gases emissions.

The building code targets new constructions in both the residential and commercial sector. Performances may be achieved in three ways:

- have an expert to work on the optimisation of the building
- respect the references given in the regulations for lighting systems, heating systems, etc.
- use the regulation "à la carte", applying specific technical solutions

The code also indicates a required performance level regarding insulation, windows, heating and hot water systems. For the commercial sector, it includes specified required performances for insulation, lighting systems and (within two years) cooling systems.

5.2.3 Germany

In Germany, building guidelines for federal institutions include lifetime cost effectiveness a checklist for ecology and economy and technical appendices on energy and sustainability.

The *Leitfaden Nachhaltiges Bauen* sustainable building guidelines for Federal Institutions define "sustainability" in a way that environment protection and low costs for the state are to be balanced.

The 115-page guideline considers the following themes:

- The life-time cost effectiveness of relatively high investment cost-efficient solutions.
- A check list for ecology and economy. Planners are required to consider factors in building design which influence energy use: compactness, energy storage in the building mass, share of rooms without windows, rooms adjacent to noisy street (therefore requiring AC), length of the hot water grid, low energy standard/ good insulation standard, natural ventilation, passive solar architecture, day lighting, natural heat protection/avoidance of AC (which is recommended), integrated energy supply, investment costs, levelled costs for water, sewage, heating, cooling, electricity, operation and monitoring). The checklist offers no defaults and requires the planner to refer detailed technical appendices.
- Detailed technical appendices on health, comfort, energy and sustainability including a database on the normal life times of building components.

The guidelines reference offers target value consumption levels for building installations (lighting, heating, cooling) based on the Swiss norm SIA 380/4.

Two other German guidelines for energy efficiency in public buildings that are mentioned in Table 5.3 are the comprehensive AMEV energy efficiency, planning, and operation guidelines on specific building technologies. They have been developed by a working group of building or energy managers from all levels of government (the AMEV), and the VDI guideline 3807 (issued by the German association of civil engineers, VDI), which defines even tougher standards for the electricity and heat consumption of public buildings than the Leitfaden Nachhaltiges Bauen. As the latter, they all are voluntary.

5.2.4 Switzerland

Switzerland has a quality label for new and refurbished buildings for which a wide range of products and services has been developed.

"MINERGIE" is a quality label for new and refurbished buildings, which defines building quality principally in terms of building specific energy consumption, e.g. for offices: 15 kWh electricity per m², 50 kWh space heat per m². It is supported by the Swiss Confederation and the Ministry of Trade and Industry is gaining wide scale acceptance. The building sector has developed a wide range of products and services to support MINERGIE.

There are many reasons for the widespread interest in MINERGIE. Most important is the fact that the final building specific energy consumed is the only really important parameter, which allows architects and planners complete freedom both in their design and choice of materials. (The French building code has a similar approach, which applies to all buildings).

5.3 Special energy-efficiency guidelines for public purchasing

Although legal requirements for energy-efficient purchasing is missing in most countries, there is a number of guidelines and tools for environmentally friendly procurement, where energy efficiency often is included in the criteria or recommendations. It is hard to survey the actual use of the guidelines and the result of their implementation.

Findings from the Country studies show that such instruments exist in Austria, Finland, France (under development), Germany, Japan, Netherlands, Sweden, Switzerland, UK and US. Guidelines for green purchasing have been developed at both national and local levels and are mainly voluntary. Most of them include environmental specifications for public procurement and some of them refer to labelling criteria. In the UK, guidelines for public purchasing for government departments also include requirements for suppliers related to energy consumption.

Below follows a short presentation of these guidelines, tools and criteria and a short description of their (non) occurrence in the EU Candidate Countries.

5.3.1 Austria

In Austria, a criteria catalogue has been developed, which includes environmental specifications and recommendations for building planning procedures. The catalogue is available for both public and private organisations.

The criteria catalogue "Check-it" has been developed in within a EU Life Project as a tool for green procurement in public administrations. The catalogue includes background information and recommendations, such as sheets of environmental specifications for call for tenders. It also contains tools and recommendations for planning procedures for buildings. Apart from public administrations, other organisations and companies, that procure goods to a larger extent can use the catalogue. It covers seven main areas, namely:

- green procurement (including legal framework analysis)
- paper and office supplies
- electrical appliances
- interior furnishing
- cleaning supplies
- structural engineering
- technical in-house facilities and water use

Table 5.2. Examples of energy efficiency requirements according to norms developed by the Swiss Society of Engineers and Architects (SIA), (from SIA 380/4) used in Germany.

Office buildings	Target values based on net floor area [kWh/(m²yr)]	Standard values based on net floor area [kWh/(m²yr)]	Target values based on gross floor area[kWh/(m²yr)]	Standard values based on gross floor area [kWh/(m²yr)]
mostly single or group offices, normal equipment (<1 PC/desk), daylighting, little air conditioning	15	30	13	27
mostly group or open plan offices, more equipment (e.g., printers), little daylighting, much air conditioning	25	50	22	43
same but central electronic data processing facilities in addition	45	90	53	77

Table 5.3. Regulations and guidelines influencing energy efficiency in building construction and refurbishment and maintenance in the public sector (other than rstandard building codes).

	Regulatory Requirements	Construction, Refurbishment and Maintenance Guidelines	
		Public Sector Specific	*General (but used by the public sector)*
Austria		Vorarlberg, Ökoleitfaden eco-gudelines	
Finland		Ministry of Trade and Industry (MTI) Energy efficient recommendations Voluntary agreements between MTI and public building owners (renewed in 2002)	
France			HQE (High Environmental Quality) eco-guidelines
Germany	VOL and VOB contain requirement to include environmental criteria	AMEV energy efficiency guidelines: Leitfaden Nachhaltiges Bauen VDI guideline 3807	State of Hessen Eco-guidelines
Italy	Article 26, comma 7, Law 10 (1991)		
Switzerland		Canton defined eco-guidelines	MINERGIE standard

Note: The new EU Directive on energy efficiency in buildings will have an impact in all EU countries. The PROST project makes no attempt at speculating in the ways the new Directive will have an impact in various countries.

5.3.2 Finland

In Finland, recommendations for energy efficiency have been developed for public procurement of products, buildings and services.

The Ministry of Trade in Finland has published recommendations – JULMA – on energy efficiency in public procurement of products, buildings and services. The recommendations are mainly directed to the public sector but can also be applied to the private sector. According to the recommendations, public administrations should set good examples for other sectors, including the participation in first buyer groups for new energy-efficient technologies as well as guidelines of correct installation and use of procured machinery and equipment.

The effects of the recommendations, which are also implemented as part of the energy conservation agreements in the private and public sector, will be monitored by the Ministry of Trade and Industry.

A tool named HYMONET has also been developed under the guidance of a consulting company owned by the Association of Local Authorities. The tool includes an environmental database on a broad range of products (see under 7.1.2).

5.3.3 Germany

In Germany, the most important handbook for green procurement usually refers to the Blue Angel labelling criteria and to the GEEA/GED label. There are also handbooks for green procurement including energy efficiency recommendations in local authorities.

The handbook on environment-friendly procurement – *Handbuch Umweltfreundliche Beschaffung* – is estimated to be the most important source of information for green and energy-efficient purchasing of products in Germany. For products and appliances the handbook, which is edited by the Umweltbundesamt (Federal Environmental Agency), usually refers to the Blue Angel labelling criteria and for electronic appliances also to the GEEA/GED label.

There are also local authorities with their own handbooks for green procurement including recommendations of energy efficiency, where the local authority can prescribe the purchase of alternatives with the lowest energy consumption. For instance, the City of Wuppertal issued a green handbook in 1997 that was even mandatory to procurers. It requires the criteria of the Blue Angel label for computers and other office equipment. However, due to the decentralisation of purchasing within the city, some purchasers are not even aware of the required specifications.

One example of the practice of environmentally

friendly purchasing guidelines is the City of Hanover, where a general service instruction requires municipal departments to carry out environmental impact assessments of procurement, constructions and installation, plans and programmes. The city uses a standardised audit scheme, for which the Department of the Environment supervises the assessment and the results of the impact analyses of the procurement are published in an internal procurement catalogue. It includes all the products that can be purchased by departments and offices of the municipality directly. The catalogue is mandatory for all departments and offices and mainly contains products that are less environmentally damaging. For example, only refrigerators with energy label class A are listed and for building materials, there are separate leaflets with information on environmental impacts.

5.3.4 The Netherlands

In the Netherlands, a web-site provides a toolbox with environmental specifications for several products and services. Environmental criteria are also available through a national eco-labelling scheme.

The *Duurzaam Inkopen* – the Sustainable Procurement Programme (see under 2.3.8) – has developed a web-site providing a toolbox with environmental specifications (http://www.inkopers.net). In the year 2001, the programme had developed specifications for 15 product and service categories including catering, paper, office furniture and equipment, street furniture, means of transport and green maintenance.

In 1992, the independent *Eco-label Foundation* (Stichting Milieukeur) was established by the Ministry of Environment to develop a national eco-labelling scheme. It has developed criteria for several products and the label can, in most cases, be awarded to producers and manufacturers.

5.3.5 Sweden

In Sweden, an internet guide, including a large number of specifications, provides environmental criteria for procurement of goods and services.

The Committee for Ecologically Sustainable Development (see under 2.3.9) has developed an internet guide – *the EKU instrument* - to help public sector bodies to integrate environmental concerns into procurement of goods, services and contracts. The aim of the instrument is to simplify the use of environmental requirements (including energy efficiency) in public procurement.

The EKU instrument includes proposals of environmental requirements that can be applied on different product groups. It now contains specifications for 150 products divided in 76 product groups.

5.3.6 UK

In the UK, a guide for government departments includes environmental requirements and energy efficiency recommendations. Energy efficiency guidance also exist at a local level.

The main guidance for energy efficient procurement is the *Greening Government Operations Green Guide for Buyers*. The Sustainable Development Unit (SDU) and a Purchasing Policy and Advice Division (PPAD) of the Department of Energy, Transport and Region (DETR) have issued the guidance in which departmental purchasing officers are advised to ensure that environmental requirements are included from the outset in the specification of contracts. Suppliers are required to provide details of average standby power demands as well as nameplate ratings to assess energy consumption. The DETR has also issued a self-assessment checklist for suppliers and a guide to choosing environmentally preferable IT equipment.

The DETR has also produced two practice guides that illustrate eco-labels to observe when purchasing energy-efficient equipment and methods of calculating energy performance.

Another example is *Leicester City Council Guide for Environment-Friendly Purchasing*, which includes energy efficiency aspects. According to the Guide, the City Council will buy the most energy-efficient appliances available and an Energy Team should be consulted before any electrical products are purchased. Specifically the council will:

- buy rechargeable or long life batteries with low mercury content
- replace standard light bulbs with energy saving compact fluorescent lamps
- ensure that all new computer equipment incorporates Energy Star features

5.3.7 EU Candidate Countries

In the EU Candidate Countries, there are no guidelines for green or energy efficient procurement, but Hungary has begun to develop a database with certified suppliers.

Efforts have been made in Hungary to build up the database of products and services provided by companies with certified energy management system (ISO 14001 or EMAS). Institutions planning to introduce environmental management system (EMS) are obliged to give preferences to environmentally friendly suppliers. However, EMS is still in a preliminary stage in local government. There are hardly any local governments that have initiated the process on introducing EMS. It is expected that their number will increase with similar intensity as in the business sector.

5.3.8 Japan

In Japan, national recommendations set selection criteria for energy efficiency and include a variety of product categories.

The *Basic Policy on Green Purchasing*, which was launched to greening administrative works of national government, sets selection criteria including energy ef-

ficiency, which applies to ministries, agencies, courts and other independent administrative entities. It includes specifications and criteria for 15 broad categories (from computers and passenger cars to building materials and services).

The *Action Plan for Greening Government Operations* was launched in 1996 in order to greening the administrative works of national government. It includes regulations for training of officers, a scheme for product databases, guidelines and target values for improvement of energy efficiency.

5.3.9 Switzerland

In Switzerland, purchasers at different administrative levels have developed an instrument for energy efficient procurement.

The Interest Group for Ecological Purchasing (Interessengemeinschaft Ökologische Beschaffung, IGÖB) is an *ad hoc* group for the exchange of information created by committed officials and purchasers from federal, cantonal and municipal administrations. The IGÖB activities are also supported by the Federal environmental authorities (Swiss Agency for the Environment, Forests and Landscape, BUWAL). Their handbook on sustainable public procurement (IGÖB 2000, www.igoeb.ch) is estimated to be the most important source of information for both green and energy-efficient public procurement in Switzerland.

In 2002/2003, a competence centre for federal public procurement will develop an interactive information system for purchasers. It will be implemented in the form of an on-line handbook with various links. A link to environmental criteria of different product groups follows the idea of the "Check-it" criteria catalogue of the Austrian procurement service.

5.3.10 USA

In the USA, energy efficiency recommendations for federal agencies include energy efficiency criteria, advice and links to product listings.

The FEMP *Product Efficiency Recommendations* are summaries that provide the user with energy efficiency criteria, a cost-effectiveness example, advice and sources of information (including links to on-line product listings). The efficiency recommendations focus on product types that meet four key criteria. They should:

- be widely purchased by federal agencies
- use a significant amount of energy
- offer a range of efficiencies (above the national mandatory standards)
- have a generally accepted method of testing (and reporting energy performance)

See more about the FEMP programme under 7.8.1.

Table 5.4. Overview of tools and guidelines for energy efficient/environmental procurement

	Purchasing Guidelines/Tools	Product categories	Services/Objectives
Austria	Check-it	Paper and office supplies, electrical appliances, interior furnishing, cleaning supplies etc.	Information and recommendations on green procurement and legal framework analysis
Finland	HYMONET (internet-based tool for energy efficient procurement), JULMA (Internet page on public procurement)		
Germany	Handbook on environment-friendly procurement (Federal Environmental Agency) Handbooks for local authorities	Comprehensive	
Hungary	Purchasing Guidelines do not exist at present. EC guidelines will be adopted		
Japan	Basic Policy of Green Purchasing	15 broad categories	Promotion of green purchasing
The Nether-lands	Duurzaam Inkopen (Sustainable Procurement Programme)	15 product and service categories including catering, paper, office furniture and equipment, street furniture	Development of a toolbox for procurement officers including environmental specifications
	Stichting Milieukeur		Development of a national labelling scheme
Poland, Slovakia	No guidelines for energy-efficient procurement		
Sweden	The EKU instrument	Specifications for 150 products (76 product groups)	Internet-based instrument for ecologically sustainable procurement
Switzerland	Interest group for ecological purchasing		Handbook on sustainable public procurement
UK	Greening Government Operations Green Guide for Buyers		Advice for environmental criteria, check-list etc.
USA	The FEMP Product Efficiency Recommendations		Provide energy-efficient criteria, cost effectiveness examples etc.

6. Product purchasing, building investments and financial management

The general trend in the public procurement process is that financial control and spending decisions are increasingly decentralised. On the other hand, building management tends to be increasingly centralised and "outsourced" to state-owned building construction and management companies. Within the confines of transparency and free competition defined by European directives and national law, public administrations are empowered to autonomously establish purchasing and financial management criteria. Following a trend in recent years, which aims to increase managerial accountability, autonomy can reach down to single department managers.

Considering the mixed trends of decentralisation in combination with outsourcing in all partner countries, it proves impossible to draw a coherent common picture of public procurement and financing practices across Europe.

The attribute, which seems generally common to the purchase of energy-consuming goods in Europe, is that with specific and important national exceptions, the greater part of this type of procurement in the EU today is based on lowest product purchase price. The use of the criteria "economically most advantageous offer", which allows procuring officers to award tenders on the basis of lowest total lifetime costs (including lifetime energy costs), still represents only a marginal number of procurement activities.

The following comments can only attempt to identify some of the most common characteristics and important issues of financial management and purchase decisions, which affect the purchase of energy-consuming goods in the public sector.

The areas of discussion are considered:

- *financial management:* funding and budget allocation in public administrations
- *purchasing routes:* the decision process in purchasing or investments

6.1 Financial management

Two administrative models are discussed in the following sections:

- The traditional management model
- The budgeted model, named after the element of New public management (see Chapter 8) that is most relevant for improving energy efficiency

In the traditional management model in public administrations, the allocation of competence and resources to fulfil the task of the administration are often separated from each other. Generally, in the countries examined, departments receive a certain budget, divided by investments and running costs. They usually have no incentive to save on their running costs, since as a consequence their running cost budget would just be reduced in the following years. Neither do they have the possibility to shift expenses from, e.g., energy, to the purchase of a more energy-efficient, and somewhat more expensive equipment, or to special energy efficiency measures that have a high initial cost but save energy costs later. Nor do in the traditional management departments see the follow-up costs of investments model since they see no depreciation (or interest and repayment of loans) in their budgets.

However, since the early 1990s, general management models of public administrations have altered. Administrative units are being reorganised and tasks, competencies and resources are re-defined and allocated differently. In order to increase economic efficiency, new management and controlling instruments are being introduced. New models of public administration aim to increase efficiency of internal administrative processes and realise cost saving potentials. Examples of new managerial elements are global budgeting (decentralised budget responsibility), cost accounting systems and monitoring systems. (The elements of new public management are treated in Chapter 8).

The Budgeted model is quite common among local authorities, at least in Germany more than 50% use some form of budgeting. The state authorities rather focus on cost accounting, maybe since they are split into more independent entities (in terms of budgets).

6.2 The "traditional management model"

In the traditional management model, the procurement of energy-consuming goods by public administrations is generally split between product or building-related expenses and investments, and energy purchases. Though ultimately the public administrations as a whole has an interest to reduce energy consumption (and hence costs), there is no direct financial incentive for each of the two/three department managers involved (see next paragraph) to minimise total

costs (investment + running costs) of this kind of procurement .

In a common, typical management model, public administrations make their purchases by splitting budgets across generally three independently managed departments in addition to the users: The facilities department, the accounts department and the procurement department:

1. the *facilities department* or construction and maintenance department: responsibility for day-to-day maintenance of all the buildings used (and possible rented) by the many service groupings (maintenance of the artificial lighting systems, heating systems and building envelopes). Depending on the size of the unit, the facilities department may either complete the work in-house, or manage external service companies. In the case of larger refurbishment projects (or new construction) it is more likely that the facilities department will co-ordinate external companies, including design agencies.

2. the *accounts department* is charged with paying all energy bills, thus heating fuels and electricity costs, incurred by the different departments as well as the investments in buildings and equipment.

3. the *procurement department* is charged with purchasing all energy-consuming products that is not acquired by the facilities department (office equipment, white goods, TVs/VCRs etc.). This is increasingly decentralised: e.g., for IT or for cars there is often a specialised procurement department, whereas each department purchases white and brown goods individually.

Finally, the *users* of appliances, cars and buildings seldom or never see the purchase costs or the saved energy costs in their own budgets.

This is not an exhaustive description of the realities. For example, in small public institutions (such as a small hospital), the accounting department or administration will typically undertake the procurement. In larger public administrations (a city council), the facilities department itself may have a dedicated procurement department, or there may be two departments: one for new constructions and one for refurbishment and maintenance.

The disincentive to optimising expenditure over product and service lifetimes caused by the division of investment and management budgets is to some degree, if not globally, recognised. There are some tentative efforts (France, Germany, Italy and Sweden) to overcome this problem by unifying the expenditure on energy-consuming goods and energy costs within the public administration under a single energy management unit. These efforts do not always mean that the rules are changed. In Montpellier, France, for example, this effort is informal within the limits of the existing rules.

6.3 The "budgeted model"

There is a trend, within the broader trend towards the *New Public Management*, for administrations and authorities to manage their resources by making departments and institutions semi-autonomous. In this model – which we call the budgeted model – the semi-autonomous departments:

- are provided with an annual global income (the 'budget'), which they can keep even if they spend less due to their own efforts to improve efficiency, but which they also must balance in the following years if they spend more due to own decisions
- provide one or more services
- incur costs in delivering the service
- cover *some* of the costs with their income from the service

The budgeted model provides an incentive for more energy-efficient resource management, because of the possibility to keep most of saved energy costs (typically in the range between 50 and 100%) in the budget of future years and to shift expenses from running costs to energy efficiency measures that save running costs. However, it still contains possible areas of conflict, e.g., it is crucial for the positive incentive to save costs that all savings due to good management (or a percentage) continue to stay within the budgeted department. In some cases, as the running costs of the department are reduced (through better energy management), central administrations are tempted to reduce the subsequent yearly budget allocations of the department. Thus, increases in energy efficiency achieved by departments may provide only temporal financial gains, and the incentive to work for energy efficiency could be again reduced in practice.

6.3.1 Incentives and possible disincentives

Any true 'budgeted' model will include the energy costs in the budget, even if energy purchases may still be managed by a central office. The important thing is the power of decision for the budgeted departments, and the possibility to use most of the saved energy costs for other expenses. Direct cover of energy cost thus eliminates any potential conflict between the authority and departments, improving the signal to departmental management to reduce energy related costs, which increases the chances for energy efficiency improvements. These are easiest achieved through the efficient energy management of existing appliances and buildings ("good housekeeping", e.g. closing windows, turning out the lighting, and turning down the heating in rooms while not in use). This can partly be done by the users themselves, and partly by an energy management unit. Budgeting thus increases both the attractiveness of energy management units to user departments and the need for co-operation between these two.

Which are the incentives and possibilities for investing in more energy-efficient equipment and buildings

in order to save energy costs? Three issues have to be distinguished.

1) *Decentralised product purchasing.* Generally, the global income will allow the departments to cover the cost of a limited set of energy-consuming products, for example office equipment, specialised medical equipment. Decentralised product purchasing is an increasing trend coupled to the decentralisation of budgets. It is easy for the budgeted department to shift funds from energy costs to the purchase of more energy-efficient appliances and equipment. However, there clearly is an explicit need for more information to the decentralised purchasers on the most economically advantageous and energy-efficient choices. Otherwise, the budgeted model may end in a status of "organised incompetence".

2) *Centralised product purchasing.* Here, the budgeted department still has the power of decision what to buy, but it may be more difficult to convince the centralised product purchasers to buy the energy-efficient solution for all departments. Top-level decisions in favour of this are therefore important.

3) *Building construction and maintenance.* This will continue to be the task of a central construction and maintenance office. It is hardly practical that individual schools, or hospital departments establish independent facility departments in order to overcome the split incentive situation. Therefore, the central construction and maintenance office can offer facilities construction and maintenance services, taking money from the central or the user department's budget to finance the investments. In this way, the user department can save its budgeted energy costs. If also building maintenance is included into the decentralised budget of the department, there will be an increased incentive to reduce energy costs by investing in higher energy efficiency from the maintenance budget. Still, in any case there must also be priority on energy efficiency for the central construction and maintenance office from the top level, and a good co-operation between the central construction, maintenance office and the user departments.

6.4 Financing energy efficiency and balancing budgets

In many cases, the increase in purchase price of an efficient over a less efficient solution is marginal. Increasing energy efficiency could be achieved simply by better utilisation of existing annual allocated investment funds.

However, the concept of investments specifically undertaken to increase energy efficiency has probably not until now been generally considered. One exception is France, where profitable investments in energy efficiency specifically can be undertaken (however not systematically), at least in the building field (for example retrofitting an old heating system for example).

Would it be possible for a public administration, having identified a large financial saving potential, to undertake an aggressive investment campaign in energy-efficient solutions? Two courses of actions are:

- financing the investments
- writing off the investments

6.4.1 Financing the investments

Public administrations can generally take loans, but these are often limited in some way. For example total loans may be limited so that the loan repayments stay below a fixed percentage of income streams, i.e., it is probably not possible for the public administrations to use property and other goods as collateral. Energy efficiency improvements will increase future liquidity but will not increase income (in this case there is a need to have savings recognised as income streams).

If there were possibilities in raising loans directly, the authority could fund own energy efficiency investments. Otherwise, it could of course bring in suppliers of energy-consuming goods to realise the investments.

6.4.2 Writing off the investments

The other possibly important problem is the need for public administrations to balance budgets on an annual basis. Private companies write off investment costs over a number of years, the writing-off period equates roughly to the life of the product (though probably less). Thus, end of year financial balance will be positive, since only a portion of the costs are attributed to the first year in which the investment is made. In the subsequent years the financial balance will be positive, since returns on the investment will be greater than the quota of investment costs attributed to each specific year.

The mechanism of writing off stems from the need to balance taxes over time (taxes = % profit = incomes in a year – factors of input accountable to that year).

Public administrations normally do not pay tax so no equivalent mechanism exists. They have the obligation to balance budgets on an annual basis. Thus, investment costs are all normally charged to the year when they are effectively undertaken, something that limits the size of investments that can be carried out (since there is usually a cap on the amount of loans a public administration can take). One exception is France, where large investments may be depreciated over three years.

There are other limits to how quickly improvements to building systems and products can be achieved, e.g. limits of managing capacity. It is hardly likely that an entire town council could effect changes in all lighting systems in all its properties within two years.

The balancing book principle is limiting the amount of money that can be used even for profitable investments. It would therefore increase the attractiveness of energy efficiency if the public sector converted to private sector financial principles, most importantly depreciation. The reason is that the follow-up costs and

benefits of investments would become more transparent to the users of the buildings and assets. Still, the problem of capped loans may remain.

6.5 Purchasing channels and information requirements

A problem commonly reported as hindering procurement of energy-efficient products is the general lack of relevant information available to the public sector.

To be useful, any information needs to be well tuned to the audience. Thus, identifying the most common purchase channels and those involved in the procurement process would be useful in developing such material. If they generally make small purchases, succinct information is required. For large volume purchases, a more detailed analysis can be made.

However, it is felt that there are no standard routes to energy-efficient service procurement. There is simple too large a diversity across organisations to identify standard procurement channels for different product categories. For example, in an average larger Finnish municipality with about 80 000 inhabitants, it is estimated that up to 2 000 decision makers may be involved in the public procurement process.

This does not mean that it will be impossible to develop information tools to improve procurement of energy-efficient products. Rather, it means that it is impossible to fine tune information tools to specific procurement officers and/or on the basis of product categories. Thus, it is more correct to suppose a full range of information tools for all products and components, both succinct and detailed.

This might be contrary to a priori expectations on the issue. For example, a single hospital wishing to equip staff rest rooms with refrigerators may purchase only a few units directly from a local supplier. (In this case, simple instructions to buy Class A might be sufficient). However, the same hospital might instead procure the units through a central buying agency. The central buying agency is likely to dedicate significant time to the tender process, have technical ability and be able to effectively use more detailed information on energy performance of cold goods.

The facilities department of a public administration is usually the preferred channel for procuring building components, at least for larger purchases (for example insulation, and glazing). Small maintenance and related purchases (such as light sources), may be acquired by the accounts or user departments. The facilities departments of the small towns and villages (several thousand in both France and Italy) will vary considerably in their level of technical sophistication from those of large municipal, provincial and regional administrations throughout Europe. This is also true for the volume of purchases they make.

7. Success stories and good examples of energy efficiency in the public sector

7.1 Finland

7.1.1 Extending product life in the City of Pori

Over the last 10 years, the City of Pori has acted as a forerunner in green purchasing issues. The city now considers energy conservation in public procurement; purchase decisions are based on a product's total life cycle costs. This is supported by web-based procurement instructions and guidelines for purchasing officers, with detailed information on energy saving potentials of products and building components.

The City of Pori also has succeeded in making alternatives to new purchases more attractive. Long maintenance agreements enable circulation of office equipment to other public users even after the normal life cycle of the product is over. Thus, instead of buying a new one, a school could receive a copying machine with a valid maintenance agreement when the City Office has deducted the machine after several years of use.

7.1.2 HYMONET – a web-based decision support system

The Association of Local Authorities have developed a web-based decision support system for environmentally friendly procurement, including energy efficiency. The database went on-line in June 2001.

HYMONET provides a platform for open discussion between equipment users, purchasers and suppliers. The programme is updated continuously and provides public purchasing agents with:

- information on legislation
- models for different procurement procedures implementing environmental criteria
- general environmental knowledge on the life cycles of products
- specific information on environmental properties of products and criteria for selection of environmentally preferable products

At present, the HYMONET database considers the product groups:

- electrical devices
- building materials
- hospital supplies
- cleaning agents
- food

7.2 France

7.2.1 The City of Montpellier

In the City of Montpellier, the Technical Service implements energy efficiency measures in all buildings and manages the energy budget of the city. Even if investments and budgets are formally separated and divided on each building of the city, it is all managed by the Energy Department, which:

- centralises the 5 000 annual energy invoices (but informs each facility responsible)
- establishes technical specifications (e.g. lighting, double glazing) for all city buildings
- participates in the selection of architects for new building constructions
- communicates on these activities

The City of Montpellier, which implemented an energy policy in 1979, has now data on each of its facilities, which can be analysed over several years. Large savings are made (around 15 250 Euro per year) by controlling energy bills and electricity contracts. Energy management is automatic, power switches are carried out where needed and maintenance specifications are issued. Montpellier has saved 1.8 billion Euro thanks to this energy policy (from 1979 to 2000), electricity expenses for municipal buildings being half as high as for comparable cities.

7.3 Germany

Good examples and success stories are numerous in Germany, particularly at the municipal level. Many municipalities have an energy management unit. Figure 7.1 just shows some of the successes in reducing the demand for heating energy.

On average, the benefits of energy management (in terms of saved energy costs) outweigh the costs by a factor of three to five. We present the City of Frankfurt/Main as an example.

7.3.1 Energy management in the City of Frankfurt/Main

Frankfurt/Main has a fully developed energy management unit. The management unit has five people and is located in the planning division of the city's construc-

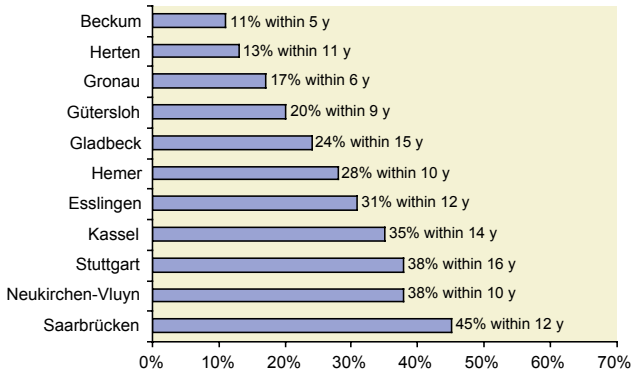


Figure 7.1. Examples of energy savings obtained in heating systems in some German municipalities.

tion and maintenance office. CO_2 emissions have been reduced by 16% compared to 1990, despite an increase in floor area.

Energy management in Frankfurt/Main has the following elements:

Energy monitoring and benchmarking

In roughly 70 buildings covering approximately 17% of the floor area, the consumption is measured automatically once a month. In the rest of the buildings it is measured manually. The results are used for an internal benchmarking to detect buildings, in which energy efficiency measures have to be carried out.

Optimisation of the building operation

Based on the monitoring, the energy management unit reacts if there are high total and/or specific values of energy consumption, or if demand suddenly rises. This continuous optimisation brings significant energy savings.

Training and information

Following an initiative promoted by the energy management unit, roughly 50 premises (mostly schools) have denominated "energy watchers" (Energiebeauftragte). These people receive one-day training seminars. No direct training is given to the rest of the staff, except for a brochure. Instead, it is expected that the "energy watchers" act as multipliers and, e.g. in schools, create "energy teams". This is connected to the system of "user participation in savings" (see below).

Creation of purchasing or operation guidelines

Energy costs are budgeted and allocated to the different departments and premises in Frankfurt. The council decided in 1996 that of the savings compared to the baseline years (1996 to 1998), 50% will go to the users of the premise that had achieved the savings.

Furthermore, for all new build and maintenance, the energy management unit has developed two important guidelines:

- One technical guideline on energy requirements for the building shell and the technical equipment, which is mandatory for the architects and planners of the construction office. The requirements are thought to be cost-effective; if a planner wishes to deviate, the cost-effectiveness of the alternative has to be proven.
- The other technical guideline concerns the calculation of the life-cycle costs including energy of a building. It is mandatory in Frankfurt/Main that for all investments above 250 000 Euro (and for smaller measures if it deviates from the guideline on energy requirements), alternatives have to be compared based on a calculation of the life-cycle costs using another spreadsheet developed and used by the energy management unit. The benefits include a premium of 50 Euro per tonne of CO_2 avoided.

Management of energy efficiency measures & investments

There is a special fund for energy efficiency (ca. 7 million Euro/year) inside the maintenance budget. The use of this fund is subject to consultations between the architects and planners of the construction office, the energy management unit, and the user department. In 1999, together with normal maintenance funds, 23 million Euro were invested and annual savings of 1.4 million Euro achieved.

7.3.2 Public Internal Contracting (PICO)

Very similar to performance contracting, public internal performance contracting (PICO) represents a way to enable energy efficiency investments by a kind of in-house "third-party" financing or energy performance contracting scheme. Different from conventional third party financing schemes, the PICO approach does not build on the engagement of an external actor such as an ESCO. The role of the ESCO is taken by a unit of the customer itself, e.g. the technical department of a municipality.

PICO has been applied with success in the cities of Stuttgart, Kiel, Wuppertal, Dresden, the Schwalm-Eder district, the Rheingau-Taunus district, and in Frankfurt/Main.

The PICO unit acts like an ESCO, delivers the financial and technical service, and the remuneration takes place through cross payments of budgets between the two separate organisational units of the same public administration. For example, in Stuttgart, Germany, the city's department for the environment takes the role of an internal ESCO and offers energy services to other units of the municipal administration. The internal offers draw the technical know-how of the building surveyor's office and supplementary energy audits, and they are backed with economic cost/benefit calculations by the environmental department.

This forms the basis for internal negotiations between the customer department and the environmental department, acting as an ESCO. When an internal en-

ergy service agreement has been concluded, the environmental department undertakes an investment in energy saving measures that are realised by the building surveyor's office.

Within the administration, a new internal revolving fund for energy efficiency investments has been established as an intermediate buffer for cash flows. First, it provides the funds for the investment and afterwards, it is refilled by the cash flow from energy cost savings, i.e. the customer department pays back the investment.

Comparable to other third party financing schemes, the efficiency measures reduce the annual energy bill of the customer department, which gives room to pay the PICO fee, e.g. under a shared-savings agreement.

In times of tight public budgets, PICO offers the opportunity to continuous implementation of energy efficiency measures through the temporary provision of seed money. For example, through a re-organisation of budgets, loans etc., during the initialising phase of PICO, it is possible to stimulate a continuous flow of investments so that the resulting payback cash flows in turn provide new funds for follow-up projects.

In Stuttgart, during the last five years, 2.5 million Euro have been invested under the PICO scheme, leading to annual savings of 11 000 MWh of heating fuels, 900 MWh of electricity, 29 000 m^3 of water, and 3 500 tons of CO_2.

Apart from the basic version of PICO described above, other modes of PICO are possible:

- the profit centre model (responsibility for energy issues is transferred completely to an internal profit centre with own budgets)
- the "fake privatisation" model (responsibility for energy issues is completely transferred to a newly created energy service enterprise which is owned by the public administration)
- the hybrid system, which joins PICO and energy performance contracting. In this model, PICO is used for smaller investments that can be handled by the administration itself and are too small to be profitable for an external ESCO. Bigger, more complex projects are contracted out to ESCO:s for realisation and investment

7.4 Italy

7.4.1 The Energy Manager of Modena

The City of Modena has given their energy manager recognition and support from the highest management tier in the authority. The energy manager was elected directly by the ruling cabinet, which agreed concurrently on the first lines of action. The energy manager reports directly to the council Director General, chief staff advisor to the City's Mayor.

The energy manager has been able to establish a strong influential role in the activities of the council service groupings, for example by assigning energy costs to individual service groupings, by developing a refurbishment plan for energy services, and by formulating proposals for building improvements for reductions in energy use.

The energy manager has successfully developed the consultancy role that the position traditionally holds (with a total of more than 20 important actions completed). However, importantly the energy manager of Modena has stepped beyond consultancy to establish direct budget control of a number of investment decisions. The energy manager now controls budgets for all service groupings for the maintenance and refurbishment of all heating and cooling plant as well as space heating energy costs (though costs are still nominally assigned to individual service groupings).

The investment model implemented by Modena goes someway to overcoming barriers to optimising investment and energy cost budgets over product and service lifetimes. The energy manager, together with the council Director General, is in the process of identifying how to develop the role further. The proposal is to achieve responsibility for heating and cooling plant in new structures, lighting in new and existing structures and electricity costs.

The proposal does not for the moment consider how to interact with the facilities department on developing building envelopes, nor does it include investment decisions regarding product purchases. However, in respect of the latter, the city council is currently in the phase of acquiring the EMAS environmental certificate, which the energy manager believes should be a strong tool toward directing product procurement.

7.5 Sweden

7.5.1 Swedish experiences with technology procurement

Technology procurement may be described as the process of satisfying a defined need with the help of a new product by issuing specifications for products that are not yet commercialised. Efficient solutions and technology development used to be regarded as positive side effects of technology procurement, but are now seen as the main target. Sweden has a long and extensive tradition of technology procurement, ranging from a variety of items (e.g. the rapid train X2000 and telecommunication systems). Examples of successful results of technology procurement contests, carried out by the Swedish National Board for Industrial and Technical Development (NUTEK) and (later) the Swedish Energy Agency are:

- the development of energy-efficient washing machines, where the winner managed to diminish the energy use per kilo clean laundry to 1.23 kWh (the target of the contest was set at 1,35 kWh)
- computer screens with an automatic turn-off function, increasing energy (and cost) efficiency and improving indoor climate (humidity)

- energy-efficient refrigerators and freezers, introducing low consuming products to the market
- well-isolated, energy-efficient windows, saving 60% more energy than the existing (three glassed) windows

Recent technology procurement incitements, made by the Swedish Energy Agency and the City of Stockholm, include biogas driven vehicles, streetlights, windows and environmental technology. Municipal and co-operative housing agencies have played a very important role in these procurement programmes.

7.5.2 The City of Sundsvall

In 2000-2001, the northern City of Sundsvall changed virtually all its street lighting luminaries into more energy-efficient high-pressure sodium equipped lamps that reduced power consumption roughly by half. The large investment was justified by LCC analysis. Originally, third-party financing was considered, but eventually the city council made a special budget reservation to allow for the one-time investment. In one year, 17 000 luminaries were replaced.

7.5.3 The Swedish Integration Board

The Swedish Integration Board (which works to integrate immigrants in Sweden) and five other government authorities within the same district, purchase approximately 40 000 hotel nights a year throughout Sweden. The authorities have developed an agreement with hotels, which requires the hotels to apply energy-efficient measures, to develop energy-efficiency programmes and to ensure that existing regulations of energy use are observed.

7.6 Switzerland

7.6.1 Reducing federal building space

In the course of the implementation of new public management, the Swiss Federal Office for Buildings and Logistic (BBL) has started to reduce the office area needed by Federal administrations. The target value is a specific office area of 12 to 15 m² per federal employee. In a similar way, the public real estate management by the city of Zürich aims at reducing the office area needed by the municipal administration by 10 per cent within 10 years. However, there are no estimates known how much energy could be saved by these measures.

7.7 UK

7.7.1 Clear objectives in central government

The UK Prime Minister told the United Nations General Assembly in July 1997:

> We must make the process of Government 'Green'. Environmental considerations must be integrated into all our decisions, regardless of the sector. They must be at the start, not bolted on later.

The UK policy is characterised by a strong clear signal to government departments to purchase energy-efficient products. This has been backed up by guidelines from the Treasury to buy goods based on total lifetime costs and not on least purchase cost.

Government departments have had a goal of ongoing 1 % per annum reduction in energy consumption on the government estate, the target being a total 20% reduction between 1991-2000. By March 1999 an improvement of 18.9% in energy consumption had been achieved against 1990/91 levels. The Government has renewed this target of 1% reduction in energy consumption from 2000/01.They must also comply with the UK legal target to reduce its greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012 and reach a domestic goal of 20% reduction in carbon dioxide emissions by 2010.

As part of this rationale, the Treasury and the Department Transport and the Regions issued a joint circular note "Environmental Issues in Purchasing" in 1999. This specifies that government's procurement policy is based on Value for Money (VFM), which is defined as "the optimum combination of whole lifetime cost and quality to meet the user's requirements".

All government departments are obliged to apply VFM in public procurement. Departmental accounting officers are accountable to parliament through the Public Accounts Committee for the department's decisions on purchasing and must prove that VFM has been achieved.

Amongst the examples of lifetime costs given are:

- *direct running costs* – resources (including energy) used over the life time of the product or the service
- *indirect costs* – loading on cooling plant arising from inefficient equipment

7.8 USA

The US government has adopted overall goals for saving energy in federal government buildings facilities and reducing associated greenhouse gas emissions. These include specific policies on buying energy-efficient products that qualify for the Energy Star-label and (for categories without an Energy Star-label) products that are among the 25% most efficient models on the market, as determined by the US Department of Energy's Federal Energy Management Program (DOE/FEMP). FEMP and Energy Star criteria now cover more than 40 categories of energy-using products commonly purchased by government agencies.

There are efforts to apply the same efficiency criteria to products and equipment acquired indirectly, through contracts for new building design and con-

struction, major renovations, operation and maintenance services, and leased space. While increasing decentralisation of government purchasing decisions makes it difficult to enforce compliance with specific directives (including those on buying energy-efficient products), the growing use of Internet-based "e-commerce" is also creating new opportunities to disseminate product-specific efficiency information and policy guidance.

A number of state and local agencies have adopted or are considering similar purchasing policies, with encouragement from DOE and the US Environmental Protection Administration (EPA) under the Energy Star Purchasing initiative.

The combined purchasing power of the public sector is very significant in the US, representing about 10% of all purchases of energy-using products. The federal government alone, with purchases of energy-using products in excess of US$12 billion, is the single largest customer not only in the nation but in the world for almost any type of product.

A key to buyer-driven market change is the use of common technical criteria for energy-efficient purchasing by many large purchasers at all levels of government and, ultimately, by leading institutional and corporate purchasers. By emphasizing Energy Star and FEMP criteria as a common basis for energy-efficient purchasing, the US has already seen some evidence of market response from manufacturers and suppliers. However, much of this remains anecdotal due to the difficulty of gathering specific data on government purchases from a highly decentralised acquisition system.

A projection of several scenarios for energy-efficient purchasing by federal and non-federal government agencies showed energy cost savings of US$1 billion/year in the "most likely" case, based on 18 TWh/year plus 2 million GJ of annual fuel savings. Of this total, 80% of the savings are attributable to state and local purchasing.

7.8.1 Policy and programmes on energy efficiency in public administrations

Beginning with the first oil embargo in the mid-1970's, the federal government has enacted legislation and administrative regulations dealing with energy efficiency in public facilities and purchasing. The latest element was added as recently as summer 2001, in the form of an updated Executive order to government agencies to purchase devices with low-standby power.

In addition to federal legislation, a series of Presidential Executive Orders direct federal agencies to undertake specific activities to promote energy efficiency in their facilities and operations, including government purchasing.

Federal Programs

At the federal level, Executive Order 13123 includes a number of specific directives to federal agencies to follow, in the process of achieving their overall energy savings goals. The Order assigns a broad co-ordination and technical assistance role to the Department of Energy's Federal Energy Management Program (FEMP).

Major elements of the FEMP program include:

- facility on-site audits to identify energy- and water-saving measures
- technical support in planning and undertaking energy-savings performance contracts (ESPC:s) using Energy Service Companies (ESCO:s) that have been pre-approved to simplify federal contracting
- design assistance to help agencies build more energy-efficient and sustainable new (or renovated) facilities
- technical assistance and (limited) financial support for renewable energy projects and "green power" purchasing
- recommendations on purchasing energy-efficient products that qualify for the Energy Star label or – for categories not covered by Energy Star – products in the top 25th percentile of the market in terms of energy efficiency
- staff and contractor training on all the above topics
- tracking and reporting of government-wide energy efficiency and renewable energy activities and accomplishments

FEMP promotes energy-efficient purchasing by helping federal agencies comply with the energy-efficient purchasing requirements of the 1992 Energy Policy Act. FEMP implements the two Executive Orders by publishing written guidance defining efficiency levels at the upper quartile (25th percentile) of the market for about 40 product types, including a number of Energy Star labelled products. FEMP has distributed over 3 500 copies of the loose leaf binder "Buying Energy Efficient Products" in response to requests from federal buyers and others; the same information is published on-line.

The EPA/DOE Energy Star Purchasing Program encourages similar policies and practices for energy-efficient purchasing by state and local agencies, with the help of the utility-sponsored Consortium for Energy Efficiency.

State and local programmes

State Energy Offices are responsible for planning and implementing state level energy efficiency programmes, mainly with funding from US DOE. In several of the larger states such as California and New York, these programmes are also supported by state appropriations and "public benefit" funds collected from utility ratepayers. These state programmes mainly target efficiency investments and energy management practices by consumers and businesses, although several states also pursue energy savings in public buildings and government purchasing.

States such as Texas, Iowa, and California have financed energy-saving capital improvements in public buildings through state revenue bonds or internal loans from revolving funds.

Several states also sponsor their own energy efficiency research and technology deployment programmes, with funding from state appropriations or utility ratepayers. In some cases (e.g., New York and California) these R&D functions are managed by the State Energy Offices; other states such as Wisconsin, Florida, North Carolina and Iowa, have created separate R&D agencies. In the aggregate, these state-managed research and technology-transfer programmes spend about US$200 million/year, mainly aimed at energy efficiency and renewable energy technologies and practices. This is almost the same scale as the entire US DOE budget for energy-efficiency research. Several states have formed a non-profit organisation (ASERTTI) to co-ordinate their energy research planning and implementation.

At the municipal level, DOE's support for community-based programmes is funded mainly under the "Rebuild America" programme. Because of significant recent growth in spending on school construction and renovation, DOE has put a special emphasis on energy efficiency in new and existing school buildings. In prior years, DOE also provided direct funding for energy management programmes by municipal agencies.

Energy labels and standards

Perhaps the best-known voluntary programme in the US for promoting energy efficiency is Energy Star. The US Environmental Protection Agency (US EPA) created Energy Star in 1992 as a joint government/industry marketing and labelling programme for efficient office equipment with a low-power "sleep" mode. Since then, the program has expanded, with sponsorship by both US EPA and US DOE, to include voluntary energy efficiency labelling of more than 30 types of energy-efficient products. In 2000, there were over 1600 manufacturing and retailing Energy Star partners, and an estimated 120 million labelled products sold (US EPA 2001). In addition to product labels, Energy Star now includes labelling of energy-efficient homes, as well as performance benchmarking for several types of commercial buildings and selected industrial processes.

Based on a directive in Executive Order 13123, several federal agencies have adopted Energy Star criteria as a basis for energy efficiency of new federal construction, both non-residential buildings and military housing. Private industry partners contribute to a national advertising and "brand-awareness" campaign to build on the current level of consumer recognition of the Energy Star logo – already about 40%, according to surveys.

There is a close link between the Energy Star label and government purchasing: the FEMP criteria for energy-efficient purchasing are harmonised with Energy Star, resulting in both:

- a clear market message (and performance target) for manufacturers and distributors
- an easier path for government buyers to identify efficient products by simply looking for the Energy Star label and logo

Moreover, all Energy Star-labelled products are also included in a web-based list, easily accessible to both government and institutional purchasers and to individual consumers.

Finally, as states such as New York, California and Massachusetts begin to target their own purchasing to Energy Star criteria. This adds to the demand-pull effect of many large buyers, all focused on common criteria for energy performance.

In addition to these market-oriented programmes, US DOE manages national programmes for mandatory appliance and equipment testing, standards and comparison-labels. DOE also issues recommended building energy-efficiency standards for new non-residential buildings and provides grants, training, and technical assistance to states and local authorities to adopt these efficiency provisions into local building codes and enforce compliance. A modified version of the DOE recommended building standards are mandatory for all new federally owned buildings (including major renovations).

As with Energy Star, these national requirements for appliance and equipment rating and labelling provide an essential foundation for energy-efficient government purchasing for several reasons. They:

- are based on industry-wide energy test methods
- produce appliance labels which help buyers to compare energy performance
- create publicly accessible data bases on energy use and efficiency, which can be used both to establish purchasing criteria and to help buyers identify products that meet or exceed a given performance level.

Part 2

Policies and tools for energy efficiency in the public sector

8. Policies for an energy intelligent public sector

Common energy efficiency criteria and guidelines adopted all over the European Union are needed and justified: The public sector typically represents 5-10% of the whole energy use in the EU Member States. Public procurement EU-wide is in excess of 200 billion Euro, or about 3% of total GDP, and it is growing. For example, in the case of personal computers alone, the annual purchasing value of the public sector is 1 billion Euro. We estimate that common public sector energy efficiency features could influence an annual sales volume of 15-25 billion Euro of products and services within the public sector in EU.

Compared to a "business as usual" scenario, Our study indicates that the public sector in EU and Candidate Countries could save up to 20% of its energy use (heat and electricity) and carbon emissions by 2020 if giving a stronger emphasis to energy efficiency aspects in their procurement and energy management routines. The energy savings could generate public savings worth up to 12 billion Euro in Europe in 20 years and in addition lead to better comfort and productivity. The investments needed are insignificant: in the whole EU they would be about 80 million Euro/year.

These are impressive numbers in their own right, but if we see the public sector as a lever for transforming the whole market it gets really interesting. Arguably, the market volume of the public sector is fragmented. But if given a common direction guided by clear and comprehensive policy decisions, the whole public sector would gradually embrace more and more of common energy efficiency targets and purchase specifications. When suppliers see all public entities all over Europe as part of one virtual entity that always ask for the most efficient products, they will adapt to that market. And to reach economy of scale, it will be profitable to sell the same efficient products to private entities and consumers as well.

How can we get there? Part 1 of the PROST report actually concluded that the public sector gradually is learning to ask for efficient solutions, but that the efforts are scattered and seldom co-ordinated. We outlined a number of barriers to broad-scale implementation of energy efficiency in the public sector. Only few, if any, of these barriers are of a truly legal nature: the problems are more related to policy, information and knowledge, and the resources for those who wish to achieve something are limited. This chapter – Policies and tools for public sector energy efficiency – provides clear proposals on how to overcome the barriers. It points at strategies that optimise the use of scarce financial and energy resources in the European public sector.

Everyone has a responsibility for implementing energy efficiency in the public sector: The European Union and its institutions, Member States and Candidate Countries, individual public administrations on all levels, and employees working in all these institutions. The role of the EU institutions deserves to be highlighted. No other energy and environment policy area offers such an obvious opportunity to provide leadership by example than this one. Any Directive asking Member States to ensure that the public sector becomes energy efficient, should also spell out mandatory requirements and actions for the European Union's own institutions.

8.1 Summary of policy proposals

A priority task of the PROST study has been to analyse the possibilities for EU policy to stimulate energy efficiency in the public sector throughout the Union. One such instrument could be a framework Directive requiring implementing action from the Member States and the EU institutions. Such a Directive has been discussed, e.g., in the European Climate Change Programme. However, the fact that we analyse the possible elements of such a Directive here does not prejudice the actual proposal of such a Directive by the European Commission. What we are exploring is the following:

- how such a Directive could promote the use of different policy instruments for energy efficiency in the public sector of the Member States and in the EU institutions
- how the Member States could implement the requirements of the Directive
- how implementation could be fostered by European pilot actions

It should be noted that a number of tools (for example the introduction of energy efficiency purchase criteria) are identified under a number of different policy instruments. It should also be noted that specific recommendations on target levels and LCC methods are summarised in the chapters covering products and buildings respectively (Chapters 10 and 11).

The various policy tools are presented in such a way that the overall policy targets are described first, then the structure needed on European and national level is discussed and what the primary responsibility of this structure should be. We then continue to discuss structures, policies and tools needed in the individual PA:s, and the focus on individual PA:s ends with a discussion on the current reformation of the European public sector, and the bearing it has on energy efficiency. A final section deals with the synergies between the policy instruments and how they overcome the barriers to energy efficiency in the public sector.

8.1.1 Setting policy targets

Concrete policy targets on energy efficiency need to be defined for the public sector in order to capture the energy savings potential represented by the public procurement and public energy management activities. This would also underline the responsibility of the public sector to act as an example for the whole society and to show how energy efficiency could be implemented in practice. This kind of exemplary function for the public sector has already been introduced in the Buildings Directive.

The relation of energy savings with CO_2 emission reductions and the Kyoto agreement is strong and therefore the policy targets should also be linked to climate change mitigation. Considering the problems with local and national government's budgets all over Europe and the general pressure on public spending, energy efficiency provides a cost-effective and often also the most economic solution to meet environmental and fiscal targets.

It seems difficult to achieve legally binding policy targets for individual Member States. This should be easy for central government institutions, but can probably only be voluntary for the lower levels of state. A minimum, however, should be a reporting requirement on the progress in Member States along a few key indicators described by each specific policy target.

8.1.2 Creating a European structure based on national programmes

A network of co-ordinated national public sector energy efficiency information centres

In order to harmonise work within and between Member States and a network of *national public sector energy efficiency information centres* should be created. In effect, these centres would be responsible for the national programmes for public sector energy efficiency. We do not propose to establish new physical institutions or legal bodies, but it is important that the Member States ensure that information centres are given a clear mission and sufficient resources to assist public administrations.

The work of the centres should be co-ordinated by a *European Co-ordination Board for Energy Efficiency in the Public Sector*. The proposed European board helps the national information centres are the natural contact points in each Member State. This European structure shall be responsible for developing and updating *efficiency criteria and LCC methods for products and buildings* (Sections 8.4 and 8.5).

The national information centres shall also work in close co-operation with the *national buying agencies* (Section 8.6).

The PROST policy tools at a glance

It is important to note that the individual policy tools shall be seen as a package, where each tool addresses different barriers and hence creates synergy effects with the other tools. An overview of barriers addressed and synergies between policies is provided in Section 8.15. The policies and instruments discussed in this chapter can be gathered under three broad headings.

Setting policy targets (Section 8.2)

An EU Directive must define clear policy targets for Member States. These are both quantitative targets for additional energy savings in each Member State's public sector, and the task for the Member States to promote that all public administrations set up similar targets.

Creating a European structure based on national programmes (Sections 8.3 – 8.6)

National programmes in each Members State (MS) should be established and co-ordinated by *national public sector energy efficiency information centres* (Section 8.3).

These centres will most likely be existing structures, who are given a clear mission and sufficient resources to carry out their work. A *European Co-ordination Board for Energy Efficiency in the Public Sector* shall be established to co-ordinate the work on a European level, and

Structures and actions within public administrations (Sections 8.7-8.14)

Within public administrations, the function of *energy-efficient procurement information desks* must be secured (Section 8.7). In the area of buildings, *energy efficiency management units* shall be established (Section 8.8). These have a host of policy tools at their disposal: *Energy efficiency budgets* (Section 8.9), *third-party financing and energy performance contracting* (Section 8.10), *public internal performance contracting, PICO* (Section 8.11), *sharing savings* (Section 8.12), and the opportunity to *bring energy efficiency to outsourcing* (Section 8.13). Each of these instruments for public administrations are discussed under a separate heading. Finally, *linking energy efficiency and public administration reform* is discussed (Section 8.14).

Summary of important focus areas of an EU Directive on energy efficiency in the public sector

The Directive would have to recognise:

- that public administrations are relevant and responsible actors in achieving EU targets for a more sustainable and efficient economy and society
- the importance of structural changes to consider the requests of an integrated product policy
- the importance of principles that allow more sustainable consumption patterns while aiming for "Value for Money"
- that energy efficiency in the public sector is a valuable strategy in achieving EU targets such as the obligations under the Kyoto Protocol
- the need for European policy targets in terms of energy and greenhouse gases in relation to improved public sector energy efficiency

The Directive should oblige:

- the European Commission to assume responsibility for a European Co-ordination Board for Energy Efficiency in the Public Sector
- EU institutions to integrate energy efficiency considerations in their daily expenses and activities
- EU institutions to establish energy-efficient procurement information desks in order to make procurement information available to all their internal purchasers of appliances and cars
- EU institutions to establish energy efficiency management units and carefully consider all relevant instruments that help make building-related measures as energy efficient as possible
- EU institutions to create one or more PICO and/or TPF/EPC (third-party financing/energy-performance contracting) schemes for improving the energy efficiency of their building stock

The Directive should further call upon Member States to ensure that:

- they set themselves quantitative targets for additional energy savings for their central government institutions, and promote the setting of similar targets by the lower levels of state (regional, local governments)
- public administrations in their countries integrate energy efficiency considerations in their daily expenses and activities
- buying agencies in their countries provide information that helps PA:s to make informed choices on energy efficient products
- national public sector energy efficiency information centres are established and given sufficient resources to provide information, and to develop common EU-wide specifications, methods and procedures for integrating energy efficiency in public procurement and buildings management
- the national public sector energy efficiency information centres co-operate with each other
- public administrations establish energy-efficient procurement information desks in order to make procurement information available to all their internal purchasers of appliances and cars
- public administrations above a threshold energy consumption (e.g., 1 000 MTOE/year) operate energy efficiency management units (EEMU:s), and that smaller administrations get access to similar services
- EEMU:s are charged with the responsibility to make refurbished and new buildings respect minimum performance standards, and document the savings
- there are explicit requirements to introduce cost effective measures to improve energy efficiency service contracts (for public administrations that outsource responsibilities)

The Directive should further call upon Member States to promote:

- the creation of energy efficiency budgets in all levels of public administrations in their country. It should at least recommend MS central government and the EU institutions to dedicate part (%) of their normal building/maintenance budget to energy efficiency investments
- the use of third-party financing and energy performance contracting (TPF/EPC) in public administrations in order to overcome existing barriers to energy efficiency in public buildings
- the use of the public internal contracting (PICO) concept in public administrations
- shared savings schemes, which give an incentive to individuals, teams or organisational units to implement energy efficient improvements
- that public administrations link the reform of public administration with actions, incentives, and instruments to improve energy efficiency

co-ordinate the work of each national programme and the work to establish common criteria and practices across Europe. It is foreseen that the board has several *ad hoc* committees responsible for issues such as developing efficiency specifications and LCC methods for products and buildings, and to develop common minimum performance standards for public buildings. Other responsibilities are method development, standard contracts etc. The European Union must provide funding to assist the co-ordination work, while Member States must ensure that national information centres have enough funding to operate efficiently. The national centres will appoint experts for the various *ad hoc* committees.

Energy efficiency specifications and LCC methods for products

Energy efficiency must be integrated as a standard criterion in public procurement routines. Generally, in procurement of products, the initial purchase costs are

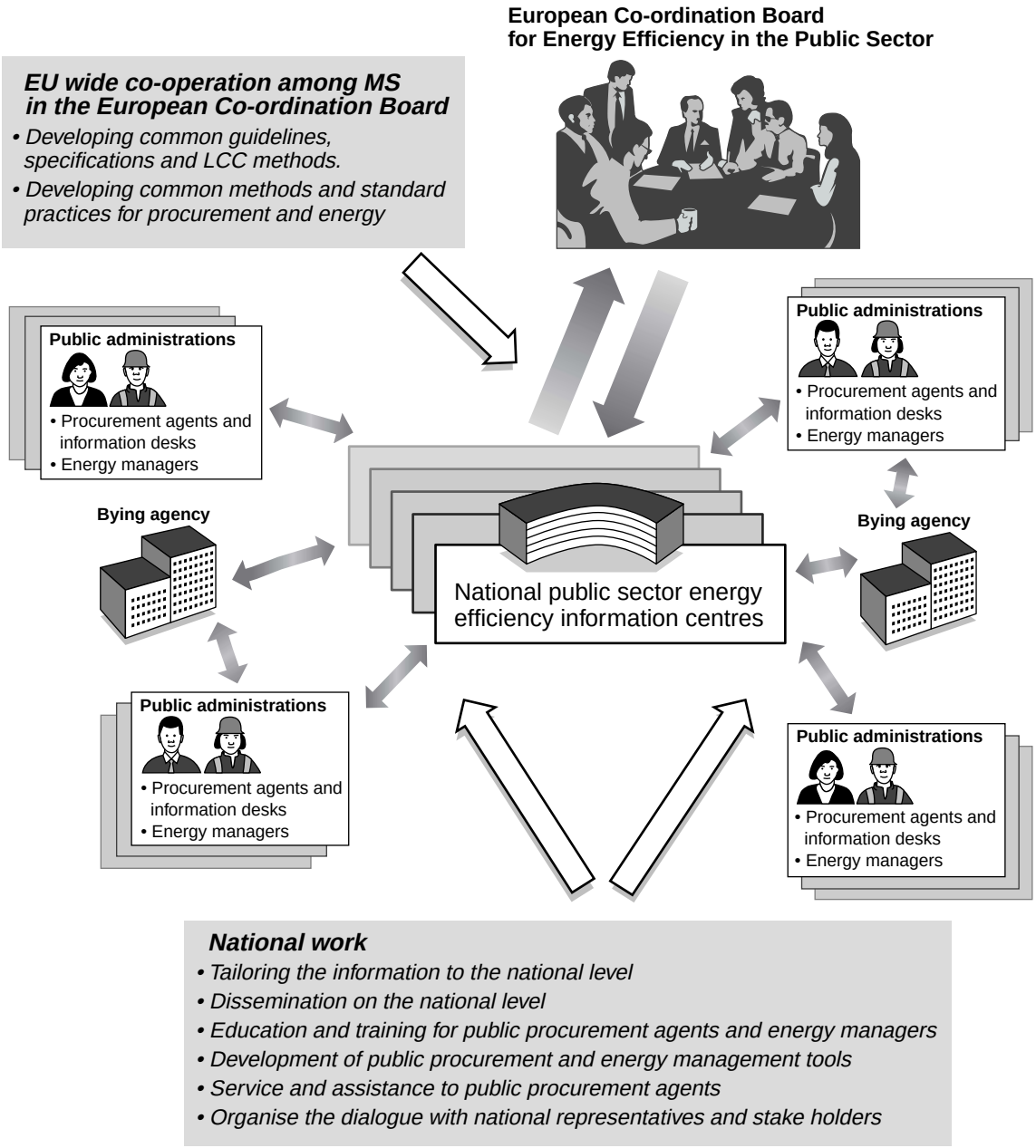


Fig 8.1: Possible co-operation structure between the European Coordination Board for Energy Efficiency in the Public Sector, national public sector energy efficiency information centres and the procurement agents and energy managers within the public administrations.

usually the most decisive factor for selecting an appliance or a product. But in order to go for the economically most advantageous tender in the long term, operating- and energy-related costs have to be considered indirectly or directly.

Energy efficiency specifications concerning energy consumption are a very practicable way for choosing products. This can be done by restricting the call for tender to those products meeting the specifications, and afterwards selecting the product with the lowest price among those that meet these specifications and the other award criteria. Only in case of a big value of a tender, this could be modified by making a life-cycle cost assessment when selecting the winner. For a lot of products, existing minimum energy efficiency standards, label schemes, etc., can give an orientation for the efficiency levels that could be used in public procurement.

Energy efficiency specifications and LCC methods for buildings
Making the building stock in the public sector energy efficient requires providing procuring officers, designers and managers with energy efficiency purchase specifications for building components. Specifications identify products and solutions, which offer minimum life-cycle costs based on typical assumptions. Specifications can make use of existing technology-specific energy labels, or otherwise non-classified performance characteristics (for example SHCG values for glazing). A clear statement by the EU as to the validity of ex-ante LCC calculations in defining tender requirements, could be important. Purchase specifications need to clearly identify the minimum acceptable performance level required of components.

To be effective in both improving the energy efficiency of the public sector building stock and leading the transformation of the wider market, component specifications and ex-ante LCC calculations of design alternatives need to be used as widely as possible by the public sector across Europe. Member States should therefore explicitly require their own central administrations to follow such specifications and LCC calculations, and promote that other public administrations in the country do the same.

Helping buying agencies provide energy-efficient products
Central buying agencies are present in all EU countries providing centralised purchasing for the public sector. The actual use of these buying agencies by single public authorities varies from country to country. Today, it is not clear to what extent buying agencies promote procurement of energy-efficient products. Buying agencies already exist within the normal procurement legislative framework. No special legislation is needed to improve their function with regard to energy-efficient-procurement, but there is a need for clear policy signals to ensure that buying agencies fulfil their potential to deliver procurement of energy-efficient products.

It may be difficult to require central buying agencies to supply products that are not requested by public administrations (the final buyer). However, an EU Directive could require central buying agencies to supply public administrations with LCC-based information of energy-efficient products, as well as lists of products based on purchase specifications. Central buying agencies present themselves as ideal candidates to develop and maintain energy-efficient procurement guidelines for products and building components. They also work closely with the public administrations, and should be used as (one of several) communication channels between PA:s and the national energy efficiency information centres.

8.1.3 Policy recommendations and tools applicable for individual PAs

Energy-efficient procurement information desks within public administrations
Continued updating and information is needed, as is the availability of tools, instruments, guidelines and training for procurement officers. The procurement information desks would ensure that the information and specifications developed nationally and EU-wide is distributed within administrations, and that purchasers have an in-house contact point for their questions. We do not envisage the creation of physical desks or offices; this policy tool rather recognises the need for allocating responsibilities and giving people or groups within public administrations a clear mission.

This policy recommendation primarily concerns the procurement of appliances and cars, while all buildings-related energy efficiency issues are subject to the proposed energy efficiency management units (below).

The EU Directive should clearly recognise that public administrations are a recognised, relevant and responsible actors in achieving EU targets for a more sustainable and efficient economy and society. MS are to ensure that PA:s are assisted in creating these desks in order to provide updated information to those involved in the procurement processes, and it would ideally require procurement officers to consider energy-efficient alternatives, as defined by the national information centres.

Energy efficiency management units (EEMU)
EEMU:s are well placed in the decisional hierarchy with the power to ensure the adoption of cost-effective energy-efficient solutions in building maintenance, refurbishment and construction. Experience throughout Europe shows that good energy management can lead to important improvements of building stock energy efficiency. Overall building stock heating energy savings of 30% or more have been achieved, similar electricity savings are potentially lying ahead.

The economic savings potential offered by efficiency improvements to building envelope and systems in public administrations consuming more than 1 000 TOE/year is typically sufficient to cover the salary costs

of an engineer working as an energy efficiency manager. Public administrations falling below this threshold are generally unable to maintain an EEMU on their own. They can work together to develop partnership EEMU:s, which can be self financed through the energy savings they realise in each public administration.

Member States should be required to ensure that public administrations above a threshold energy consumption (recommended at 1.000 TOE/year) operate EEMU:s. Public administrations falling below the threshold level should have ongoing access to similar energy efficiency management services.
EEMU:s should be charged with the responsibility to ensure that refurbished and new buildings respect minimum performance standards. EEMU:s should be required to document achieved energy savings in building stock and improvements to building stock energy efficiency.

Energy efficiency budgets
Creation of energy efficiency budgets (EEB) in a public administration will enable a stable level and continuous energy efficiency investments. It could also be applied by the EU institutions. A certain percentage of the normal building and maintenance budget is secured for the detailed energy audits, implementation and monitoring of energy efficiency measures in buildings. It provides savings of energy and public money and reduces emission of greenhouse gases.

This instrument can mainly be recommended as a voluntary one, to be introduced by each individual public administration. There should, therefore, not be any legal problems if Member States just promote the use of this instrument. They could, however, self-oblige their own central government administration to use it.

Should a Member State want to make it mandatory for all public administrations, the main aspect of implementation of this instrument would be if the EU or national legislation can determine for what purposes the local authorities and self-governments shall spend their money. The legal feasibility of a mandatory implementation of EEB would then depend on the legislation of each Member Sate. This may be seen as too deeply interfering with the competences of a particular public administration. The Directive should at least recommend MS central government and the EU institutions to dedicate a part (e.g., 20%) of their normal building/ maintenance budget to energy efficiency investments.

Whether voluntary or mandatory, there is a crucial role for a national campaign and adequate instruments to change the perception of local authorities, convince them of this instrument, and show the significant opportunities and benefits.

Third-party financing and energy-performance contracting (TPF/EPC)
The internal energy efficiency budgets described above, where they are possible to create, can improve energy efficiency in day-to-day maintenance or smaller refurbishments. Still, they may not be sufficient: often, there is a delay in public administrations of the scheduled refurbishment of windows, heating, or ventilation systems due to lack of funds. Sometimes the normal maintenance budget is too small anyway. In these cases, Third-party financing and energy performance contracting (TPF/EPC) (or Public internal performance contracting,, see below) provide possibilities to fund additional energy efficiency projects, particularly major refurbishments of buildings and installed systems.

The SAVE Directive 93/76 required the Member States to promote TPF/EPC the public sector, which would also imply the removal of any legal barriers. Yet, some of the Country studies in the PROST project still report legal impediments for public administrations to use TPF/EPC. On the other hand, the existing procurement regulations for awarding and carrying out services of public administrations (e.g., the contract procedures for construction work and for services in Germany) are not a real barrier.

An EU Directive on energy efficiency in public administrations should require the Member States to promote the use of TPF/EPC in public administrations in order to overcome existing barriers to energy efficiency in public buildings. In this way, the Directive would also support the further development of a sustainable market for energy efficiency services in general. The EU Directive should furthermore require EU institutions to analyse, in which of their buildings the TPF/EPC approach could be implemented.

Public internal performance contracting (PICO)
Public internal performance contracting (PICO) is enabling energy efficiency investments by a kind of in-house "third-party" financing or energy savings performance contracting scheme. With PICO, the role of the ESCO is assumed by a unit of the public administration itself, e.g., the technical department of a municipality. This unit acts like an ESCO, delivers the financial and technical service, and the remuneration takes place through cross-payments of budgets from the customer units' saved energy costs to the PICO unit of the same public administration.

One overall result of the analyses of the usefulness and feasibility of the PICO concept in different countries in the course of the PROST project is that legal impediments seem to play a minor role. The different modes of PICO seem to be possible from central administration level down to municipal administration level in many countries. PICO will particularly be feasible for larger public entities having energy management facilities. However, the formal and legal aspects of PICO, e.g., with regard to public debt management, budgetary codes and the acceptance of budgets by the supervising financial authorities, are not always clear. Therefore, in particular cases, adaptations of rules are required, but are assumed to be feasible.

An EU Directive on energy efficiency in public administrations should require the Member States to pro-

mote the use of the PICO concept in public administrations in their country. The Directive could indicatively name possible actions for national implementation. It should furthermore *require* the EU institutions to create one or more PICO schemes for improving the energy efficiency of their building stock.

Sharing savings
An important barrier for active implementation energy efficiency is lack of accountability. Specifically, often those groups using energy services are not directly held responsible for paying the costs, which this use implies.

Important savings can be triggered through procedures, which directly involve the users in economic savings derived from energy savings. A number of procedures have been tested in this sense, which reward individuals, teams or organisational units with a share in the energy cost savings they achieve. This provides an incentive to develop energy efficiency improvement proposals, to change energy consumption behaviour and/or to implement measures/procurement decisions, which particularly contribute to saving long-run costs, thereby reducing consumption and emissions.

In general, legal impediments seem to play a minor role. However, in particular cases, adaptations are required, e.g., with regard to regulations and wage agreements, which do not allow personalised bonuses for individuals or teams in public administrations. Furthermore, an important precondition for the implementation of the shared savings concept is the accountability of administrative units for the energy costs they cause, and/or decentralised budget responsibility.

An EU Directive on energy efficiency in public administrations should require the Member States and the EU institutions to promote the shared savings or bonus incentive schemes which give an incentive to individuals, teams or organisational units to develop energy efficient improvement proposals.

Bringing energy efficiency to outsourcing
There is a trend for the public administrations to outsource public services (for example street cleaning or street lighting services) and its own service provision (for example office space winter comfort). The incidence of energy costs on the total costs of service provision varies significantly from relatively high (for example in the case of public street lighting) to relatively low (for example in the case of canteen provision). Service contracts should balance the many requirements of service provision with the necessity to improve the energy efficiency of the building stock, building systems, and products owned or utilised by the contracting public administration.

Introducing *explicit requirements* in tenders and contracts that require cost effective measures to improve energy efficiency to be undertaken can do much to overcome a number of barriers to energy efficiency, which presently characterise these contracts. (The problems seem to be practical rather than legal.)

The requirement to introduce energy efficiency improvements should be applied to all service contracts. Thus a provider, for example, of canteen services may be required to evaluate the possibilities to use more energy-efficient cookers. Though it is likely that the provider will have to rely on outside skills to evaluate energy savings potentials, there really is no logical reason to object to the requirement. The provision of standard contractual texts will reduce the possibilities for contentious disputes between contracting and contracted parties.

A possible EU Directive shall make explicit requirements to introduce cost effective measures to improve energy efficiency into service contracts.

8.1.4 A possible European pilot action on energy efficiency in the public sector

A European pilot action on energy efficiency in the public sector should aim to cover both product purchasing and building energy management. It is also important that a number of countries are involved, so as to test the importance of national structures, traditions and legislation, as well as starting to develop the co-operation between national programmes.

It is advisable that the central partner in each country participates with an organisation that is likely to become the national public sector energy efficiency information centre. Thus, the structures and experiences built up during the pilot action would be useful in the future, once the Directive has been implemented. A number of public administrations in each country should also be involved. One may envisage specific policy actions, where certain policy instruments are being tested (such as the ongoing PICOLight project under the SAVE programme). At this stage, it is impossible to specify exactly what the pilot actions shall focus on, since this will depend on the needs and competence of the public administrations that eventually choose to participate.

In the areas of product purchasing the following areas should be explored as a minimum:

- development of common purchase specifications and LCC methods
- a learning-by-doing exercise where procurement officers practice to write call for tenders, and to evaluate these tenders, based on the purchase specifications. A limited number of products relevant for as many administrations and countries as possible should be selected
- the pilot project would identify current practices and propose a reform for the energy-efficient pro-curement *within* EU institutions
- development of common information material and simple "how-to" guides based on the experiences of the pilot action

In the areas of buildings, the following areas should be explored as a minimum:

- development of common purchase specifications and minimum performance standards, as well as LCC methods
- a learning-by-doing exercise where building managers practice to write call for tenders, and to evaluate these tenders, based on the purchase specifications and possibly ex-ante LCC calculations of possible alternative designs of building shells or installed systems. A limited number of end uses common for as many administrations as possible should be selected
- the establishment of (proto-) energy management units in administrations who lack these.
- public administrations should investigate at least one of the investment-related tools described in this chapter.
- development of common information material and simple "how-to" guides based on the experiences of the pilot action

8.2 Policy targets

Concrete policy targets on energy efficiency need to be defined for the public sector in order to capture the energy savings potential represented by the public procurement activities. This would also underline the responsibility of the public sector to act as an example for the whole society and to show how energy efficiency could be implemented in practice. This kind of exemplary function for the public sector has already been introduced in the draft Building Directive.

The relation of energy savings with CO_2 emission reductions and the Kyoto agreement is strong and therefore the policy targets should also be linked to climate change mitigation. Considering the problems with local and national government's budgets all over Europe and the general pressure on public spending, energy efficiency provides a cost-effective and often also the most economic solution to meet environmental and fiscal targets, which is also an important practical link to policy formulations.

8.2.1 Legal feasibility

It seems difficult to achieve legally binding policy targets for individual Member States. A minimum, however, should be a reporting requirement on the progress in Member States along a few key indicators described by each policy target.

8.2.2 Effectiveness in overcoming barriers to energy efficiency

Clear policy targets do not automatically make the public sector energy efficient, since they do not specify how the policies are implemented or the targets are reached. The answers to these concrete needs are provided for by the other policy tools described in this chapter. The role of the policy targets is more fundamental: Concrete policy targets provide justification and motivation for the other policy tools in order to judge how much, and at what cost, particular efforts are needed.

Thus, setting policy targets is the basis for all other instruments, which will help in implementing the targets. Setting policy targets for energy efficiency will, however, be easier if public administration reform (see Section 8.14) is already implemented or is in the course of implementation. This is because steering the administration by targets is a general feature of administration reform.

8.2.3 Treatment in a Directive on energy efficiency in public administrations

Basically, the Directive should require that the Member States themselves set quantifiable and concrete targets for improving energy efficiency and reducing CO_2 emissions in the public sector. The Directive also sets up the legal framework enabling the public sector to accomplish these targets. Possible provisions in the Directive on specific instruments for achieving the targets are discussed under the separate sections covering each instrument.

The Directive should define in a general way, how and where the public sector could save energy and in particular using public procurement as one of the central instruments to enhance energy efficiency. Existing or planned Community legislation or recommendations on energy efficiency could serve as basis for core activities included in the Directive.

When using public procurement as a policy instrument for energy efficiency, there is a clear link to public procurement legislation and directives in general. Where and when necessary, the Community legislation need to be modified in such a way that it allows using energy efficiency as a criteria for purchasing products and services. The Directive should give a clear signal on accepting this.

8.2.4 Actions for national implementation of the Directive

General framework

The national implementation should cover the whole public sector, i.e. the national, regional and local levels. For instance, this could be made mandatory for the central government institutions, but promoted as a self-obligation for the other levels of government (local, regional or in any other way separated from central government). Recognising that the range of activities in which the public administrations could influence their own energy use may be very broad and vary from country to country, the implementation should focus on energy-efficient purchasing and improvements in buildings. These are segments in which the whole public sector in Europe has similar activities (e.g. purchasing of office equipment, heating of buildings). The

products and services in which energy efficiency is required can thus be easily identified and they should also be categorised, if necessary, as part of the suggested Directive.

In order to be effective and credible, the implementation should be monitored and tracked. This should be the responsibility of the national governments. The improvements should be reported annually to the European Commission. The European Commission should in turn produce a yearly report on the progress of the recommended Directive on energy efficiency in the public sector. This report shall be based on the national reports. The Commission should make suggestions for improvements and suggest further actions whenever necessary.

Concrete targets and measures

In order to have a clear impact, the energy efficiency targets to be set for the public sector nationally should be at least as challenging as what the Council has previously stated on EU's energy efficiency targets (1%/year energy efficiency improvement over the natural trend). The scenarios on the energy efficiency potential in the public sector for electricity and heat indicate that a 1-1.5%/year energy efficiency improvement over the natural trend could be possible for the public sector to achieve, taken the size of its purchasing power and volume and the potential for energy efficiency in the public building stock. This necessitates at the same time clear directives to include energy efficiency in the public procurement regulation.

The relative efficiency improvements to be set (%/year, or, for example reduce total energy consumption by 20% over 20 years) can be turned into concrete volume targets and outcomes by the following kind of requirements, which would be jointly developed by actors from the EU and Member State level (see Section 8.6, "Energy efficiency specifications and life-cycle costs for buildings"):

- weather and climate corrected specific heat consumption in new public buildings should be under x kWh/m^2 by 2005 and y kWh/m^2 by 2010
- weather and climate corrected specific electricity consumption in new public buildings should reach a level of x kWh/m^2 by 2005 and y kWh/m^2 by 2010
- weather and climate corrected specific heat consumption of existing public buildings should be under x kWh/m^2 by 2005 and y kWh/m^2 by 2010
- weather and climate corrected specific electricity consumption of existing public buildings should reach a level of x kWh/m^2 by 2005 and y kWh/m^2 by 2010

To achieve the policy targets stated above, a set of actions is needed (described in more detail in the following sections). Important actions directly linked to support the kWh/m^2 targets are the following:

- all public buildings larger than 5 000 m^2 should be audited once in a year to verify their heat and electricity consumption and the measures taken to improve energy efficiency – this is the task of energy efficiency management units that each public administration should have, or have access to
- minimum energy efficiency requirements should be applied on equipment purchased by the public administration within 2 years from the acceptance of the Directive. These criteria will depend on the nature of equipment. Whenever applicable A-label class requirements or better should be followed (separate list, to be jointly developed by actors from the EU and Member State level – see Section 8.5, "Energy efficiency specifications and life-cycle costs for products")
- 50% of equipment purchased by the public administration by year 2005 and 90% in year 2010 should be at or above the recommended criteria set initially by PROST, and/or the collaboration of buying agencies and partners, and/or the EU Directive whenever it is issued

It is also advisable that national policy sets itself a number of targets as to the use of specific instruments for improving energy efficiency in public procurement and public buildings, e.g., the use of energy efficiency criteria, life-cycle costs, energy management schemes, etc.

The public administration is requested to integrate energy efficiency into the public procurement instructions of the administration. This includes also the EU institutions' and particularly the European Commission's own purchasing. The EU administration's example is considered very important to gain credibility for the energy efficiency scheme proposed. The public administration also need to allocate or create the necessary competencies in the form of resources and staff for the practical realisation.

The public administrations in the Member States are requested to put in place the measures required and specified in this document within 2 years from the acceptance of the suggested Directive on energy efficiency in the public sector.

8.2.5 Actions and resources needed by each PA

The follow-up of meeting the policy targets is the responsibility of municipalities, municipality consortia and government agencies. This usually correlates with the tasks of a green and energy-efficient procurement information provision and an energy efficiency management unit (cf Sections 8.8 and 8.9) The local authorities shall annually report on their progress in meeting the energy efficiency targets to the national authorities, which have been given the task of implementing the energy-efficient public procurement and building policy and shall in turn make a summary of the national progress in energy efficiency of the public sector. SAVE energy agencies should take a strong initiative to support local governments in tracking the energy efficiency improvements.

8.2.6 The role of the policy instrument in a European pilot action

The creation and realisation of energy efficiency targets could be tested in a pilot action in which, e.g., a group of municipalities in Europe would be willing to set policy targets for energy savings within their administration, implement concrete actions, monitor impacts and analyse outcomes.

The PROST study has made the necessary preparations so that the next step could be an implementation into practice. PROST has laid out specific policy targets, criteria, identified monitoring approaches, etc. to make the consequences from policy targets balanced between the different regions in EU and especially considering the Candidate Countries.

It is recommended to prepare a call of tender for the pilot action under an appropriate EC energy programme and launch the pilot implementation as soon as possible. A 3-year project is envisioned with clear target and milestones. The pilot action should present in year 1 the policy targets and necessary supportive elements, implement these from the second year onwards and present a mid-term report of experiences at the end of year 2. A revision, whenever necessary, is made in the beginning of year 3 and the full testing goes on during year 3. The pilot action will feed its experiences along the whole project life into the policy target work on the suggested Directive.

8.3 A co-ordinated network of national public sector energy efficiency information centres

Most common barriers to integrating energy performance as a criterion for procurement are lack of information and the fear of being in conflict with public procurement rules. These barriers could be overcome by organising information dissemination at European level through the establishment of a network of *national public sector energy efficiency information centres*, which will provide up-to-date information on energy efficiency in the public sector. Through the information centres, all public procurement and building construction and maintenance officers should find relevant information to enable them to make informed decisions about energy-efficient products as well as energy-efficient design and refurbishment of buildings. This information should be presented in an easily accessible format tailored to the needs of the public sector, in order to make it useful even to the smallest of administrations with limited resources for further processing of the information. The proposal does not aim at the creation of new structures (most Member States already have structures dealing with energy efficiency and/or green procurement), but at the development of a *specific and co-ordinated mission*.

The second very important role of the energy efficiency information centres is to act as national resources and contact points in the pan-European work to establish common criteria and methodologies and to monitor the work. The centres shall appoint national representatives to *European Coordination Board for Energy Efficiency in the Public Sector*.

The information centres should be established in each Member State. The function should also be ensured for European Union institutions either through the establishment of a dedicated centre, or by appointing national centres to serve that mission. The activities of the centres would target products, building components, building design and refurbishment, and information on all other instruments proposed in this study. They would:

- disseminate information on energy performance requirements for procured products and services, elaborated collectively at European level (cf. Policy sections 8.5 and 8.6 for products and buildings, and 8.14 for outsourcing services; the centres could also participate or be responsible for the elaboration of the requirements).
- disseminate information on guidelines and methods, and provide assisting services for green and energy-efficient procurement and building energy (efficiency) management, elaborated at national or if useful collectively at European level.
- provide for legal advice concerning the possibilities to integrate energy efficiency and environment in public call for tenders ("info" telephone line, ready-to-use call for tenders, legal advice on the specific wording of call for tenders, etc.).
- be responsible for organising the dissemination of this information (on-line advice, paper catalogue, web based information, etc.) in an efficient way.
- gather information on current methods and practices, evaluate these methods, and provide feedback both to the European Board for Public Sector Energy Efficiency, as well as to the national stakeholders.
- serve as the contact point in the European coordination board.

In this way, a coherent message could be sent across the European Union to industrial operators willing to have their products comply with homogeneous requirements and guidelines.

8.3.1 Legal feasibility

No legal barriers are foreseen for this instrument.

8.3.2 Effectiveness in overcoming barriers to energy efficiency

The proposed information centres will be cost effective, provided the information is of high quality and its dissemination is well organised (multiplication of structures and documents are avoided if implemented correctly). The centres address several barriers to the implementation of energy efficiency in the public sector:

- *Lack of information:* the first aim of the centres is to provide information about the financial and environmental gains, the potential savings and ways to achieve them.
- *Complexity of public procurement rules and legal uncertainty:* the centres will advise procurement officers and propose "ready to use" tenders in which the wording asking for energy-efficient products would have been checked by lawyers.
- *Too much and unclear information:* The centres will streamline information by centralising the first source of information, making products' selection criteria more uniform, and facilitate a network.
- *Insufficient priority and lack of motivation:* The information disseminated by the centres will highlight the importance of energy-efficient procurement and potential savings, thus possibly influencing the attitude of procurement officers.
- *Lack of investment culture:* if at the same time "global budgeting" is promoted, any information showing for example potential savings in Euros, or how to implement third party financing operations, will reinforce the investment culture in a given administration.
- *Lack of personnel resources and time:* public administrations dedicate time and resources to procurement anyway. By providing these administrations with free of charge high quality and pragmatic information, the Desks will allow these administrations to achieve positive results without investing more time or resources.

8.3.3 Synergies with other policy tools

The centres will directly and indirectly support most of the other policy tools proposed – supporting several of them could actually be stated explicitly in their missions, and it could even be the responsibility of the centres to develop some of the other policy instruments.

8.3.4 Treatment in a Directive on energy efficiency in public administrations

The following are key messages, which could be included in a Directive on energy efficiency in public administration:

- Member States are to ensure that public administrations integrate energy efficiency in their daily expenses and activities.
- Member States are to organise information and feedback gathering at national level, through national public sector energy efficiency information centres, but the structure and name are chosen according to the subsidiarity principle; they might be existing or newly created structures. For example, the activities of the centres can be developed within the body(ies) responsible for public procurement so that legal advice given to procurement agents includes – upstream – energy efficiency requirements, within public buying agencies, within energy or environment agencies, or at national, regional or local levels.
- The EC is to provide support to the centres, organise the co-ordination of their work (common definition of requirements and guidelines, and their regular update) through the proposed European co-ordination board so that a consistent message is provided in the various Member States to procurement officers and to the industry wishing to develop products and services complying with these specifications.
- The Directive applies to EU offices and institutions, which should benefit from the information provided by a dedicated EU centre (or through national centres who have been appointed to serve EU institutions).

8.3.5 Actions for national implementation of the Directive

At National level, the following action seems necessary:

- Member States should designate (or create) one national centre in charge of organising the information dissemination in their country (see below). The first tasks will be to participate in the European co-ordination activities and to establish a communication plan, which will be implemented when the information content is defined. The centre should ensure that national representatives participate in the activities co-ordinated by the proposed *European Co-ordination Board for Energy Efficiency in the Public Sector,* to *develop* common information that will then be disseminated in the Member States.
- The national centres should have sufficient financial means and human resources to participate in co-ordinated activities at European level and disseminate the resulting information nationwide to as many procurement officers, building construction and maintenance officers in all public administrations and in central buying agencies as possible. The necessary means and human resources may already exist in national structures in charge of green or energy-efficient public procurement, but may need to be enhanced to perform the full range of services proposed here. A minimum staff size is considered 5-10 for a smaller EU Member State and 10-20 for a larger country. Resources for dissemination (websites, brochures, workshops, courses etc.) should be in the order of several million Euros per country and year.
- The national centres choose the most efficient way to disseminate the information in their country, choosing the best operators to relay the information (regional agencies, existing networks, central buying agencies, environmental directions and energy-efficient procurement information desks and energy (efficiency) management units in large public administrations, etc.). The information support should be web-based but a paper based support is seen as a necessary complement. The information should in most cases be translated in national languages (either a

translation of the European information, or the establishment of a full national version).
- The national centres also provide tailored information through an information telephone line and/or a dedicated e-mail address. Public administrations may ask questions on a specific problems regarding energy performance levels or efficient products.
- Furthermore, the national centres promote the creation of structures within PA:s to ensure that energy-efficient procurement information is provided. They should also promote the creation of energy efficiency management units (EEMU:s) in individual public administrations or groups of smaller public administrations.
- The national centres are also in charge of designing and disseminating information on financing instruments, such as internal energy efficiency funds, performance contracting, and PICO, as well as all other policy instruments proposed in this report – based on experience gathered at European level.
- The national centres organise the dialogue with national representatives of the industry (information and consultation activities, programmes to encourage industry to include energy performances in their marketing activities, etc).

8.3.6 Actions and resources needed by each PA

Since this policy tool concerns the establishment of a structure to support public administrations, no specific action and resource would be needed for the individual PA:s, although support to PA:s could be channelled through the national information centres.

8.3.7 The role of the policy tool in a European pilot action

1) *One Pilot project directed at the EU offices:* limited to equipment procurement (in order to be pragmatic, building investments would come separately, possibly in a second phase), the pilot project would identify current practices and propose a reform for the energy-efficient procurement within EU institutions.

A team of consultants would provide direct advice to the EU institutions:

- interviews of procurement agents to assess how procurement presently works within the EU (various EC DG:s, EU Parliament, etc.)
- work with EC's legal advisors to assess where improvements can be made
- proposal for improvements regarding the organisation of energy-efficient procurement (not on technical specifications at this stage)

2) *One pilot project directed at Member States:* Some countries would get together and start implementing both the co-ordinated definition of requirements (cf. policy instruments on efficiency specifications and LCC for products and buildings) and the dissemination of information (including legal advice). In order to attract national administration to participate, an "A-Club" configuration could be proposed, underlining the possibility to become a national public sector energy efficiency information centre when they are set up, or to influence the definition of co-ordinated European technical requirements.

8.4 Energy efficiency specifications and life-cycle cost methods for products

Generally in procurement of products, the initial purchase costs are usually the most decisive factor for selecting an appliance or a product. But in order to select the economically most advantageous tender in the long-term, operating- and energy-related costs have to be considered indirectly or directly.

Two principle ways are possible:

- Energy efficiency specifications concerning energy consumption are a very practical way for choosing products. This can be done by restricting the call for tender to those products meeting the specifications, and afterwards selecting the product with the lowest price among those that meet these specifications and the other award criteria. Only in case of a big value of a tender, this should be modified by making a life-cycle cost assessment when selecting the winner among those products that meet the criteria, but may still differ considerably in energy efficiency. For a lot of product groups, there exist minimum energy efficiency standards, label schemes, etc. which can give an orientation for the efficiency levels that could be used in public procurement.
- Life-cycle costs (LCC) calculations is a concept for evaluating all relevant costs over the lifetime of appliances. The life-cycle cost concept takes into account first costs (purchase price, installation costs) and future costs (energy costs, operating costs, maintenance costs and/or disposal costs) over the life of the product. Hence, life-cycle costs reflect the total consumer expenses over the life of an appliance and capture the trade-off between purchase price and upcoming operating expenses.

The analysis in Chapter 9 shows that, for most products, energy efficiency specifications in the call for tender in combination with low purchase costs of those products meeting the specifications, can lead to an energy efficient purchase decision. (This is valid in particular for products where the running costs related to the energy consumption over the life of the product are lower than the initial purchase costs.) In this case, a life-cycle cost approach is not useful. A comprehensive life-cycle cost calculation is applicable, when the running costs over the life of a product exceed the initial purchase costs significantly.

In particular in the area of appliances and equipment, the markets become more and more interna-

tional and homogenous within the EU Member States. Specific national peculiarities will become increasingly less relevant in the future. Thus, an EU-wide approach has to be aspired in order to implement both approaches (energy efficiency specifications and LCC) into public purchasing routines on a broad basis.

- Energy efficiency must be integrated as a standard criterion in public procurement routines.
- Energy efficiency specifications will only be useful, if the criteria are "market relevant", which means that they indeed classify the most energy-efficient appliances. The criteria must therefore be updated regularly in order to enable energy-efficient public procurement on basis of specifications. The update has to be done on the European level and should be co-ordinated with other EU-policy instruments in the field of energy-efficient appliances, such as the energy label.
- For a life-cycle cost approach, it is necessary to develop methodologies and tools showing where this approach is applicable and how life-cycle costs can be calculated. These tools have to be practical but simple enough to lead to sensible results. One must keep in mind that life-cycle costs are always based on assumptions; and the longer the life of an appliance, the more uncertain are the results of the LCC calculation. At the other hand, the fact that a LCC deals with assumptions is no reason not to use them, but an EU-wide, co-ordinated approach is necessary to gain widespread acceptance for the assumptions used.

8.4.1 Legal feasibility

From the legal point of view there should be no problem to consider energy efficiency criteria[1] and/or life cycle costs in public procurement routines in order to reach the economically most advantageous tender. But in this context it is important to include clearly – already in the call for tender – the relevant specifications, or the information or assumptions for the life-cycle costs calculation and their importance in evaluating the tenders.

The whole procedure dealing with energy efficiency specifications and/or life cycle costs must be transparent and obvious from the very beginning *(ex ante)*. This also covers how tenders are evaluated. In principle, it is not possible to change the tendering and evaluation procedure after the tenders have been submitted *(ex post)*.

Nevertheless, a lot of public procurement agents are not sure how to correctly introduce energy efficiency requirements in their purchasing routines. This is seen as one of the most important barriers to energy-efficient public procurement.

8.4.2 Effectiveness in overcoming barriers to energy efficiency

In particular in the area of appliances and products the following barriers can be identified:

- energy efficiency has no or low priority. Other items and features (technical features, low purchase price) are considered much more relevant than energy efficiency
- energy-efficient appliances are considered to be significantly more expensive than less energy-efficient ones
- appliances and "non-installed" products are not seen as "long term" investments. Public purchasing routines will thus focus on "short term issues"
- it is not realised that energy efficient appliances can save money in a long-term perspective
- public procurement officers are not sure how to introduce energy efficiency issues in the purchase routines technically and legally
- to consider energy efficiency issues in public procurement is seen to be complicated and time consuming

In order to overcome at least some of these barriers, energy efficiency must become a relevant subject in the day-to-day public procurement routines. On the one hand this means that suitable information strategies for public procurement agents, focusing on the benefits of energy-efficient public procurement and developing tools must be provided. On the other hand it is absolutely necessary to "embody" the subject of energy efficiency in public procurement at a European level. In this context, an EU Directive should provide the main framework and backbone.

To summarise: this policy tool addresses the following barriers: Lack of information, complexity of public procurement, and thus indirectly, lack of priority.

8.4.3 Synergies with other EU policy instruments

Synergies with appliance energy efficiency policies

Several policy instruments exist in EU with the aim to transform the markets to more energy efficient products, in particular in the area of appliances. Most of these instruments are based on the provision of standardised product information corresponding to energy efficiency, in order to support users/consumers to make a more rational purchase decision (EU label scheme for household appliances, car label scheme, etc.).

Moreover there are minimum energy performance standards for certain appliances, in order to get rid of the worst appliances on the markets.

Other policy instruments are based on voluntary approaches (e.g., negotiated agreements for TV:s and VCR:s, and the "Energy Star" scheme for office equip-

[1] **It is not possible just to require that an appliance has a voluntary label (e.g. Energy Star) in the call for tender, but it is possible to require appliances fulfilling the corresponding criteria.**

ment). In this kind of policy instruments, manufacturers agree that their appliances, or at least some of their appliances, fulfil a certain energy efficiency criterion. Negotiated agreements intend to get rid of the "bad" ones; quality disclosure systems/labels intend to promote the most energy-efficient appliances available on the market.

All EU policy instruments are market transformation instruments intending to make the market more energy-efficient. These policies should be used directly in public procurement procedures. But there is one important problem: The update of the EU-policy instruments is a very time consuming process (e.g. it takes some years to update the label schemes) and for some appliance groups the market development is faster.

Public procurement can go for the top range appliances on the market from an energy-efficiency point of view. This does not mean automatically that these high level appliances have to be more expensive than other "normal" products. So the public sector can use this important market position to push the *whole* market towards more energy efficiency and to bring the prices down. Energy-efficient public procurement is thus in a position to influence the EU-policies towards higher standards and to accelerate possibly the update procedures.

To summarise, existing EU-policy instruments and energy-efficient public procurement must fit and work together. On the one hand, these instruments have to be used in the public procurement routines, on the other hand energy-efficient public procurement should support the existing EU-policy instrument and deliver inputs to develop them further. In particular, the life-cycle cost issue could be a relevant topic for the future, at least for some appliance groups.

Synergies with public procurement energy efficiency policies

This instrument will mutually benefit the following of the tools proposed in this study:

- policy targets for energy efficiency in public administrations
- national public sector energy efficiency information centres
- continuous provision of comprehensive information and services on energy efficiency to public administrations
- efficiency specifications and LCC for buildings
- making buying agencies more energy-efficient
- energy management units
- bringing energy efficiency to Outsourcing

8.4.4 Treatment in a Directive on energy efficiency in public administrations

The market for stand-alone appliances and products is more or less homogeneous within the EU Member States. Several policy instruments concerning market transformation exist at the EU level. Moreover, legislation concerning public procurement on the EU level constitutes the framework for public purchasing in Europe. For that reason, an EU-wide co-ordinated approach (EU Directive) is appropriate and necessary, in order to implement the energy efficiency possibilities in public procurement procedures.

The following points should be addressed in the Directive:

- creation of a European Board for Public Sector Energy Efficiency, which coordinates the activities of the working group of experts from the national public sector energy-efficient procurement programmes.
- Member States should be required to use minimum efficiency specifications and/or life-cycle costs in their own public procurement procedures, and to promote the use of these methods in lower level public administrations.
- it should be indicated when it is applicable to use efficiency specifications and/ or a life-cycle cost approach.
- Member States should be required to set up a national public sector energy efficiency information centres, which act as contact point to dispersed procurement agents throughout the country and to the European Board for Public Sector Energy Efficiency.
- moreover, the process and procedure for setting up and updating the efficiency specifications at the European levels should be outlined.

8.4.5 Actions for implementation of a Directive

European level

At the European level a European Co-ordination Board for Energy Efficiency in the Public Sector should be created (see 8.2), where the European Commission and the Member States (through the national public sector energy efficiency information centres) are represented.

In relation to product purchasing, the Board and the working group(s) of national experts should be responsible for the following tasks:

- co-ordination of the activities concerning energy-efficient public procurement on the European level
- co-ordination with other EU policy instruments, which are relevant to energy efficient public procurement, in order to combine the different policies in an efficient way
- developing guidelines for what kind of products energy efficiency specifications and/or life-cycle costs are applicable
- developing, monitoring and updating the relevant energy efficiency specifications for different appliances; this should be done in close co-operation with the Member States and in line with the relevant EU-policy instruments
- setting up the principles for a life-cycle cost approach for the relevant appliances
- creating public procurement guidelines for the various appliances. These guidelines should give infor-

mation how energy-efficient public procurement can be done for appliances/equipment in reality
- preparation of model tenders for energy efficient public procurement for the different kind of appliances/products. (These could be used by public procurement agents directly for their daily work.)
- communication to Member States and public procurement agencies (cf. "A co-ordinated network of national public sector energy efficiency information centres", Section 8.3)
- dissemination of information, in co-operation with the national energy-efficient procurement centres
- a web-page in combination with a comprehensive database should be set up, where the relevant information should be made available to all procurement officers (preferably through national interfaces). The database should include the required and recommended specifications, the appliances lists which correspond to these criteria, guidelines, model tenders, etc.

National level
In parallel, the Member States have to set up a "National public sector energy efficiency information centre" (see 8.3), which is on the one hand responsible for tailoring the activities and information to the national markets and on the other hand a place where public procurement agents can go when they need assistance. The tasks of the national information centre should be:

- participation in the European Co-ordination Board's working groups and contribution to the European-wide activities
- contributing in developing energy efficiency specifications at the European level
- dissemination on the national level (eg. operation of a national public procurement web page and database, etc.) and setting up an communication plan (cf. policy instrument "A co-ordinated network of national public sector energy efficiency information centres", Section 8.3)
- education of public procurement agents
- development of public procurement tools (life cycle costs calculators, lists of recommended criteria and appliances that fulfil these criteria, etc.) for the national level
- service and assistance to public procurement agents (again in the information and services programme)
- organise the dialogue with national representatives of the industry and relevant national stake holders

8.4.6 The possible role of the policy tool in a European pilot action

A European pilot action in the appliances area could contain:

- development of guidelines for energy-efficient public procurement of appliances
- testing the guidelines in real public procurement procedures
- developments of model tenders for different appliance groups

The pilot action should first of all show that energy-efficient public procurement could be done. Furthermore, it should give inputs for a European action.

8.5 Energy efficiency specifications and life-cycle cost methods for buildings

Improving the energy efficiency of the building stock in public administrations requires that procuring officers, designers and managers are provided with component purchase specifications, building performance standards and life-cycle cost calculation methods and tools. These tools are described further in Chapter 11.

Component purchase specifications
Based on building component energy performance. Specifications provide guidance, based on typical life-cycle cost (LCC) calculations[2] of products and solutions. Yhey consider either:

- technologically comparable solutions; for example, to define/assist the choice between inefficient and efficient types of light sources, ballasts and boilers
- technologically dissimilar solutions; for example, to define/assist in the choice between air conditioning units on one hand and the use of low e-glazing on the other

Building performance standards
Building performance standards specify for example, though not necessarily, energy use per useful floor space (kWh/m²/year). Performance standards identify the minimum LCC of buildings based on built examples. They thus identify the goal of energy-efficient building design.

Two levels of building performance standards can be defined:

- minimum performance – the maximum *allowed* energy consumption for public sector new build or renovated building stock
- target performance – targeting even lower energy consumption levels, for mainly voluntary adhesion

[2] **The life-cycle cost (LCC) of a piece equipment/a system, is the sum of the initial purchase cost (of the equipment/system) and the relative lifetime running costs (for example, energy costs, maintenance) incurred in use. Future running costs are discounted to present day values using suitable discount rates.**

Purchase Specifications help delineate the *process* of efficient building design.
Performance Standards define the *goal* of efficient building design.
Purchase Specifications and Performance Standards are complementary tools in a single integral solution.

Life-cycle cost calculation methods and tools
Component purchase specifications and building performance standards are deemed to lead to LCC cost-effective solutions, based on case studies and LCC calculations considering *typical* conditions of use (for example typical working hours, energy costs, product purchase costs, maintenance costs, product lifetime, etc., across the public sector).

By providing life-cycle cost calculation methods, building designers and management staff are assisted in determining the preferred choice of solutions based on the *specific* economic and operating conditions enjoyed by the *single* public administration. This allows building designers and management staff to:

- identify and justify alternative solutions to those identified by approved component specifications (which consider typical public sector economic and working conditions as explained above) if deemed necessary
- identify the combination of solutions (whether indicated by component specifications or otherwise), which lead to minimum LCC for a building; while meeting the minimum performance standards

8.5.1 Legal feasibility

There are two issues to consider:

- the relation of component purchase specifications to EU procurement law
- the status of component purchase specifications within the public sector; strict requirements or simple recommendations

Component purchase specifications are most efficacious if used in the preparation and definition of a call for tender. Contracting agents can award contracts based on the cheapest offer meeting the declared requirements.

Specifications are based on ex-ante LCC calculations. By identifying minimum LCC solutions in a simple way, specifications should thus allow contracts to be awarded on the criteria "most economic advantageous offer", based on the (ex-ante) quantified reduction in running costs.

Only in the case that a tender proposes solutions with a significantly improved efficiency over those reported in component specifications, will it prove necessary to undertake LCC calculations in the selection phase.

However, specifications can only be developed by considering the cost effectiveness for some restricted set of hypothetical conditions of use. Most often conditions of use are determined principally by operating hours and energy costs, though for some building components, issues such as geographical location are important. Though in developing specifications, cost effectiveness may be determined in respect of a number (even large) of operating conditions (considering variations in energy costs, operating hours, climate, etc.), it is obvious that not all situations can be covered. Indeed if purchase specifications are to be useful to purchase officers, specifications must attempt to limit articulation in order to be easily understood.

Consequently the potential may therefore exist for suppliers to contend purchase decisions based on specifications, by maintaining that the conditions operated by specific public administrations do not equate with the general or typical conditions on which the specifications are based.

The public sector may refrain from using component specifications given the possibility of contentious disputes. *A clear statement by the EU as to the validity of ex-ante LCC calculations in defining tender requirements*, will be important in ensuring that specifications are taken up by the public sector.

To be effective in both improving the energy efficiency of the public sector building stock and leading the transformation of the wider market towards the supply of energy-efficient products and solutions, component specifications need to be used as widely as possible by the public sector across Europe.

Within central governments this should be readily feasible. For example in 1999, the UK Treasury placed an obligation on all central government departments and agencies to purchase products based on overall "Value for Money" (i.e. on the criteria of "the economically most advantageous offer"). Logically it is a small step to pass from "economic most advantageous offer" to requiring the explicit use of "approved" component specifications (which themselves are based on minimum LCC). It is reasonable to suppose that a similar institutional obligation could be introduced by central governments throughout Europe, without recourse to legislation, (though the EU could facilitate the process by inviting national governments to make the step).

Introducing a strict obligation on all public administrations through legislation could well prove problematic since it could infringe on the autonomy, which many public administrations enjoy. However, national governments could certainly act as catalysts and invite the wider public sector to introduce the same obligations.

In a similar fashion, minimum performance standards for refurbished and new buildings can only be efficacious if there is widespread adhesion across the public sector. The implementation of a global obligation could possibly be facilitated by introducing public sector specific minimum performance standards within the context of national building codes. The draft EU Building Directive, "on the energy performance of buildings" was due to be introduced by the end of

2002. This Directive is concurrent with, or itself instigating a period of renewal of building codes across Member States, to be completed at the latest by 2006. By suitable co-ordination at national level, public sector specific minimum performance standards could be made integral to national building codes.

The issue of introducing public specific minimum performance standards is considered in detail in Chapter 11.

8.5.2 Effectiveness in overcoming barriers to energy efficiency

Briefly, the public sector consistently reports lack of priority and lack of knowledge of energy-efficient solutions and the procurement legislation.

Minimum Performance Standards, provide clearly defined overall efficiency objectives for designers, architects and managers.

Purchase Specifications provide purchasing officers and technicians with means to:

- clearly and simply identify efficient components
- respect procurement legislation when making efficient choices (In part this will depend on the nature of the specifications themselves. For example, if instigated as "requirements", this would suppose implicit compliance with legislation due to some a priori "validation" by the agency charged for their development and publication.)

In short, approved performance standards, purchase specifications and LCC calculation methods and tools, address the lack of information, unclear information, legal uncertainty, and complexity of public procurement.

8.5.3 Synergies with other policy tools

The policy tool "A co-ordinated network of national public sector energy efficiency information centres" (Section 8.3) considers how to ensure access to purchase specifications and performance standards throughout the public sector.

The policy tool "Energy efficiency specifications and LCC methods for products " (8.4) looks at the development of purchase specifications and LCC methods for products. Though product and building component specifications differ in content, they should be presented within a coherent single information package.

Purchase specifications, building performance standards and LCC calculation methods and tools also:

- assist the work of energy efficiency management units
- assist the implementation of TPF/energy performance contracting, and public internal performance contracting (PICO)
- help bring energy efficiency to outsourcing

8.5.4 Treatment in a Directive on energy efficiency in public administrations

An EU Directive should require the Member States :

- To develop a set of energy-efficient *purchase specifications* for the most common components installed in buildings. The indicative list of components is developed in Chapter 11. Specifications should be maintained and updated in time, considering for example changes in energy costs, the diffusion of efficient components on the market and the introduction of new technologies.
- To develop and maintain a set of *minimum and target performance standards* for refurbished and new buildings. Chapter 11 of this report details the recommended level at which minimum performance standards should be set.
- To develop and maintain easy to use *LCC calculation methods and tools.*
- To oblige their central government departments and agencies, and to encourage* other national public administrations to introduce similar obligations to purchase building components in line with the specifications.
- To oblige their central government departments and agencies, and to encourage* other national public administrations to introduce similar obligations to respect the *minimum performance standards* when constructing new buildings.
- To oblige their central government departments and agencies, and to encourage* other national public administrations to introduce similar obligations to respect, within the limits of economic feasibility, the *minimum performance standards* when restructuring existing buildings. If this cannot be achieved, public administrations should be required to document the relative technical and economic impediments.

(Economic feasibility is defined as the recovery during the technical lifetime, as defined by common national or EU standards, of the extra cost of efficient solutions with respect to the standard solution, through the annual savings in energy costs. The indicative list of efficient solutions is given in Chapter 11.)

- To oblige their central government departments and agencies, and to encourage* other national public administrations to introduce similar obligations to use LCC **calculation methods and tools** when planning and selecting offers for larger building works, above a certain threshold value (e.g., 250 000 Euro).

*** It is probably not possible that non central government administrations and institutions are obliged through legislation to respect performance standards, purchase specifications and complete LCC calculations, see section "Legal feasibility" above. Therefore, the other public administrations should at least be enoucraged by the national governments to do so.**

The Directive should furthermore require that:

- public buildings built or restructured using EU structural funds respect *target performance standards* and/or are designed using *LCC calculation methods and tools.*

8.5.5 Actions for national implementation of the Directive

Development of and access to component specification, performance standards and LCC calculation methods and tools.

Building component specifications, though articulated to conditions of use, should be common across Member States. Development of component specifications will benefit if the work of national bodies charged with their developing is co-ordinated, rather than allowing multiple parallel development by each Member State.

Member States can develop national-specific minimum and target performance standards for public sector stock, and nationally harmonised LCC calculation methods and tools. However, performance standards should lead to comparable climate corrected energy performance of public sector building stock, which supposes a minimum of co-ordination of the national bodies involved in development. (Responsibility: national energy experts).

Thus, for purchase specifications and minimum performance standards, EU should seek to co-ordinate the activities of national energy experts, energy and procurement agencies already engaged in their definition, or those otherwise interested in working in this area, in order to develop common requirements across Europe.

The reader is referred to Section 8.4 "Energy efficiency specifications and LCC methods for products", which considers in detail the responsibilities and activities of a co-ordinated programme for developing purchase specifications for products. Purchase specifications and minimum performance standards for buildings could be defined and maintained following the same, or by developing a similar process.

Access to the purchase specifications and performance standards needs to be capillary, reaching all those involved in the procurement and design process, above all those on whom rests the obligation (whether institutional or legislative) to use the specifications and to achieve minimum performance standards. This process of dissemination is considered in more detail under Section 8.3, "A co-ordinated network of national public sector energy efficiency information centres".

Elimination of legal barriers

It is necessary to ensure compatibility of component specifications with existing regulations. For example:

- specifications identify cost effective solutions based on a set of general use conditions. Are purchase officers justified in following specifications, or is it necessary to prove that the tender respects the criteria "economically most advantageous offer" based on the specific conditions operated by the contracting public administration ?
- clarify the nature of specifications; guidelines or requirements?
- under what conditions can requirements be ignored?

Accompanying activities

- inform potential users of the specifications and their obligations, whether legal or institutional
- inform suppliers about component specifications. In order for the public sector to transform the wider market, suppliers need to be provided with structured information, which provides a clear framework in which to develop future (energy-efficient) services to offer to the public sector
- provide professionals in the public sector with additional tools (other than component specifications) which identify the routes by which to meet minimum and target performance standard levels:
  - comprehensive descriptions of efficient technologies and systems
  - energy-efficient product databases
  - LCC calculation methods and tools
  - promote the use of simulation software (for example Energy Plus, DOEII or Transys), and develop libraries of base case buildings, which respect the minimum, recommended and target values

Section 8.3, "A co-ordinated network of national public sector energy efficiency information centres", considers these issues in more detail.

8.5.6 Actions and resources needed by each PA

Each PA needs to adopt component specifications, building performance standards and LCC calculation methods and tools as mandatory for their own planning and purchases in building construction, refurbishment and maintenance.

Component specifications should be developed such that they provide direct instruction as to the choice of efficient building component with no or only minimal elaboration by the purchasing officer. Staff should therefore not require specific training in their use.

However, a minimum of explanation of the rationale for their introduction (namely lower environmental impact, lower costs) and the criteria on which specifications are based (average use conditions) should reduce resistance to their introduction and provide for greater success than punitive control.

Achieving **minimum and target performance standards** will require architects, engineers and staff involved in design to refresh concepts, update existing, and possibly learn new skills (for example the use of building thermodynamic simulation software), requiring suitable training and consequential resources.

The new criteria may be seen by some professionals

as restricting creative freedom. Again suitable training explanation rational will assist passage to their introduction.

8.5.7 The role of the policy instrument in a European pilot action

Actions

1. Introduction of component specifications, building performance standards and LCC calculation methods and tools as mandatory in planning and purchasing in a number of public administrations cross Europe. This is possibly linked to the creation/expansion of energy efficiency management units (Section 8.8).

2. Refurbishment of a selected number of buildings across Europe to respect minimum and target performance standards.

Description of Action 2

Restructuring existing buildings to respect the minimum and target value performance standards will involve important changes in the design culture of the public sector, in some areas even radical. Architects, engineers and generally personnel involved in the design process will need to refresh concepts, update existing and possibly learn new skills (for example the use of building thermodynamic simulation software).

Thus, in order begin to facilitate the rapid adoption of performance standards it will be necessary, (if not essential), to realise a number of refurbishment projects in line with the new standards. The pilot projects will:

- provide a database of positive examples to show the feasibility of the achieving the standards
- start developing the required skills base both within the public sector and the amongst private suppliers

Resources and target groups

Funds to cover targeted expert assistance to the public institutions involved in the action, not the cost of purchase of building components or systems (efficient solutions will be cost effective). The activity is targeted towards architects, engineers and managers involved in building design.

8.6 Helping buying agencies supply energy efficient products

Central buying agencies are present in all EU countries. The actual use of the central buying agencies by single public administrations varies from country to country, and it is not clear to what extent buying agencies supply energy-efficient products. Central buying agencies have a double role - they act as purchasers, but are also suppliers in the sense that they provide agreements and (sometimes) supply public administrations with products. Their income often comes from a small percentage of the contract value, and they must adapt to the preferences of their customers.

The definition of the notion "buying agency" varies among countries and users, and this complicates the picture. In this study, we have defined the term as follows: An agency that purchases products on the account of another agency (thus supplying the second agency with products). This covers central buying agencies with purchasing functions as well as today's typical central buying agency, which does not purchase products directly for public administrations, but co-ordinates and supervises public procurement and provides framework agreements. (Framework agreements can be used by public agencies for ordering products without the hassle of initiating a tendering process.)

The decentralisation of public procurement to single public administrations has made it difficult to assess the importance of buying agencies. It has thus not been possible to quantify to which extent public administrations apply co-operative procurement locally (for example co-operation between municipalities) or procure through buying agencies.

Furthermore, framework agreements are not applicable to all products. For example, in Sweden framework agreements cover as little as 10% of the procured products in government authorities, and it is not known to what extent they apply them. Some examples also indicate that there are few possibilities for buying agencies to influence the agreements to adapt them to more energy-efficient procurement.

However, the example of Statskontoret, the central buying agency for IT-related products in Sweden, shows that buying agencies may be an important policy maker of energy-efficient procurement. Statskontoret has a long tradition of energy-efficient procurement, such as the formulation of energy-efficient procurement criteria and the carrying out of LCC analyses. This indicates that there is a case for using central buying agencies to initiate energy-efficient procurement and a clear need for directives to generate further initiatives in Europe as a whole.

On one hand, with increasing autonomy of the different levels of the public sector, the possibility increases to purchase through alternative channels. On the other hand, increasing access to the Internet and the complexity of procurement practices is increasing the interest of purchasing through central buying agencies. Thus, their role seems guaranteed in the future and they obviously represent an important actor in any attempt to achieve procurement of energy-efficient products and building components.

8.6.1 Legal feasibility

Buying agencies already exist within the normal procurement legislative framework. No special legislation is needed to improve their function with regard to energy-efficient-procurement. However, it may not be legally feasible to require buying agencies to supply energy-efficient products.

8.6.2 Effectiveness in overcoming barriers to energy efficiency

Lack of information: Public administrations see lack of information and the complexity of public procurement procedures as the main barriers for energy-efficient procurement through public buying agencies. Being professional organisations in public procurement with considerable experience and knowledge, central buying agencies are important tools to overcome these barriers. They may be important actors in simplifying the procurement procedures and developing energy efficiency specialist competence for public procurement.

Insufficient priority for energy efficiency: Another barrier is insufficient priority for energy efficiency, something that applies to both public administrations and central buying agencies. A Directive that requires buying agencies to at least provide information on energy efficiency should help to overcome this barrier and initiate the role of buying agencies as leading examples. However, the role of buying agencies as experts is highly dependent on the success of other policy tools.

Lack of personnel resources and time: The buying agencies can offer the right products to procurement officers who are too stressed to evaluate tenders themselves.

High prices of energy-efficient equipment: Bulk contracts can help reduce the prices of the most efficient products.

8.6.3 Synergies with other policy instruments

A clear mandate for buying agencies to work for energy-efficient procurement would have mutual benefits with the provision of comprehensive information and services on energy efficiency to public administrations. Moreover, buying agencies would benefit, but may also be important actors in the creation of energy efficiency specifications and LCC methods for products.

8.6.4 Treatment in a Directive on energy efficiency in public administrations

The EU Directive should ask the Member States to ensure that buying agencies supply energy-efficient goods. Depending on the role of the buying agency, it may not be legally possible to influence what products they supply. In such cases, buying agencies should be required or assisted to supply products and building components in accordance with the proposed energy-efficient procurement guidelines. (See elsewhere in this report).

As an alternative to a requirement, or as a complement, buying agencies that fulfil certain minimum standards should be receive training and a certificate that shows that they can offer energy-efficient products and that they have methods for calculating life cycle costs.

8.6.5 Actions for national implementation of an EU Directive

Elimination of legal, administrative and financial barriers
A clarification that restricting calls for tender to energy-efficient products alone will lead to low life-cycle costs. Since low life-cycle costs are implicit in the specifications, the competition in tenders will ensure best value for money in a long-term perspective.

Accompanying measures
Central buying agencies present themselves as ideal candidates to develop and maintain energy-efficient procurement guidelines for products and building components. They also work closely with the public administrations, and should be used as communication channels for national public sector energy efficiency information centres.

Accompanying activities could be:

- To develop a tool for purchasing for buying agencies and their customers where energy-efficient products are presented. The tool should in an easy way show the economical and environmental advantages with the energy-efficient choice. (Such tools have already been developed by individual agencies)
- Training courses for buying agencies in using the tool and how to present the results for their customers.
- To require from the EU institutions only to buy recommended products from the buying agencies whenever they buy from an agency and such products are available (but not to restrict eu institutions only to buy from buying agencies).
- To collect databases and statistics of available energy-efficient products.
- To award the energy-efficient buying agency of the year.
- To award a share of the life-cycle cost savings the agency achieves through provision of energy-efficient products as an extra bonus to the agency.

8.6.6 The role of the policy tool in a European pilot action

A pilot action should include:

- a questionnaire among agencies to clarify the most common barriers
- the development of a simple tool for calculating savings (or to adapt existing tools used by other agencies)
- training course for a limited number of buying agencies
- specific information for the agencies
- material for the agencies to use in communication with their customers

8.7 Energy-efficient procurement information desks within public administrations

The aim of the proposed policy tool is to enable procurement officers in each public administration to implement energy-efficient purchasing without having to fear conflict with public procurement rules, and to ensure that they receive political backup and commitment to rely on for their decisions. The procurement information desks would ensure that the information and specifications developed nationally and EU-wide is spread within administrations, and that purchasers have an in-house contact point for questions. We do not envisage the creation of physical desks or offices; this policy tool rather recognises the need for allocating responsibilities and giving people or groups within public administrations a clear mission.

The policy recommendation primarily concerns the procurement of appliances and cars, while the structure for buildings-related energy efficiency issues within PA:s is subject to the proposed energy efficiency management units (Section 8.8). The scope of energy-efficient information procurement desks should preferably be co-ordinated with activities of "green" procurement. Although this co-ordination is valid throughout this policy proposal, references are made to energy-efficient procurement alone.

8.7.1 Legal feasibility

No legal barriers are foreseen for this policy instrument. Member States will probably not be able to require PA:s to create the procurement information desks, but should assist in this process.

8.7.2 Effectiveness in overcoming barriers to energy efficiency

This proposed instrument has the potential to help overcome most of the barriers identified in the PROST study:

- *Lack of information:* informing procurement officers and others involved in the process of purchasing within a PA about the financial and environmental stakes, the potential savings and ways to achieve them is the main aim of this policy proposal.
- *Complexity of public procurement rules and legal uncertainty:* the provision of training on and information about how energy-efficiency issues can be integrated in tender specifications and of ready-to-use materials will offer procurement officers easier handling to ask for energy efficient (and greener) products.
- *Too much and unclear information:* centralising the first source of information, using product selection criteria that are more uniform, will "make it clearer and simpler" for decisions to be taken in an environmentally friendly way.
- *Insufficient priority and lack of motivation:* Training and information provided plus political backing are essential ingredients for a proper place on the list of priorities. When there is also a point of feedback and reporting to target setting bodies as is proposed here, the reward for acting accordingly will likely create a motivation among procurement officers to act energy consciously.
- *Lack of investment culture:* if at the same time "global budgeting" is promoted, any information showing for example potential savings in Euros, or how to implement third party financing operations, will reinforce the investment culture in a given administration.
- *Lack of personnel resources and time:* time and resources are integral part of a PA time and personnel budget. With information and training provided, this time will eventually be used much more efficiently since purchases can be made on grounds that allow a quicker procurement decision. Also, the instrument implies the assignment of the task of information and training of the procurement staff to a person or an info desk. This means dedicating personnel resources and time to this task, and thereby also alleviating the lack of personnel resources and time.

8.7.3 Synergies with other policy instruments

Together with other PROST recommendationsm the information on the individual PA level becomes more efficient in the implementation of energy-efficient procurement.

Clear policy targets are seen to be a prerequisite for making procurement officers implement energy-efficient purchasing a mainstream activity of public procurement. National public sector energy efficiency information centres and the creation of a network are instrumental for the provision of information in each individual PA.

Efficiency specifications are among the prerequisites for reliable information and for informed decision making among procurement officers. Information about savings achieved will provide an incentive to further save energy when result and decision are linked.

If central buying agencies become well-informed from actions at national level, this will make it easier for the procurement offices of the individual public administrations using the services of central buying agencies to ensure energy-efficient choices.

Defined objectives and informed officers will also help bring efficiency to outsourcing since there will be a felt responsibility that will be carried to any contracts for outsourcing.

Finally, sharing the savings from energy-efficient product choices with the procurement officers will increase their motivation to go for the energy-efficient choice.

8.7.4 Treatment in a Directive on energy efficiency in public administrations

The instrument is aimed towards individual PA:s on all levels. An EU Directive must set the framework in order to provide backing for implementation. For PA:s, energy efficient procurement needs to be institutionalised and thus become an integral part of the current procurement processes. The Directive therefore needs to call for structural changes that allow energy efficient procurement to become institutionalised such as is hinted on in the 6th Action Programme and Paper on Integrated Product Policy.

The Directive would have to recognise:

- that public administrations are relevant and responsible actors in achieving EU targets for a more sustainable and efficient economy and society – therefore, the responsibility of information within PA:s must be clearly allocated
- Member States are to ensure that individual PA:s are assisted in setting up the procurement information desk function

8.7.5 Possible actions for national implementation of the Directive

On a Member State level, the implementation of public sector energy efficiency information centres is described in Section 8.3 (National public sector energy efficiency information centres). The procurement information desks must have political support and backing. This is in fact one of the main tasks of the national public sector energy efficiency information centres: to assist individual PA:s in the creation or assignment of energy-efficient procurement information desks, and to support them with networking and continuous information.

On the individual PA level, energy-efficient procurement information desks are the multipliers of the information, guidelines and tools to implement intelligent procurement that are developed externally. In order to achieve that as many individual PA:s as possible establish the information desk function, Member States should:

- promote the assignment or creation of energy-efficient procurement information desks within all PA:s and ensure top-level support for this process
- define the time scale for this process
- provide training and technical support to energy efficient procurement information desks and individual procurement officers
- support to PA:s. Providing examples of energy-efficient procurement information officers or desks schemes, possibly seed funding for the creation of desks

8.7.6 Resources and actions needed on each PA

A strong backing in political commitment is needed not only through the framework set on a EU and Member State level. Each PA needs to incorporate these in their objectives. Therefore the management needs to:

- elaborate the commitment to energy efficient procurement
- define the need for reporting on integration and resulting environmental benefits from energy-efficient procurement
- define the need for and (if not already installed) create the position of a responsible person to be information and training officer for energy efficient procurement

The information desk in each PA would have a clear mandate for:

- awareness raising on energy efficient procurement
- provision of information on issues and benefits of energy-efficient procurement to all level of decision makers in their PA
- training of all procurement officers in their PA
- information about the current policy for energy-efficient procurement
- offering and spreading the tools and guidelines to implement energy-efficient procurement
- monitoring and reporting on success to the target setting body of the authority and to the national information desks

8.7.7 The possible role of the policy instrument in European pilot action

Elements for a European pilot action could be the following, which would support the recommendation in its need and effectiveness:

- assignment or creation, where not yet existing, of energy efficient procurement information desks schemes in the participating PA:s
- training of procurement officers in participating PA:s
- training on current energy efficiency policy for procurement
- introduction to the use of guidelines, development of calls for tenders based on Templates developed (such as are developed in RELIEF, Energy+, PROST, etc.) and use in several PA on all levels
- reporting on results and verification of prost recommendations for energy efficient public procurement to the own top-level management and to the central national reporting point

8.8 Energy efficiency management units

Energy efficiency management units (EEMU:s) work to improve building energy efficiency within the public administration.
Typical actions of EEMU:s are:

- undertaking energy monitoring and benchmarking of building energy consumption within/between public administrations
- audits of buildings to identify saving potentials
- ensuring the introduction of cost effective actions to improve end-use energy efficiency including for example:
  - optimisation of the building operation (e.g. closing down HVAC systems outside times of use)
  - assessment and preparation of energy-efficiency investments (which then are usually implemented by the construction/facility/technical management offices)
  - providing training and information on energy efficiency for staff
  - reporting on the development of energy consumption and on energy efficiency successes

EEMU:s work with staff charged with maintaining, refurbishing and designing buildings, such as the facilities department. They are well placed in the decisional hierarchy with the power to ensure the adoption of cost-effective energy efficient solutions in building maintenance, refurbishment and construction. This may mean for example direct budget responsibility for specific elements of facility management (for example lighting and HVAC system management) or the role of consultant on energy efficiency with the possibility of ruling against inadequate choices made by facilities departments.

EEMU:s may work with procurement officers to improve product energy efficiency; there are synergies between the use of efficient products and building energy efficiency. They require skills in the field of thermodynamics, mechanical engineering and specifically building physics, but also in electrical engineering and economics.

The economic savings potential offered by efficiency improvements to building envelope and systems in public administrations consuming more than 1 000 TOE a year, are typically sufficient to cover salary costs of an engineer working as an energy efficiency manager. Public administrations falling below this threshold are typically unable to autonomously maintain an EEMU. They can work together to develop Partnership EEMU:s, which can be self financed through the energy savings they realise in each public administration.

8.8.1 Legal feasibility

There is considerable experience of energy management units across Europe (for example in Italy and Germany), though the function of these may differ somewhat from the EEMU:s described above.

Energy managers traditionally play a consultancy role to energy consuming departments of public administrations. Though they may identify and highlight energy related cash flows from within the total annual budget of their administration, and attempt to influence these, the ultimate responsibility for system investment and energy purchase costs remains with other units (for example the facilities and accounts department and/or the user departments with decentralised budgets).

Instead, EEMU:s directly influence the choice of building systems (for example lighting or HVAC systems) or those elements of the building structure which affect building energy consumption (for example glazing, thermal insulation). This may mean direct budget responsibility for specific elements of facility management (for example lighting and system management) or the role of consultant with the duty of assessment and the right of approval to choices made by facilities and user departments. A combination of both is also possible: the right of approval for all building activities, plus an own energy efficiency budget (cf. Section 8.9) or a PICO fund (cf. Section 8.11) managed by the EEMU for energy efficiency investments.

Though more limited in number, there are examples in which energy managers have stepped beyond the traditional consultancy role to obtain direct control of energy related costs, whether totally or partially. The city of Modena in Italy, the City of Montpellier in France, and a number of German cities (such as Frankfurt am Main, and Stuttgart) are examples of administrations, which have adopted similar procedures for nominally attributing investment and energy costs to departments and dependent institutions (e.g. schools). This increases accountability, whilst actually assigning control to energy management units.

Thus, past experience would indicate that EEMU:s are feasible, though providing EEMU:s with the required power to ensure energy-efficient actions (through direct budget responsibility or power of approval) requires either support and commitment from top management to change traditional structures of budget responsibility in public administrations or legislation.

8.8.2 Effectiveness in overcoming barriers

Increasing energy efficiency of the building stock is a complex task requiring dedicated skilled staff. EEMU:s and Partnership EEMU:s effectively address a number of the barriers to increased energy efficiency in the public sector, particularly:

- *Lack of information, too much and unclear information, legal uncertainty:* by bundling information for facility departments and building operators
- *Split incentives:* by defining technical rules, and by organising energy efficiency investments
- *Lack of investment culture:* by managing energy efficiency investments

- *Complexity of public procurement:* by managing energy efficiency investments, or assisting the facilities department in managing them
- *Lack of personnel resources and time:* in their function as structures with personnel resources and time dedicated to energy efficiency management

Experience throughout Europe shows that good energy management can lead to important improvements of building stock energy efficiency. Overall building stock heating energy savings of 30% or more have been achieved, similar electricity savings are potentially lying ahead.

However, energy management is a wide term, often embracing activities which may only marginally lead to improved energy efficiency of the public building stock, such as load management or mere energy monitoring and reporting. Energy management can, and is often used to identify staff involved in the administrative management of utility supply or space heating service contracts. This is *not* the kind of energy efficiency management meant here.

Even energy management structures with a clear mandate may suffer from a number of recurrent problems, which impede buildings achieving optimum (or even sub optimum) energetic efficiency. Principle amongst these are the lack of decisional autonomy/responsibility, lack of funds and lack of information/training.

8.8.3 Synergies with other policy instruments

As already noted, existing energy management structures, which have a clear mandate, suffer from a number of recurrent problems which impede buildings achieving optimum (or even sub optimum) energy efficiency. These problems include lack of information on efficient solutions, lack of decisional autonomy, and lack of funds.

Providing EEMU:s with building component purchase specifications is an important step in addressing the first of these problems (see Section 8.5, "Energy efficiency specifications and LCC methods for buildings" and Section 8.3 "A co-ordinated network of national public sector energy efficiency information centres").

Assigning EEMU:s the *responsibility to ensure* that refurbished and new building stock meet minimum performance standards (see section 8.5) will require that public administrations provide EEMU:s with the sufficient decisional autonomy and resources to meet their legal obligation.

Generally, all policy instruments, which seek to fund energy efficiency investments, are both supporting, and themselves benefiting from the activities of an EEMU (for example energy efficiency budgets, energy performance contracting, PICO, and shared savings).

An administration reform that introduces decentralised budgets for energy and maintenance also facilitates the activity of EEMU:s. With decentralisation and improved responsibility for total departmental budgets, managers are generally both more susceptible to the economic savings offered by energy efficiency improvements, and more flexible in using parts of maintenance budgets in order that these can be realised.

8.8.4 Treatment in a Directive on energy efficiency in public administrations

Member States should be required to ensure that public administrations above a threshold energy consumption level (recommended at 1.000 TOE/year) operate energy-efficient management units (EEMU:s).

The requirement should clearly state the principal activity of EEMU:s, namely: identify actions, interventions and procedures necessary to improve building stock energy efficiency.

Member State should be required to ensure that public administrations falling below the threshold annual energy consumption level should have ongoing access to energy efficiency management services. Public administrations should be invited to form Partnership EEMU:S.

EEMU:s should be charged with the responsibility to ensure that refurbished and new buildings respect minimum performance standards.

EEMU:s should be required to document achieved energy savings in building stock and improvements to building stock energetic productivity.

Results from annual reports should be available for public scrutiny. Ideally, results should be aggregated by the national information centres.

8.8.5 Actions and resources for national implementation of an EU Directive

Creating EEMU:s

Existing energy management units must be informed about their new responsibilities. In Member States with no wide-scale existing energy management in the public sector, the requirement to maintain EEMU:s will create a demand, maybe not easily met, for several thousand engineers/managers. The position (a role with considerable responsibility) will require mid-range managers with a technical background, ideally in the field of thermodynamics/mechanical engineering, electrical engineering or building physics, as well as some knowledge of investment analysis.

Public administrations will have to adjust existing decisional hierarchies in order to accommodate EEMU:s, and to allow managers to fulfil their legal mandate. This may mean for example providing direct budget responsibility for specific elements of facility management (for example lighting and HVAC system management) or the role of consultant with the possibility of ruling against inadequate choices made by other operating units, (for example the facilities departments).

Adjustment to structures will be facilitated by providing public administrations with schemes of possible management structures.

Introducing EEMU:s and the requirement to meet performance standards should be defined within the context of a realistic time scale, which takes account of the time to locate, employ and train staff and modify management structures. Providing for a phased introduction of EEMU:s rather than supposing "immediate" compliance should help avoid creating nominal but inactive structures.

At national level:
- promote the creation of EEMU:s at top management level and amongst policy makers of all PA:s
- define time scale with which to activate EEMU:s
- provide training and technical support to EEMU:s
- support to public administrations: Providing examples of management schemes and seed funding

For each PA:
- locate and training new or existing staff
- integrate EEMU into managerial decision process
- provide initial funds to cover initial salary of EEMU (In the medium term the savings achieved by the EEMU should cover salary costs, though these might not necessarily be explicitly directed into an identifiable fund.)

Creating Partnership EEMU:s
Public administrations falling below the threshold annual energy consumption level should have ongoing access to energy efficiency management services. Partnership EEMU:s, in which single public administrations develop a shared service, offer a solution to this requirement. Partnership EEMU:s should be self-financing through the accumulated savings derived from the actions undertaken.

Starting Partnership EEMU:s may lie heavily on the resources of smaller public administrations, which need to develop and negotiate partnerships with other (possible many) authorities and institutions. Though partnership EEMU:s should prove cost effective to all participating administrations over the medium term, partnership EEMU:s will be limited in the actions they can take in any one year, and thus initial outlays from public administrations to cover their share of costs are likely to be greater than initial realised savings.

Alternatively, the requirement to provide smaller public administrations with ongoing access to energy efficiency management services could be met by, for example, through private energy consultants, ESCO:s, or national energy agencies.

However, experience would demonstrate that though these actors can be successful in achieving specific improvements, they are unable to guarantee national cross-the-board consistent savings. The reasons are:

1. Payments to private consultants are in advance of, and not connected, to effective energy savings, representing a problem for smaller administrations.

2. The public sector has a history of difficulties of achieving satisfactory conditions from private sector service companies providing "qualitative" services such as heating, lighting and comfort. ESCO:s generally seek to maximise returns on investments ("cream skimming") avoiding lower returning but nevertheless costs effective solutions, and are anyway not well placed to undertake long pay-back (10 years or more) interventions, though these considered over the lifetime of the buildings can again be extremely cost effective.

3. National energy agencies have not the resources to provide ongoing services to all but a small proportion of the public sector.

Further, none of these agents have the decisional autonomy with the public authority to *ensure* that cost-effective energy efficiency improvements are undertaken.

Though on the last point it is worth noting that charging larger single public administrations (and specifically EEMU:s) with the requirement to achieve quantifiable efficiency improvements, it seems difficult that the same requirement could be placed on Partnership EEMU:s.

It does not seem viable that the state would readily infringe on the autonomy of the public administrations and oblige them to develop partnerships. Partnership EEMU:s could only realistically be created through the voluntary agreement of interested public administration and it would be incoherent to charge voluntarily created structures with a legal requirement to achieve efficiency improvements.

For smaller public administrations the present text therefore proposes charging the state with ensuring access to effective energy management. It is recognised that this is a non-ideal solution; without placing the requirements on individual administrations, it is likely that improvements will be limited. The issue is open to debate.

At national level:
Assist the start up of Partnership EEMU:s by:

- providing standard agreements with which public administrations can develop partnerships
- providing funds, or loans to cover the initial period in which costs outweigh incomes

For each public administration:

- develop Partnership EEMU:s with other public administrations
- provide for some integration of the Partnership EEMU into the managerial decision process of each partner so that it may effectively undertake efficiency improvements
- provide initial funds to cover a quota of the initial salary of EEMU

Ongoing support to EEMU:s
EEMU:s will benefit from procedures created within the policy instrument "Energy efficient procurement information desks within public administrations" (Section 8.7) as well as from association at national and at

European level. National associations would allow members to share experience and develop standard tools and processes, for example:

- collect and disseminate national "energy" legislation
- develop a database of energy-efficient solutions for building stock improvement
- develop guidelines for achieving minimum and target performance standards
- define common annual reporting schemes for individual EEMU:s
- develop annual reports of country-wide EEMU performance

A European association would provide for an interface of EEMU:s, with the co-ordinating body charged with the definition of building component specifications and minimum performance standards (see Section 8.5 "Energy efficient specifications and LCC methods for buildings"). However the EEMU:s or their associations should participate but not be charged with the direct responsibility of developing component purchase specifications or performance standards (in effect separating the "executive" from the "legislative").

National and European associations should be responsible for reporting directly to, respectively, the national and European governments on annual building stock efficiency improvements.

Associations should be financed through their associated (cost effective) EEMU:s with additional support by national government.

Where Associations of EEMU:s do not presently exist, national energy and/or environment agencies could assist in their creation.

8.8.6 The possible role of the policy instrument in a European pilot action

Action
Creation of Partnership EEMU:s in partner countries.

Description
Energy management structures are already active in a number of countries. However, these usually work with larger public administrations where the savings potential from efficiency improvements to building stock are sufficient to cover salary costs of the structure. However, this leaves a large number of smaller administrations bodies without any structured access to energy management services. For example, in Italy, the 1 000 TOE threshold covers roughly only 500-900 of the more than 8 000 village and town councils. The pilot projects aim to test the creation of Partnership EEMU:s in which small public administrations develop a self financing shared energy efficiency management service. The project will provide a model and valuable experience for wide scale replication.

8.9 Energy efficiency budgets

Creation of energy efficiency budgets (EEB) in a public administration, will enable a stable level and continuous energy efficiency investments in that administration. It could also be applied by the EU institutions.

A certain percentage of the normal building/maintenance budget is secured for the detailed energy audits, implementation and monitoring of energy efficiency measures in buildings. It provides savings of energy and public means and reduces emission of greenhouse gases.

Energy efficiency budgets can thus improve energy efficiency in day-to-day maintenance or smaller refurbishment. Still, since they are probably a smaller part of the maintenance budget (10 to 20%), they may not be sufficient for large-scale modernisation or major refurbishment of buildings and installed systems. For such bigger projects, the two following instruments of energy performance contracting (EPC) and public internal performance contracting (PICO) can provide possibilities to fund additional energy efficiency projects (Sections 8.10 and 8.11). Therefore, EEB funds can best be used for low-cost modernisation measures, such as window carpentry and attic insulation, maybe adding insulation to walls that are refurbished anyway, energy-efficient pump retrofits etc., which can also bring significant energy savings. All investments financed in this fashion should incorporate the (PROST recommended) energy efficiency specifications (cf. Section 8.5 on energy efficiency specifications and LCC method for buildings) as a minimum level of performance for any new equipment installed.

8.9.1 Legal feasibility

This instrument can mainly be recommended as a voluntary one, to be introduced by each individual public administration. There should, therefore, not be any legal problems if Member States just promote the use of this instrument. They could, however, self-oblige their own central government administration to use it.

Should a Member State want to make it mandatory for all public administrations, the main aspect of implementation of this instrument would be if the EU or national legislation can determine for what purposes the local administrations and self-governments shall spend their money. The legal feasibility of a mandatory implementation of EEB would then depend on the legislation of each Member Sate. One of the main problems can be resistance from local administrations. This instrument can be seen as too deeply interfering with the competences of a particular public administration and telling how to spend its own money from the normal building/maintenance budget.

Whether voluntary or mandatory, there is a crucial role for a national campaign and adequate instruments to change the perception of local authorities, convince them of this instrument, and show the significant opportunities and benefits.

8.9.2 Effectiveness in overcoming barriers to energy efficiency

The main barrier addressed by an energy efficiency budget, EEB, is the lack of funds for energy efficiency investments, which are consequently postponed. Establishment of EEB is one of the most important actions to overcome existing administrative and financial barriers to energy efficiency in public services. This will also reduce the barrier of split incentives, since energy efficiency is included in maintenance quasi automatically. Assurance of stable and continuous financing for energy efficiency investments through EEB enables incorporating energy efficiency in day-to-day maintenance of the buildings, introduction of energy monitoring, planning and creation of the rational policy for energy efficiency measures, and improves effectiveness of such mechanisms. Money ensured in an EEB for energy efficiency measures will be returned through savings in energy bills. Hence, in a long perspective it is a very rational and effective solution.

8.9.3 Synergies with other policy instruments

Funds from EEB should be used in connection with other policy instruments described in this task. It will enable better and effective use of funds and appropriate implementation of energy efficiency measures.

Very important is the synergy with energy (efficiency) management units as the likely executing units of EEB.

Policy targets and high-level support are probably a prerequisite for installing EEB, since it means a reallocation of existing maintenance budgets.

In the use of EEB funds, the energy efficiency specifications for buildings created, updated, and disseminated by two other policy instruments proposed here are an important support.

An administration reform that introduces decentralised budgets for both energy and maintenance will also make the creation and use of EEB easier, because it will be easier for the managers of the EEB to convince other departments of the benefits in avoided energy costs from using parts of their maintenance budget for additional energy efficiency measures.

Support from EEB should also aim at:

- Improving availability and quality of energy data in municipalities and public administrations. These data shall be used by energy (efficiency) management units for calculating energy savings. The other way round this will lead to improving of effectiveness of energy efficiency measures through EEB.
- Improving energy metering/monitoring systems.
- Supporting the development and operation of measurement and verification standards and tools.
- Introducing and improving accountability of administrative units for the energy costs they cause.

EEB may be used together with TPF/Energy performance contracting and public internal performance contracting (PICO). These instruments are complementary: EEB can be used for day-to-day maintenance, low-cost measures, such as window carpentry, attic and possibly walls insulation, PICO and TPF/Performance contracting for larger investments and system improvements.

8.9.4 Treatment in a Directive on energy efficiency in public administrations

The planned EU Directive should require the Member States to promote the creation of energy efficiency budgets in all levels of public administrations in their country. It should at least recommend Member States central government and the EU institutions to dedicate part (%) of their normal building/maintenance budget to energy efficiency investments. Additionally, the requirement should clearly state that part of this budget should be allocated for executing energy audits of building stock in order to asses possible energy savings and propose adequate energy efficiency measures. energy efficiency budgets shall improve energy efficiency in day-to-day maintenance or smaller refurbishment.

8.9.5 Possible actions for national implementation of the Directive

The following action should be undertaken to implement EEB in public administration:

Elimination of legal, administrative and financial barriers
In order to implement the possible directive on energy efficiency budgets the following issues should be considered:

- clarification of formal and legal aspects of EEB, e.g. with regard to budget structure and requirements in public administrations
- elaboration of supportive codes or guidelines which promote EEB
- linking EEB with subsidy schemes targeting municipal energy strategies
- support of energy (efficiency) management units as the executing units of EEB

Information and promotion activities

- generation of target group-specific information material (regional, local public administrations)
- accompanying PR and media campaigns, use of internet, seminars etc., to convince local authorities that creation of EEB is useful and profitable
- introduction of energy efficiency budgets in EU institutions and federal/central/regional state institutions in order to create pilot action and to provide a replicable and economically-viable example of such an instrument.

Accompanying activities
Policy support should aim at:

- improving the availability and quality of energy data

in municipalities and public administrations
- provision of information on options for energy efficiency measures (basic information about the environmental impacts of energy production and use, the greenhouse effect, climate change, introduction to relevant supply-side and demand-side technologies, examples of best practices)

8.9.6 Actions and resources needed by each PA

When the legal basis, supportive codes and information campaign are set, then following action shall be undertaken by each public administration:

- establishment and operation of energy management units or personnel dedicated to EEB, responsible for supervising and management of EEB
- monitoring of heat and electricity use in public buildings is in place
- introduction of measurement and verification standards and tools
- implementation of no-cost or low-cost measures in day-to-day operation of public administrations
- implementation of high cost measures with the support of other instrument, particularly TPF and PICO. The combination of these three instruments can give satisfactory and significant results in energy savings.

If an energy management unit already exists, the cost of establishment of an EEB is insignificant. The creation of such a unit in the first step requires some resources, but the public administration receives a stable source of financing energy efficiency measures and benefit from lower energy expenses and lower pollution.

In small public administrations, the operation of EEB requires personnel for supervising and management of this instrument. Naturally, qualified personnel with adequate knowledge is needed, but this is the role of national information centres to educate personnel and create necessary instruments and tools.

8.9.7 The role of the policy instrument in a European pilot action

Energy efficiency budgets could be tested in a European pilot action to create and disseminate good practice on EEB, for example focusing on thermomodernisation measures. This would be enabled, i.e., through EEB pilot projects, brochures, case studies, workshops in European countries. The project should involve scientific institutes, public administrations and associations of municipalities willing to introduce EEB. The expected results would be experiences in EEB introduction and management, part of building stock retrofitted, a policy framework for EEB set, and awareness raised in the involved countries. Experiences are to be disseminated in other EU and Candidate Countries. This instrument can be tested complementary with PICO and TPF/ performance contracting, with the roles of each instrument as outlined above.

8.10 Third-party financing and energy performance contracting

The internal energy efficiency budgets described in Section 8.9, where they are possible to create, can improve energy efficiency in day-to-day maintenance or smaller refurbishments. Still, they may not be sufficient: often, there is a delay in public administrations of the scheduled refurbishment of windows, heating, or ventilations systems due to lack of funds. Sometimes the normal maintenance budget is too small anyway. In these cases, third-party financing/energy performance contracting or public internal performance contracting (PICO; cf. Section 8.11) provide possibilities to fund additional energy efficiency projects, particularly major refurbishments of buildings and installed systems.

The approach of third-party financing (TPF) or energy (savings) performance contracting, abbreviated as TPF/EPC in the following, builds on the involvement of an external actor such as an energy service company (ESCO) to enable energy efficiency investments in a public administration. This does not only include the financing of the investments, as the term TPF may suggest. It also entails the management of the investment process, and often the operation of facilities for the duration of the contract in order to guarantee that the targeted energy savings are actually achieved – hence the term energy (savings) performance contracting.

The TPF/EPC approach is advantageous compared to PICO in cases when new means of financing or the special know-how of the ESCO are needed, the public administration wishes to transfer risks of performance to the ESCO, own staff shall get access to external knowledge and qualification, only limited personnel resources are available, or the public administration wants to concentrate on core activities.

It is sometimes argued that with TPF/EPC, there would be the danger of cream-skimming, i.e. that the ESCO takes large performance contracting projects which are very attractive to them, while the less attractive, small and medium-sized tasks remain with the public administration. However, since the public administration can choose the contractor and decide in the call for tenders on the conditions the contractor has to fulfil, it is mainly up to the public administration how far it will allow cream-skimming. Furthermore, the danger of cream-skimming can be reduced by pooling several buildings with different energy saving potentials and different specific investment costs together in one call for tenders.

There are two general types of TPF/EPC:

- Plant/grid contracting means that the public administration contracts with an ESCO, which has the responsibility for design, equipment procurement, financing, installation and/or O&M of a power and/or heat/cold generation and/or distribution equipment at the public administrations' site. The public administration usually pays for the useful en-

ergy carriers delivered (heat, cold, electric power).
- Energy savings performance contracting (ESPC) covers a broad range of contract types with an ESCO, where the cost of the implementation of energy conservation measures (investments in energy efficiency or energy-efficient measures within operation & maintenance) is recovered through the savings created by the measures.

According to a recent study by Frost & Sullivan, the general market for TPF/EPC in Europe is expected to grow rapidly with a growth rate of 15%/year, from a turnover of 2 900 million Euro in 2001 to 6 700 million Euro in 2007 (Handelsblatt 22.10.2002). Germany will have the biggest share in this market with 26.9% in 2007. Moreover, some German studies come to the conclusion that there will be a rapid growth of the market for energy performance contracting (e.g., E&M Technomar 2000). However, the share of TPF/EPC on energy efficiency measures on the demand side (energy savings performance contracting) is only between one and five percent of the total TPF/EPC market, the rest is TPF/EPC for investments on the energy supply side (plant/grid contracting).

For the public sector in Germany, Öko-Institut and the Berlin Energy Agency estimated that with the help of energy savings performance contracting public energy budgets (which are estimated at 3 078 million Euro/year) could be cut by 25 to 100 million Euro/year, and between 4 430 GWh/year (=10%) and 8 860 GWh/year (= 20%) of energy could be saved, of which about 430 to 860 GWh/year would be electricity (Umweltbundesamt 2000). One result of a recent survey conducted by the Wuppertal Institute was that, depending on the specific circumstances and depending on the contract specifications, between 10 and 38% energy are saved within an energy savings performance contracting agreement (Kristof 2002).

8.10.1 Legal feasibility

There should be no real legal barrier to use the TPF/EPC approach in public administrations in the EU, since the "SAVE Directive" 93/76 required the Member States to promote TPF/EPC in the public sector, which would also imply the removal of any legal barriers. However, some of the country studies in the PROST project still report legal impediments for public authorities to use TPF/EPC. On the other hand, the existing procurement regulations for awarding and carrying out services of public authorities (e.g., the contract procedures for construction work and for services in Germany) are not a real barrier. However, among many public administrations, there is some uncertainty about how to interpret such regulations, particularly when inviting to tender for TPF/EPC projects and assessing the energy efficiency measures proposed by the ESCO. Furthermore, some other formal and legal aspects are partly hindering the broad implementation. For example, budgetary laws and the rules and procedures, according to which government financial authorities control public administrations, are not always clearly enough in favour of TPF/EPC. They should, e.g., clearly state that TPF/EPC for cost-effective energy efficiency investments is not to be considered an additional debt financing, and hence possible in addition to a capped maximum debt of a public administration.

8.10.2 Effectiveness in overcoming barriers to energy efficiency

TPF/EPC particularly addresses several specific barriers to energy efficiency in the public sector:

- *Lack of funds:* Against the background of the poor financial situation of many public administrations and the investment gaps in public buildings and heating systems (which were the result of earlier budgetary policy), the involvement of external capital in the financing of energy optimisation is often needed or even unavoidable to reduce energy consumption and life cycle costs.
- *Lack of personnel resources and time:* Increasing internal energy efficiency does not belong to the core activities of public administrations. The priorities and financial means of public administrations often lead to a lack of personnel resources and time for energy efficiency measures. TPF/EPC provides the chance to implement energy efficiency potentials with only little personnel resources and time. Furthermore, additional know-how is sometimes needed for the development of measures and their implementation. The contractor can provide this know-how, the own personnel can learn from it.
- *Furthermore, TPF/EPC contributes to creating an investment culture, and to overcoming the barrier of split incentives/budgets:* it provides refinancing for investments from saved energy costs, which is traditionally not easy in public administrations, since investments have to be financed from the investment budget, while the energy costs are part of the running cost budget.

8.10.3 Synergies with other policy instruments

It is necessary to overcome further barriers and to increase incentives to implement TPF/EPC activities in public administrations. Policy support should aim at the following actions that also support the creation of TPF/EPC schemes:

- setting targets for energy efficiency in public administrations
- improving the availability and quality of energy and emissions data in municipalities and public institutions
- providing information on options for energy efficiency measures (national programmes for information dissemination)
- establishing funds to finance detailed energy audits in public administrations, which can be a basis for de-

veloping invitations to tender for TPF/EPC projects
- supporting energy management in public administrations as the units initiating TPF/EPC activities, and sometimes managing them on the side of the public administration as the customer
- ensuring the use of minimum efficiency specifications and/or life-cycle costs in public building management procedures and in invitations to tender for TPF/EPC projects
- supporting the development and operation of measurement and verification standards and tools, which help to reduce transaction costs of TPF/EPC
- supporting public internal performance contracting (PICO) as the complement to the realisation of energy efficiency potentials by a third party
- using administration reforms to bringing together tasks, competences and responsibilities with respect to energy efficient building management in such a way that the implementation of energy-efficiency measures by own personnel or with the help of third parties is eased
- using administration reforms to installing systems and procedures (cost accounting systems, budgeting rules, performance data, performance targets, participation schemes/rewards), which make it possible and give incentives to implement energy efficiency measures by own personnel or with the help of third parties

8.10.4 Treatment in a Directive on energy efficiency in public administrations

A possible EU Directive on energy efficiency in public administrations should require the Member States to promote the use of TPF/EPC in public administrations in order to overcome existing barriers to energy efficiency in public buildings. Such a Directive may also indicatively name some of the actions for national implementation as listed below. In this way, the Directive would also support the further development of a sustainable market for energy efficiency services in general. The EU Directive should furthermore require the EU institutions to analyse in which of their buildings the TPF/EPC approach could be implemented.

8.10.5 Actions for national implementation of the Directive

Concerted communication, motivation and networking action
As an overarching initiative, a concerted action "TPF/EPC" in parallel to a similar action "PICO", could provide the platform for promoting the approach. The following actions are proposed:

- generation of target-group-specific information material
- launching new and using existing national and European networks for the exchange of experiences and the dissemination of best practice
- identifying and engaging high level promoters of TPF/EPC activities in the campaigns on the different public administration levels
- accompanying PR and media campaigns, and use of internet, user groups, etc.

Elimination of legal, administrative and financial barriers
It is necessary to improve the compatibility of TPF/EPC with existing regulations in public administrations:

- by clarification of formal and legal aspects of TPF/EPC, e.g. with regard to public control authorities and budgetary laws
- important actions to overcome existing administrative and financial barriers are the following
- (further) standardisation of public call for tenders, assessment schemes to evaluate the measures proposed, contract types and measurement and verification procedures and tools to reduce transaction costs
- development of funding or guarantee concepts to mitigate risks of insolvency of ESCO:s
- establishment of arbitration boards to clear problems between ESCO:s and users
- establishment of a programme providing coaching to public administrations that wish to use TPF/EPC: coaching in the call for tenders, the assessment of energy efficiency measures proposed by the ESCO, the contract, the monitoring, etc.

Accompanying activities
As a social innovation, TPF/EPC has to diffuse into the various social and institutional structures before becoming a relevant option. Policy support should aim at the integration of TPF/EPC into the energy related curricula of institutions for professional training in public administrations.

8.10.6 Actions and resources needed by each public administrations

The principal steps needed in a public administration to implement energy efficiency measures with the help of a third party (here: ESPC) are shown in Figure 8.2 Three phases can be distinguished:

- *Project preparation/determination of details for the tenders:* After having decided in principal to implement energy efficiency measures with the help of a third party, a task force should be installed, in which every unit of the public administration relevant for the project should be represented. The buildings have to be selected in which energy efficiency measures are considered to be implemented. Building data has to be collected, a baseline determined and minimum savings targets to be formulated.
- *Carrying out the tendering procedure:* After this preparation, the call for tenders can be developed. First, there should be an announcement in the EU Official Journal to receive letters of interest. Then invitations to tenders have to be sent out. The interested bidders

will get the possibility to visit the buildings, verify the energy consumption data and analyse the energy (cost) savings potentials in order to be able to develop and present their proposals. A few bidders will be chosen for negotiations of a contract. If a detailed analysis is required before starting with the implementation, a pre-contract will be concluded, otherwise a contract on the implementation of energy efficiency measures. The measures have to specified in the contract in detail including the determination of the measurement and verification procedures.

- *Implementation of measures:* After the contracts have been concluded, the implementation phase starts. The measures have to be prepared and implemented. Operation and maintenance of the installed systems may be part of the contract. The energy consumption has to be measured and compared with the base line (verification of savings).

The resources needed for the preparation of the project, for the incorporation of all relevant actors within the public administration into the project from its beginning, for the call for proposals, for the assessment of proposals and for negotiating with the possible contractors should not be underestimated. However, pooling of several buildings and using existing standardised procedures and contracts can significantly reduce transaction costs. Furthermore, even some part of this work could be outsourced to a third party; e.g., the Berlin Energy Agency manages the preparation and implementation of TPF/EPC on the customer side for pools of public buildings on behalf of the State of Berlin and its municipalities as well as of other public administrations.

8.10.7 The possible role of the policy instrument in a European pilot action

The following European-wide actions are recommended:

- launching new and using existing European networks for the exchange of experiences and the dissemination of best practice in TPF/EPC
- (further) standardisation of public calls for tenders, assessment schemes to evaluate the measures proposed, contract types and measurement and verification procedures and tools to reduce transaction costs
- co-ordinated establishment of a programme providing coaching to public administrations that want to use TPF/EPC: coaching in the call for tenders, the assessment of energy efficiency measures proposed by the ESCO, the contract, the monitoring, etc.

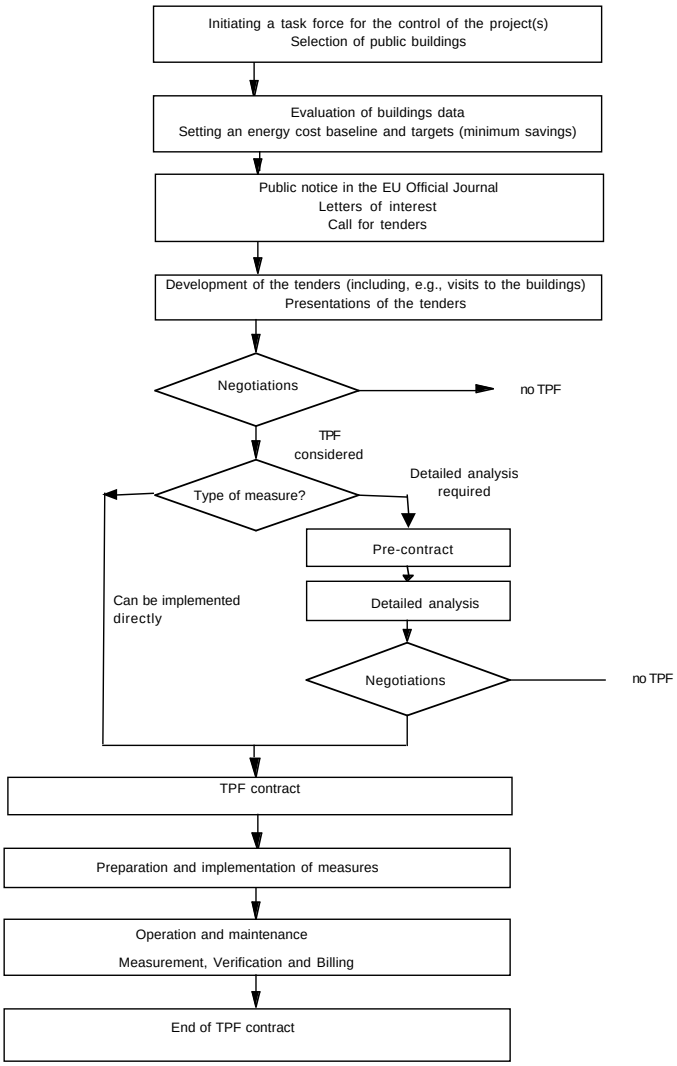


Figure 8.2 Flow scheme of energy savings performance contracting in public buildings

8.11 Public internal performance contracting (PICO)

Public internal performance contracting (PICO) is enabling energy efficiency investments by a kind of in-house "third-party" financing or energy savings performance contracting scheme. With PICO, the role of the ESCO is assumed by a unit of the public administration itself, e.g., the technical department of a municipality. This unit acts like an ESCO, delivers the financial and technical service, and the remuneration takes place through cross-payments of budgets from the customer units' saved energy costs to the PICO unit of the same public administration.

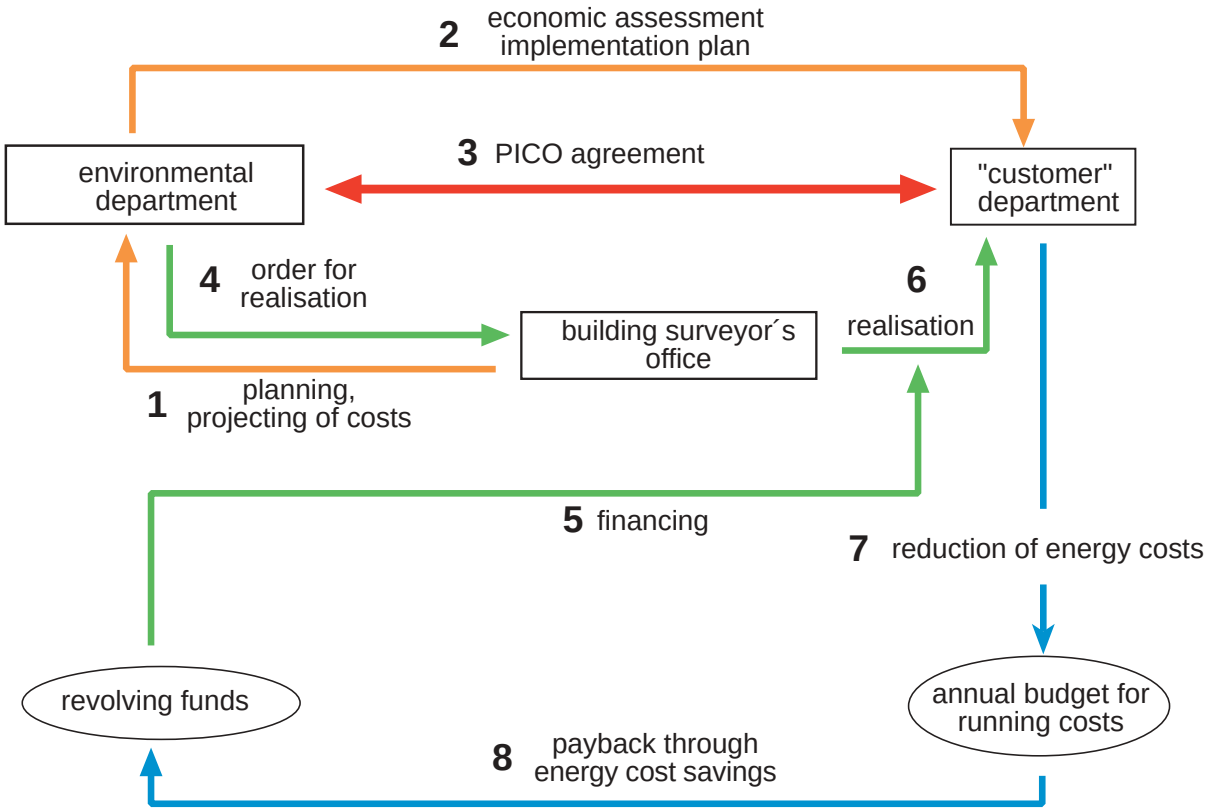


Figure 8.3: The Stuttgart Model of PICO within a public administration

Source: Kristof et al. 1998, based on Kiedaisch 1995

The PICO concept was first used in Germany (cf. Chapter 4, Part I, and the German Country report in the separate PROST Annex volume). It can be illustrated by the example of the "Stuttgart Modell", which was one of the first successful initiatives of this kind in Germany (Figure 8.3; cf., e.g., Kienzlen 1996, LH Stuttgart 1996, Görres/Kienzlen 1998).

In the City of Stuttgart, the City's department for the environment, which is also responsible for energy management, takes the role of an internal ESCO and offers energy services to other units of the municipal administration. The initial momentum came from a general evaluation of energy consumption that triggered a search for energy saving potentials in all kinds of public buildings.

The internal offers draw on the technical know-how of the building surveyor's office and supplementary energy audits, and they are backed by economic cost/benefit calculations of the environmental department. This is the foundation of internal negotiations between the customer department and the environmental department, acting as an ESCO. When an internal energy service agreement has been concluded, the environmental department undertakes an investment into energy saving measures that are realized by the building surveyor's office.

Within the administration, a new internal revolving fund for energy efficiency investments has been established as an intermediate buffer for cash flows. First, it provides the funds for the investment, and afterwards it is refilled by the cash flow from energy cost savings, i.e. the customer department pays back the investment. Comparable to other third party financing schemes, the efficiency measures reduce the annual energy bill of the customer department, which gives room to pay the PICO fee, e.g. under a shared-savings agreement. Obviously, if participation of the customer department in the cost savings from the very beginning is desired, this will have to be compensated by longer pay-back times and contractual obligations compared to the case where the investor, i.e. the environmental department, uses all cost savings for re-financing the investment.

In times of tight public budgets, PICO offers the opportunity to ensure continued energy efficiency actions through the temporary provision of seed money. For example, through a re-organisation of budgets, loans, etc., during the initialising phase of PICO, it is possible to stimulate a continuous flow of investments so that

the resulting pay-back cash-flows in turn provide new funds for follow-up projects.

The German country report includes a detailed description of the PICO concept and the different PICO modes that can be found in Germany. Furthermore, Annex 8 summarises an analysis of the usefulness and feasibility of PICO in different countries.

8.11.1 Legal feasibility

One overall result of the analyses of the usefulness and feasibility of the PICO concept in different countries in the course of the PROST project, is that legal impediments seem to play a minor role (cf. Appendix 8.) The different modes of PICO seem to be possible from central administration level down to municipal administration level in many countries[3]. PICO will particularly be feasible for larger public administrations having energy management facilities. However, the formal and legal aspects of PICO, e.g., with regard to public dept management, budgetary codes and the acceptance of budgets by the supervising financial authorities, are not always clear. Therefore, in particular cases, adaptations of rules are required, but are assumed to be feasible.

8.11.2 Effectiveness in overcoming barriers to energy efficiency

Due to focus on internal procedures, PICO can help to overcome existing barriers to energy efficiency in public institutions:

- *Lack of funds because of separated budgets:* Among the barriers to energy efficiency in public administrations, typical characteristics of public investment financing play a prominent role. Very often the funds for paying the variable costs, such as the annual energy bill, are strictly separated from the budget for investments. A typical lock-in situation of public administrations is the result: On one hand, administrations have to pay enormous energy bills due to the bad conditions of public buildings, on the other hand, the departments are not able to re-finance the urgently needed saving measures by paying back the saved energy costs to the investment budget. External (TPF/EPC) and internal (PICO) energy services provide a solution to this situation. Several German municipalities have already been using the instrument to implement energy saving measures, which helps to reduce the energy cost burden of tight public budgets.
- *Lack of personnel resources and time:* Increasing internal energy efficiency does not belong to the core activities of most of the units in public administrations. The priorities and financial means of the different units in public administrations often lead to a lack of personnel resources and time for energy efficiency measures. However, in most public administrations, there is at least one unit with knowledge on improvements in energy efficiency. PICO activates and strengthens these personnel capacities of the public administration by setting a framework to handle energy efficiency measures internally.
- PICO thus also contributes to the aim of creating an investment culture, and alleviates the barrier of split incentives.

For example, in the City of Stuttgart, more than 130 PICO projects have been implemented between 1995 and 2000, which have already saved in total 5 132 583 kWh and 1 662 kW of district heating, 5 763 744 kWh, 869 kW of natural gas, 883 228 kWh and 189 kW of electricity until the year 2000 (LH Stuttgart 2001). With total investments of 2.68 million Euro, cumulated cost savings of 1.52 million Euro have already been achieved until the year 2000, while annual cost savings in the year 2000 summed up to 0.59 million Euro (Figure 8.4). On average, the payback time of the projects implemented is less than five years.

8.11.3 Synergies with other policy instruments

It is necessary to overcome further barriers and to increase incentives to implement PICO activities in public administrations. Policy support should aim at implementing the following policy instruments, which also support the introduction of PICO:

- setting targets for energy efficiency in public administrations
- improving the availability and quality of energy and emissions data in municipalities and public institutions
- providing information on options for energy efficiency measures (national programmes for information dissemination)
- establishing programmes to finance detailed energy audits in public administrations, which can be a basis for development of PICO-projects
- supporting energy management in public administrations as the initiating and managing units of PICO activities
- ensuring the use of minimum efficiency specifications and/or life-cycle cost assessments in public building management procedures
- supporting the development and operation of measurement and verification standards and tools, which help to reduce transaction costs of demonstrating the results of PICO projects
- supporting third-party financing/energy performance contracting (TPF/EPC) as the complement to the realisation of energy efficiency potentials with own personnel and funding, depending on the specific circumstances and the detailed description of PICO in Annex 8 indicates possibilities to benefit from fruitful synergies between PICO and TPF/EPC

[3] **In the Netherlands, there is a widespread opinion, that at least on the regional level PICO is legally not feasible.**

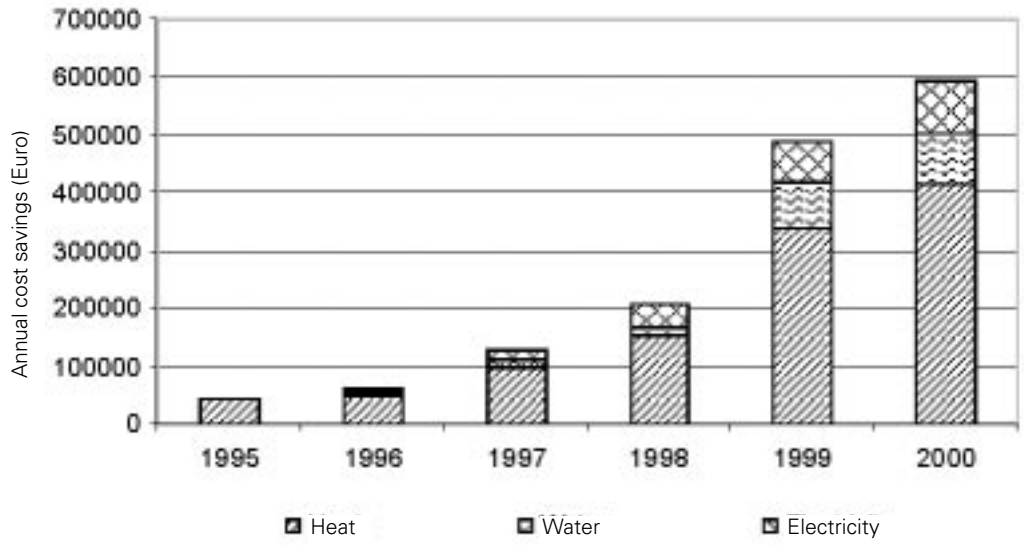


Figure 8.4: Annual cost savings in the city of Stuttgart due to PICO projects.

Source: LH Stuttgart 2001

- using administration reforms for bringing together tasks, competences and responsibilities with respect to energy-efficient building management, in such a way that the implementation of energy efficiency measures by own personnel or with the help of third parties is eased
- using administration reforms for installing systems and procedures (cost accounting systems, budgeting rules, performance data, performance targets, participation schemes/rewards), which make it possible and give incentives to implement energy efficiency measures by own personnel or with the help of third parties

8.11.4 Treatment in a Directive on energy efficiency in public administrations

A possible EU Directive on energy efficiency in public administrations should require the Member States to promote the use of the PICO concept in public administrations in their country. The Directive could indicatively name some of the possible actions for national implementation listed below. It should furthermore require the EU institutions to create one or more PICO schemes for improving the energy efficiency of their building stock.

8.11.5 Actions for national implementation of the Directive

Concerted communication action PICO

As an overarching initiative, a concerted action PICO could provide the platform for refining, developing and marketing the approach.

The following actions are proposed:

- generation of target-group-specific information material
- launching a PICO initiative (kick-off meeting)
- accompanying PR and media campaigns, and use of internet, user groups, etc.
- elaboration of a PICO seminar, which can be disseminated by (regional) energy agencies
- introduction of PICO in federal/central state institutions in order to create pilot projects with high PR appeal

Elimination of legal, administrative and financial barriers

It is necessary to improve PICO:s compatibility with existing regulations. Examples are:

- clarification of formal and legal aspects of PICO, e.g. with regard to public debt management
- elaboration of supportive codes or guidelines which foster decisions in favour of PICO
- generation of a common understanding of PICO among municipalities and supervising authorities, i.e., increasing the likelihood for a formal acceptance of PICO projects
- use of (existing) policy programmes to ensure the initial funding of PICO schemes, and linking PICO with subsidy schemes targeting municipal energy strategies
- support of energy management units as the nucleus of PICO activities

Accompanying activities

Finally, as a social innovation, PICO has to diffuse into

the various social and institutional structures before becoming a relevant option. Policy support should aim at

- establishing PICO as a field of action of existing lobby groups and associations of municipalities
- integration of PICO into the energy related curricula of institutions for professional training
- making PICO a topic for (regional and SAVE) energy agencies
- improving the availability and quality of energy data in municipalities and public administrations
- provision of information on options for energy efficiency measures

8.11.6 Actions and resources needed by each public administration

Compared to traditional routines of facility management and energy conservation investments, PICO represents a remarkable shift of paradigms to public administrations. Accordingly, new institutional arrangements of the administration have to be settled and appropriate procedures need to be established (cf. Fig. 8.3, showing how it is organised in Stuttgart). It is evident that this cannot be achieved at one stroke but demands a stepwise approach. The more detailed description of PICO in Annex 8 shows how PICO could be introduced into a public administration, from the first initiative over the choice of the PICO model to the final implementation and evaluation.

Considering the information, communication and knowledge resources needed for the introduction of the instrument PICO into a public administration, and considering the administrative changes related to the implementation of a PICO project, it is quite obvious that the benefit of activities increases over time when several projects are consequently realised. Due to learning effects and shared transaction costs, a stepwise renovation of facilities offers interesting opportunities to optimise the approach.

8.11.7 The role of the policy instrument in a European pilot action

PICO could be tested in a European pilot action to both create and disseminate good practice on PICO. A concrete proposal for such a pilot action could be as follows:

Objectives
The main objective of this pilot project would be to transfer, promote, test and disseminate the concept, first used in Germany, in other European countries, to develop it further and adapt it where necessary. The European PICO pilot action could aim at establishing PICO schemes in several public administrations. The technical focus in field-testing PICO could be, for example, energy-efficient lighting.

Description of the work
Achievement of the project's objectives would be enabled, i.e., through PICO pilot projects on energy-efficient lighting, brochures, case studies, websites, guidebook chapters, and workshops in several European countries. The consortium should include energy agencies, scientific institutes, public administrations willing to test PICO, and an agent experienced in dissemination, e.g., international ecological association of municipalities. The general project structure may consist of an overall project co-ordination, a scientific and a dissemination co-ordination, and national teams. The national teams should consist of one public administration and one scientific expert. Representatives of the target groups and key actors would thus already be involved in the project group, but would be further involved in the dissemination activities. The success of the pilot projects, the analysis of public procurement of lighting systems, and the success of the dissemination would be documented in reports available to the public.

Expected results
The expected results could be several buildings retrofitted, adapted PICO schemes developed and implemented, a policy framework for PICO set, recommendations for improving the public procurement of lighting and other building technologies developed, and awareness for PICO (and energy-efficient lighting) in public buildings raised in the participating European countries. This would be expected to pave the way for widespread uptake of PICO and energy efficiency by public administrations in these and possibly other EU and Candidate Countries. If, as a long-term result of such a pilot action, PICO were broadly implemented by public administrations and institutions throughout the EU, it can be estimated that over 10 years, savings of up to 50 TWh/year of electricity and fuels could be reached. This would not only be in lighting, but also in heating, hot water, circulation pumps, fans, air conditioning, etc.

8.12 Sharing savings

An important barrier for active implementation energy efficiency, is lack of accountability. Specifically, often those groups (administrative entities or people) using energy services are not directly held responsible for paying the costs, which this use implies.

Important savings can be triggered through procedures, which directly involve the users in economic savings derived from energy savings. A number of procedures have been tested in this sense, which reward individuals, teams or organisational units with a share in the energy cost savings they achieve. This provides an incentive to develop energy efficiency improvement proposals, to change energy consumption behaviour and/or to implement measures/procurement decisions, which particularly contribute to saving long-run costs, thereby reducing consumption and emissions (life cycle

perspective, no short-sighted cost savings). This instrument can be further distinguished between:

- personal participation - individuals receive a reward (personal benefits like pecuniary advantages/bonuses, higher status, appreciation)
- community or team participation - the community or working team receives part of the saved energy costs, e.g., 50% (as in the well-known "fifty-fifty" projects in schools, rewarding the school community for energy and cost savings from switching of heat and lights when not in use, and more economic use of water). The community or team is given freedom to use the reward, e.g., for purchasing common "non essential" goods/services, for example to cover the costs of employees' social activities (e.g., contribution to sports clubs, organise office party, employees trip), for the purchase of non standard equipment to improve the members working conditions (e.g., improved chairs), or for covering further investments to increase future energy cost savings and also the community's/team's participation in them
- unit participation – the respective organisational unit receives part of the energy costs saved, e.g., 50% as non-personal benefits, to help cover the general administration costs of running the unit, or for further energy efficiency investments

Combinations are also possible. In "fifty-fifty" projects, in which other individuals, teams or units within the public administration contribute to a more efficient use of energy (e.g., responsible purchasing and/or buildings officers or teams, energy management units, or caretakers of public buildings), it could be considered to reward these individuals, teams or units as well. They could, for example, receive bonuses depending on overall energy efficiency targets reached (e.g., if the fulfilment of these targets is part of a scorecard system with individual or team rewards).

8.12.1 Legal feasibility

In general, legal impediments seem to play a minor role. However, in particular cases, adaptations are required, e.g., with regard to regulations and wage agreements, which do not allow personalised bonuses for individuals or teams in public administrations. Furthermore, an important precondition for the implementation of the shared savings concept is the accountability of administrative units for the energy costs they cause, which has not been introduced in every public administration yet.

8.12.2 Effectiveness in overcoming barriers to energy efficiency

Sharing savings arrangements address several specific barriers to energy efficiency in the public sector:

- *Split incentives:* Those groups in a public administration using energy services, are often not directly held responsible for paying the costs for this use. Furthermore, they often do not receive incentives to influence these costs. The shared savings approach gives economic incentives to the users of a building or facility to contribute to a more efficient use of energy by changing consumer behaviour and by developing ideas for further energy conservation measures. The heads of building or product user departments see their budgets increase. Furthermore, shared savings approach could reward procurement officers to reduce the life-cycle costs for the procured products, e.g., by giving them a share in the net cost savings they achieve through energy-efficient procurement. The same is possible for energy managers reducing the total energy costs of buildings through their actions.
- *Lack of motivation:* The extrinsic and/or intrinsic incentives of a shared saving scheme motivate the users to think about ways how to improve energy efficiency in their public administration.
- *Lack of investment culture:* The shared savings approach contributes to the creation of an investment culture by spreading economic thinking. Furthermore, teams or units participating in energy cost savings receive extra money, which can be invested, e.g., in further energy efficiency improvements.
- *Lack of funds:* The heads of building or product user departments see their free available budgets increase through shared savings approaches. They will thus be more apted to using funds for energy efficiency measures.

8.12.3 Synergies with other policy instruments

For the implementation of shared savings schemes, it is necessary to monitor energy consumption in every public administration unit and to verify energy savings. Furthermore, information and knowledge on energy savings potentials and possible measures have to be available. Therefore the following activities which establish, improve or support energy efficiency management in public administrations are helpful:

- setting up targets for energy efficiency and rules for monitoring their fulfilment in public administrations
- continuously providing comprehensive information and services on energy efficiency to public administrations
- establishing a unit in every public administration, which is responsible for metering/energy monitoring /collecting energy consumption data and for calculating energy savings ("energy watchers", energy efficiency management units)
- improving the availability and quality of energy data in municipalities and public institutions
- improving energy metering/monitoring systems;
- supporting the development and operation of measurement and verification standards and tools
- introducing the accountability of administrative units for the energy costs they cause

8.12.4 Treatment in a Directive on energy efficiency in public administrations

A possible EU Directive on energy efficiency in public administrations should require the Member States and the EU institutions to promote the shared savings or individual bonus incentive schemes, which give an incentive to individuals, teams or organisational units to develop energy-efficient improvement proposals, to change energy consumption behaviour and/or to implement energy conservation measures/energy-efficient procurement decisions within the public sector.

8.12.5 Actions for national implementation of the Directive

Communication, motivation, networking
The following actions are proposed: dissemination of best practice incentive schemes/bonus schemes by group-specific information material, use of internet, use of existing networks.

8.12.6 Elimination of legal, administrative and organisational barriers

It is necessary to improve the compatibility of the shared savings concept with existing regulations and administrative structures by:

- introducing or improving the accountability of administrative units for the energy costs they cause
- removing or changing laws, regulations and wage agreements which do not allow (and introducing regulations which do allow) bonuses for individuals or teams in public administrations

8.12.7 Accompanying activities

Finally, the awareness for energy matters has to be strengthened and ideas how to save energy/energy costs have to diffuse into the various social and institutional structures before becoming relevant options.
Policy support should aim at:

- training procurement officers/"energy watchers" (by supporting "Train the trainer" seminars, etc.)
- provision of information on least-cost procurement options/options for energy efficiency measures
- establishing programmes, which give support to on-site "energy savings weeks" with energy experts (e.g., from energy agencies) as starting events to implement energy savings measures and shared saving schemes in public administrations

8.12.8 Actions and resources needed by each public administration

Shared saving schemes are very popular and effective in providing incentives to users of a building or facility to change their energy consumption behaviour. However, the transaction costs, i.e. the resources needed for introducing and running such a scheme, should not be underestimated:

- the scheme has to be developed, i.e. adapted to the specific circumstances, introduced into the public administration and continuously controlled and advertised
- participants have to be found and 'contracts' with the participating users have to be concluded, which include agreements on the energy consumption baseline, the measurement and verification procedures and the calculation of the rewards, i.e. the part of the energy cost savings which remains with the users
- annual metering and billing are needed
- the users need information on energy efficiency potentials and possible measures. For some measures, technical assistance is needed (e.g., special metering devices). Furthermore, it is useful to provide training to key persons of the participating user groups.
- finally, the users spend time on learning about the scheme and possible measures, and for planning and implementing measures in the building or facility they use

To illustrate this, in the City of Hamburg, a board of seven people is controlling the local "fifty-fifty"-project in schools. The "fifty-fifty"-project group responsible for the operation of the project consists of ten persons. Six people in this project group inform the more than 400 local schools about energy and water efficiency potentials and possible measures (one gives advice on waste management). The total annual working time of these seven advisers is 4.1 years.

Similar effort may be needed for other shared-savings approaches, e.g., targeting procurement officers of energy managers. Synergies are therefore possible, if energy monitoring, information dissemination, and other policy instruments proposed here are already in place.

8.12.9 The role of the policy instrument in a European pilot action

"Fifty-fifty"-projects in schools have already been quite common, so another pilot action does not seem appropriate. For the extension of such schemes to the user communities of all public buildings within an administration, a European pilot action may be useful in order to disseminate the idea. First experiences exist, e.g., in Frankfurt am Main and Munich. Bonuses for purchasing and/or building officers should, maybe, first be tested in individual administrations, before a European pilot project is started.

8.13 Bringing energy efficiency to outsourcing

There is a trend for public administrations to outsource public services (for example street cleaning) and its own service provision (for example office space winter comfort).

The incidence of energy costs on the total costs of service provision varies significantly from relatively

high (for example in the case of public street lighting) to relatively low (for example in the case of canteen provision).

Service contracts require effort to develop, requiring parties to define, amongst other things, service provision, service measurement, responsibility for energy costs and responsibility for investment in infrastructure.

Service contracts should balance the many requirements of service provision with the necessity to improve the energy efficiency of the building stock, building systems (for example HVAC and lighting), and products owned or utilised by the contracting public administration.

Introducing energy-efficiency into tenders and contracts to require cost effective measures to improve energy efficiency can do much to overcome a number of barriers to energy efficiency which presently characterise these contracts.

8.13.1 Legal feasibility

Problems in application should be practical rather than legal, for example in relation to the means to finance the efficiency improvements or the lack of skills amongst some service providers to evaluate the requirements.

It is important to underline that the requirement to introduce energy efficiency improvements should be applied to all service contracts. Thus, a providermay be required to evaluate the possibilities to use more energy-efficient cookers. Though it is likely that the provider will have to rely on outside skills to evaluate energy savings potentials, there really is no logical reason to object to the requirement.

The provision of standard contractual texts will reduce the possibilities for contentious disputes between contracting and contracted parties.

8.13.2 Effectiveness in overcoming barriers to energy efficiency

Generally, service contracts do not explicitly call upon service providers to improve the energy efficiency of public sector infrastructure (building stock, building systems and products) falling under the management of service providers.

Where investment and energy costs fall under the single responsibility of the service provider, the belief is that the provider will introduce all cost-effective measures to improve energy efficiency considering that with a fixed income, the provider will attempt to maximise profit margins by reducing costs through the optimal choice of investment and running costs. However, there are a number of reasons why providers do not undertake all cost-effective measures :

The pay back time of many cost effective measures may be longer than, or close to the length, or the contract, but short compared to the useful lifetime of the measure.

Providers will attempt to maximise profits considering their entire client base. Managerial time and resources spent by managers seeking marginal, but nevertheless profitable energy improvements, in one public administration may offer higher profit margins if spent, with another client.

Service providers tend to introduce technologies with which they have matured experience and for which they have readily available spare parts in stock and established contacts with suppliers, even though these technologies may not be the most efficient.

There is inadequate knowledge of efficient solutions amongst providers.

In other contracts, the responsibility for covering energy and investment costs may be divided between the contracting (the public administration) and the contracted parties (service provider). This mostly results in "split incentives" to improve energy efficiency, where the party charged with investing in improved infrastructure obtains no direct financial rewards (due to energy and hence economic savings) from its actions. There are generally "split incentives" to improve energy efficiency between the owners and the renters of office space, where the owner has little interest to introduce improvements which provide energy savings to the renter. Contracts should therefore aim to overcome such split incentives through well-defined actions and responsibilities.

Requiring service contracts to explicitly recall the requirement to implement cost effective energy efficiency improvements, can do much to redress these problems.

8.13.3 Synergies with other policy instruments

The present requirement in part depends upon, and in part completes the requirements set out in the policy instruments for energy efficiency specifications and LCC for products and buildings (see Section 8.4 and 8.5):

- calling upon service providers to respect the there proposed Purchase Specifications and minimum performance standards
- ensuring that the public administration does not abdicate its responsibilities to improving energetic productivity by outsourcing services

Other policy instruments that bring energy efficiency to outsourcing are:

- policy targets for energy efficiency in public administrations, which give priority to this action
- continuous provision of comprehensive information and services on energy efficiency to public administrations, which can, e.g., provide standard contract provisions for bringing energy efficiency to outsourcing, along with the energy efficiency specifications
- energy (efficiency) management units, because they can take care of bringing energy efficiency to outsourcing in the buildings sector
- energy efficient procurement information desks (see

Section 8.7), who can take care of bringing energy efficiency to outsourcing in the procurement sector
- sharing savings, with the contractors
- linking energy efficiency and public administration reform, because it increases the benefits of building users from energy cost savings in optimised service contracts

8.13.4 Treatment in a Directive on energy efficiency in public administrations

The planned EU Directive should require Member States to place obligations on public administrations to make **explicit requirements** to introduce cost-effective measures to improve energy efficiency into service contracts.

Cost-effectiveness should be defined considering the extra cost of the efficient measure, with respect to the alternative standard solution, and the consequential annual savings in energy costs. Cost-effectiveness should only consider the extra cost of the measure and the price of energy paid by the party responsible for delivering the service. Cost-effectiveness **should not** be influenced by the division of responsibilities between the contracting and contracted agent for covering the different service costs (investment and energy) or the length of the contract.

In the case of building stock and systems and public lighting, cost effectiveness should be defined as all those actions in which the extra cost of the efficient solution, with respect to the standard solution is repaid from economic savings during its technical lifetime, as defined by common national or EU standards.

A Directive should cover the following items:

- List, in the call for tenders, the energy consuming elements of the infrastructure (building components and products), which the service provider will be called upon to manage, and identify the possible measures to improve energy efficiency. The call should also identify other elements of infrastructure, which, though not directly consuming energy, influence the quantity of energy required to deliver the service, and again identify those measures which could lead to improved energy efficiency. (See note 1 below)
- Award contracts, all other things equal, to those bids that define an intervention programme, which identifies the largest cost effective **energy** savings. (See note 2 and note 3, below)
- Ensure that service providers define an intervention programme based on an updated analysis of cost effective efficiency improvements, at least every five years.
- Ensure that all building components and products purchased by the service provider for use by the public administration respect the component and product purchase specifications (see Policy instrument "Energy efficiency specifications and LCC methods for buildings", Section 8.5) applicable to purchases directly undertaken by the public administration.
- New contracts for renting **existing** office space must ensure that the buildings respect the minimum performance standards for **refurbished** buildings which apply to public sector owned property.
- New contracts for renting **new** office space must ensure that the buildings respect the minimum performance standards for **new** buildings which apply to public sector owned office property.
- Renewed contracts for office space must ensure that all future maintenance is carried out in line with the purchase specifications for building components applicable to purchases undertaken directly by the public administration, and that building refurbishment meets the respective minimum performance standards.

Additional notes

1. Winter space comfort service provision should consider both improvements to the heating system and improvements to building shell insulation.

2. Service providers should provide an appraisal of the cost-effectiveness of each potential action identified in the bid and define a realistic programme, by which these cost-effective measures could be introduced within the time scale of the contract, considering, for example, the resources of the provider and its potential to finance the actions.

3. Punitive financial clauses should guard against service providers not realising the actions in accordance with the proposed plan.

8.13.5 Actions for national implementation of the Directive

The proposed requirement obliges a tendering public administration to face a number investment costs, that it otherwise could potentially avoid by maintaining in-house service provision.

For example, following the proposed requirement, a provider, bidding for a five year heating service contract (with coverage of energy and investment costs), will be obliged to consider improvements to systems and building structures (for example improved insulation) over ten years. Unless there are considerable economic gains to be made in the initial contractual period, which the provider can use to cover the required ten year payback measures (which for the provider are loss making), these latter investment costs will be passed onto the public administration in the provider bid.

The consequence of this maybe that outsourcing could increase short term costs of providing a service, compared to the (present) in-house alternative, though over the long term, total costs will be reduced. There may be political or financial pressure to chose against large energy saving (high investment) bids. The following should help guard this:

Definition of standard procedures
Member States should:

1. Identify the energy efficiency measures contractors should evaluate in the bidding process.
2. Define the terms of cost effectiveness for each measure (i.e. the minimum payback period, the required Internal Rate of Return, or Net Present Value).
3. Define standard procedures for determining cost effectiveness, including for example tabulated efficiencies of equipment, standards operating hours and maintenance costs. This makes the evaluation process transparent.
4. Define standard contract texts

Points 1, 2 and 3 are essential to ensuring compliance with the requirement. Considerable experience (for example from Italy), shows that placing the legal requirement on public administrations to introduce efficiency measures, but not providing the tools by which contracting and contracted agents can identify and evaluate what these are, does not lead to any tangible improvement in public sector energetic productivity.

8.13.6 Actions and resources needed by each public administration

Bringing energy efficiency to outsourcing contracts will need some resources in facilities departments, energy (efficiency) management units and procurement offices. On the other hand, outsourcing saves resources that would otherwise have been necessary for implementing the energy efficiency actions by the public administration itself. A net economic benefit from the energy cost savings can therefore be expected.

8.13.7 The role of the policy instrument in a European pilot action

The field of outsourcing is so wide and dispersed that including it as a specific point into a European pilot action is not deemed appropriate.

8.14 Linking energy efficiency and public administration reform

In the common traditional management model in public administrations, tasks and (the allocation of) competences/resources to fulfil the task and responsibilities, are often separated from each other. Therefore, administrative processes are often not very transparent, efficient and effective. Although there is the principle of economic behaviour and of cost-effectiveness, and although the administration as a whole has an incentive to save energy costs, there is no real economic incentive for the different actors in the traditional management model – e.g., the user department, the purchasing or construction offices, the financial authorities who have to free the money for investments (Note: the management models are described in more detail in Chapter 6 and in the German Country study, provided in a separate PROST Appendix volume).

However, since the early 1990's, general management models of public administrations have been changing. In the course of these restructuring efforts, there are efforts to reduce bureaucracies, administrative entities are being re-organised and tasks, competences and resources re-defined and allocated differently. New management and controlling instruments are being introduced to reform public administrations towards increased (economic) efficiency, thereby changing administrative culture and activities. Two perspectives of the reform processes have to be distinguished:

- *Increasing (internal) efficiency:* Increasing the efficiency of the internal administrative processes, i.e., acquiring resources more economically and using those resources more efficiently (input-output). This perspective concentrates on realising cost saving potentials, while the outcomes, i.e. the effects on society of goods and services provided for the citizens, are not put into question.
- *Increasing (external) effectiveness:* Increasing the effectiveness of achieving the outcomes demanded by the public (output-outcome). This perspective looks more on the strategic orientation, the strategic and operational targets, the outputs, i.e., the goods and services which government entities provide for their citizens, and the effects these outputs have on environment and society.

Both perspectives are needed to improve the performance of a public administration, e.g., with the help of performance management systems[4]. However, the internal efficiency perspective appears to dominate in current reform processes.

By being aware of the need to improve the management of energy efficiency, the general changes introduced by new public management can be used as a vehicle for that. Table 8.1 gives an overview of the possible links between energy efficiency and typical elements of new public management.

In many administrations precisely defined "products" have already been implemented, i.e. identified outputs (goods and services) produced by the different administrative units, as well as agreements on (operational) targets (e.g., between the management and the unit heads), budgeting, cost accounting and controlling systems have already been implemented.

With the introduction of the "global budgeting", the

[4] **A system, integrated with corporate management, of performance information, evaluation, performance monitoring, assessment and performance reporting (OECD Working Definitions 2002, www.oecd.org). Such a performance management system was introduced, for example, in the Danish central government in 1992 (Thorn/Lyndrup 2002). Three fourths of all OECD countries routinely include performance data in their budget information. However, only in some countries this includes performance targets (e.g., in Canada, the UK and the US), and only in Canada, the performance data is audited (OECD 2002).**

economic incentive for individual departments to save energy (costs) is increasing. Improving energy efficiency can become highly attractive for the departments by introducing unrestricted transferability of funds within budgeting periods, and unrestricted transferability of funds saved through good management across budgeting periods.

Cost accounting systems[5], which are implemented on the overall administration level, as well as on the unit level, can lead to increased efficiency (cost effectiveness, energy efficiency), by allowing a detailed monitoring of costs and cost-effectiveness of products, processes, liabilities (e.g., pension reserves) and short and long life assets.

Measurement-based management and controlling instruments like the "balanced scorecard"[6] are generally introduced to measure and manage performance more effectively. They also help to clarify the strategy and targets of the administration and to translate them into action via defining tangible objectives and measures within a broad communication and learning process. In a similar manner, sustainability controlling and management instruments like the sustainability balanced scorecard systems can be developed, which define, among others, environmental indicators and targets for energy efficiency improvements or emissions targets, and give incentives to reach the targets.

8.14.1 Legal feasibility

In principle, linking energy efficiency with the different elements of public administration reform is legally feasible. However, the formal and legal aspects of these links are not always clear, e.g., if there are conflicting aims to be considered. These rather stem from the legal framework, such as general procurement legislation, than from the public administration reform itself. Therefore, in particular cases, adaptations and clarifications of the elements of public administration reform are required, but are assumed to be feasible.

8.14.2 Effectiveness in overcoming barriers to energy efficiency

As it has been explained before, public administration reform can be used as a vehicle to improve the management of energy efficiency. In this way, it can increase the chances to overcome barriers to energy efficiency in the public sector:

- *Insufficient priority:* If energy efficiency is considered and linked to the elements of public administration reform, energy efficiency gets a higher priority, e.g., when energy efficiency targets are included into the general target system of the administration.
- *Split incentives:* Public administration reform increases accountability, clarifies responsibilities and provides economic incentives to reduce (energy) costs to all units. However, a precondition for using these advantages for increasing energy efficiency is to have not only the responsibilities and incentives, but also the competences and resources to implement energy efficiency instruments and measures.
- *Lack of motivation:* On one hand, linking energy efficiency to public administration reform can provide new intrinsic and extrinsic motivation to increase economic efficiency and energy efficiency. On the other hand, there is the danger that the personnel is overcharged with these changes, which may reduce motivation. Therefore, information, communication and qualification measures should not be neglected.
- *Lack of investment culture:* With public administration reform, economic aspects of administrative processes are increasingly considered. Modifying the framework, the structures and processes to increase economic efficiency, involves a change in culture and activities, which makes it easier to invest into cost-efficient energy efficiency measures.

8.14.3 Synergies with other policy instruments

Global budgeting, cost accounting and sustainability controlling/management instruments can help to support the introduction of other (economic) instruments (as proposed elsewhere in this document), such as shared savings schemes, PICO, energy management. Global budgeting and cost accounting are sometimes even necessary preconditions for the implementation of these instruments. Global budgeting and cost accounting are, however, usually not sufficient for improving energy efficiency without the specific information, management, and financing facilities (such as internal energy efficiency funds, performance contracting, and PICO) that the specific energy efficiency instruments proposed by the PROST study provide.

The following other policy instruments can help to improve the link between energy efficiency and public administration reform:

- If energy management units and procurement information desks exist or are created, their staff will have

[5] Cost accounting is a tool that provides information to decision-makers in assessing public administrations operating performance from a financial perspective. Cost accounting helps achieve the following objectives: 1. Determine the costs of specific services, programmes, and activities. 2. Understand the composition of these costs and what the cost drivers are. 3. Determine the efforts and accomplishments associated with programmes and delivery of services and their changes over time in relation to costs. 4. Measure the efficiency and effectiveness of the organisation's management of services, programmes, and assets.

[6] The balanced scorecard is a management system (not only a measurement system) that enables organisations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve centre of an enterprise. A good explanation ("What is the Balanced Scorecard?") can be found at the website www.balanced-scorecard.org/basics/bsc1.html.

Table 8.1 Possible links between energy efficiency and elements of new public management

Element of new public management	Link to energy efficiency
Vision and mission, strategy, targets and indicators	Including energy efficiency targets in vision and mission, strategy, target systems and performance management systems (performance indicators, etc.).
Review of tasks, definition of requirements	Considering energy efficiency aspects in procurement, production and distribution of goods and services.
Outputs/Products (goods and services)	Including energy efficiency criteria into the process of developing goods and services and into the description (definition) of goods and services produced.
Agreements on (operational) targets	Including, where appropriate, energy efficiency targets within the general agreements with (heads of) units on (operational) targets to achieve.
New organisation structure	Considering possibilities for energy efficiency measures in the different administrative units. If necessary, creating new organisational units and responsibilities with respect to energy efficiency.
Optimising administrative processes (business re-engineering)	Considering energy efficiency criteria in the administrative processes.
Global budgeting (decentralised budget responsibility)	Setting the framework, within which profitable energy efficiency measures that reduce life cycle costs can be realised .
Cost accounting	Implementing rules for monitoring and allocating saved (variable) energy costs, and thus for balancing these cost savings with the costs of investments in energy efficiency improvements.
Monitoring	Evaluating in how far energy efficiency criteria are being considered, and energy efficiency targets are being met. Including into the reports (reporting system) in how far energy efficiency targets have been reached.
Personnel Management	Taking responsibility for energy efficiency aspects by the management. Increasing the energy efficiency knowledge of the personnel (qualification).
Performance incentives	Providing incentives to fulfil energy efficiency criteria: a system of bonuses and maluses within the resource allocation system.
Competition, benchmarking	Comparing different organisational units or different administrations with respect to achieving improvements in energy efficiency. Contests, rewards.

Source: Wuppertal Institute/ifv 2002

the task, the responsibility and the (sometimes limited) resources to identify possible instruments and measures to improve energy efficiency. In this way, these units can look for chances to link energy efficiency with the elements of public administration reform.
- If energy efficiency targets are set, they will have to be considered, for example, in the strategies and target systems, in the agreement on targets and in the controlling systems developed in the context of public administration reform, and thus contribute to improving the link between energy efficiency and public administration reforms.

8.14.4 Treatment in a Directive on energy efficiency in public administrations

A possible EU Directive should require the Member States and the EU institutions to promote the link between energy efficiency and these and other instruments of administration reform, more specifically: the principle, that every unit in a public administration should be accountable for the energy consumption/ costs it causes, and that public administrations set clear and measurable energy (cost) savings and emissions targets (cf. the analysis on policy targets).

On a more general sustainability level, another EU Directive that requires the Member States to align their policies much more according to sustainability targets and to promote the introduction of sustainability targets in performance management schemes of public administrations is desirable . In this context, the Member States could be required to promote the introduction of sustainability management and controlling systems in the context of administration reforms.

8.14.5 Actions for national implementation of the Directive

This is largely beyond the scope of our analysis, since it concerns the general reform of the public administrations throughout the EU. However, the national policy in the Member States should promote the link between public administration reform and energy efficiency, and disseminate information and good practice through the national information centres and the procurement desks within each public administration (cf. Section 8.3 and 8.7).

8.14.6 Actions and resources needed by each public administration

Formal and legal aspects are not the main barrier to linking energy efficiency to public administration reforms. The problem is, that often the persons and units within a public administration supporting and introducing elements of public administration reforms, are not the same as the persons and units supporting and introducing instruments and measures improving energy efficiency. The persons and units implementing public administration reforms often purely concentrate on economic aspects of these reforms in the short-run. In many cases, they do not have the knowledge, the motivation and the incentive to link the reform with energy efficiency.

Therefore, intensive information and communication with the decision makers within the public administration responsible for the reform elements is needed, and should not be neglected. To address these decision makers successfully, support by key persons in politics and management (e.g., by the mayor) is helpful and often needed.

An effective link of public administration reform not only with energy efficiency but with sustainability in general requires (cf. OECD 2002a):

- a common understanding of the sustainability concept and its benefits, and of the sustainability targets introduced within the public administration
- clear commitment and leadership of the decision-makers in the administration and of key persons in politics, and communication of this commitment
- specific institutional mechanisms and specific design of the elements of the reform process to steer integration
- effective stakeholder involvement
- efficient knowledge management

8.14.7 The role of the policy instrument in a European pilot action

Such general administration reform, or even specific actions to link it to energy efficiency, is probably beyond a European pilot action targeting energy efficiency. The main reason for that is in our view that the situation regarding the status of the reform is too diverse between public administrations.

8.15 Barriers addressed and synergies

8.15.1 From barriers to tools

Table 8.2 summarises how the various policy tools can help to overcome the barriers that have been identified in the PROST report.

8.25.2 Synergies between policy instruments

Figure 8.5 (p. 91) provides a simply overview of synergies between the various policy instruments.

Table 8.2

Barrier	Goal	Instrument*
Insufficient priority	Setting EE on the agenda; clear, specific policies and concrete guidelines at all levels	8.2, 8.3, (8.4), (8.5), 8.6, 8.13, 8.14
Lack of information Too much and unclear information Legal uncertainty	Easy access to sufficient relevant information	8.3, 8.4, 8.5, 8.6, 8.7, 8.8**
Split incentives	Increased economic incentives; increased autonomy of the different levels of the public sector; defining accountabilities/responsibilities	8.7, 8.8, 8.9, 8.12, 8.14
Lack of motivation Lack of investment culture	Creating an investment culture	8.2, (8.3), (8.4), (8.5), 8.7, 8.8, 8.14
Complexity of public procurement	Easing procurement procedures; creating energy efficiency specialist units (i.e., energy management units and EE procurement information desks)	8.3, 8.4, 8.5, 8.6, 8.7***
Lack of funds	(Setting priorities and/or) finding other ways to finance investments	(8.2), 8.9, 8.10, 8.11, (8.13)
Lack of personnel resources and time	Setting priorities, dedicating special resources and/or using staff resources and time more effectively to realise EE potentials	(8.2), 8.3, 8.6, 8.7, 8.8, 8.10, 8.11, 8.13

* Policy tools and the sections where they are found

8.2 Policy targets
8.3 A co-ordinated network of national public sector energy efficiency information centres
8.4 Energy efficiency specifications and life-cycle cost methods for products
8.5 Energy efficiency specifications and life-cycle cost methods for buildings
8.6 Helping buying agencies supply energy efficient products
8.7 Energy efficient procurement information desks within public administrations
8.8 Energy efficiency management units
8.9 Energy efficiency budgets
8.10 Third-party financing and energy performance contracting
8.11 Public internal performance contracting (PICO)
8.12 Sharing savings
8.13 Bringing energy efficiency to outsourcing
8.14 Linking energy efficiency and public administration reform

** The PROST report mentions simple examples of available tender documents; tools and data on the product level at issue.

*** The PROST report furthermore mentions E-commerce.

Figure 8.5

Synergies between PROST policy tools

	8.2 Policy targets for energy efficiency in public administrations	8.3 A netwrok of national public sector energy efficiency info centers	8.4 Efficiency specifications and LCC for products	8.5 Efficiency specifications and LCC for buildings	8.6 Making buying agencies more energy-efficient	8.7 Energy efficient procurement information desks within PAs	8.8 Energy efficiency management units	8.9 Energy efficiency budgets	8.10 TPF / Energy performance contracting	8.11 Public internal performance contracting (PICO)	8.12 Sharing savings	8.13 Bringing energy efficiency to outsourcing	8.14 Linking energy efficiency and public administration reform
8.2 Policy targets for energy efficiency in public administrations													X
8.3 A netwrok of national public sector energy efficiency info centers	X		X	X	X	X	X						
8.4 Efficiency specifications and LCC for products	X	X		X	X								
8.5 Efficiency specifications and LCC for buildings	X	X	X										
8.6 Making buying agencies more energy-efficient	X	X	X										X
8.7 Energy efficient procurement information desks within PAs	X	X	X	X				X	X	X	X	X	X
8.8 Energy efficiency management units	X	X	X		X						X	X	X
8.9 Energy efficiency budgets	X	X		X		X							X
8.10 TPF / Energy performance contracting	X	X		X		X				X			X
8.11 Public internal performance contracting (PICO)	X	X		X		X			X				X
8.12 Sharing savings	X	X				X	X						X
8.13 Bringing energy efficiency to outsourcing	X	X	X	X		X	X				X		X
8.14 Linking energy efficiency and public administration reform	X			X			X						

9. Life-cycle costs, performance standards or purchase specifications?

Earlier in this report it was demonstrated by many good examples that energy efficiency in public purchasing and buildings is usually cost-effective. This is to be understood in the sense that the energy-efficient solution has lower life-cycle costs than an inefficient solution or the current state of a building, and hence is the economically most advantageous solution. But how can this economically most advantageous solution be determined in the day-to-day public procurement and building management? Particularly, can it be achieved in an easier way than calculating the life-cycle costs of all alternatives each time a choice is made? What we are looking for are therefore tools that help to overcome the many barriers for energy-efficient procurement and building management.

For agencies seeking to implement energy-efficient purchasing, a primary barrier is the lack of data and technical specifications on energy-efficient products. Other obstacles include the lack of time to research energy performance and concern about the cost of high-efficiency products. Vendors are often the primary source of product information, despite strong preferences for independent sources of information.

9.1 The three main technical tools to improve energy efficiency

Improving the energy efficiency of public administrations requires providing the right amount on information to the right people at the time needed. Three tools can offer an important contribution in this sense.

1. life-cycle calculation methods
2. product and building component purchase specifications
3. building performance standards

9.1.1 Life-cycle costs

Life-cycle costs (LCC) considers all relevant costs over the lifetime of appliances, building components and solutions. LCC takes into account first costs (purchase price, installation costs) and future costs (energy costs, operating costs, maintenance costs and/or disposal costs) over the lifetime of appliances, components and solutions. LCC costs reflect the total consumer expenses over the life of an appliance and capture the trade off between purchase price and upcoming operating expenses. LCC allows the *economic advantages of efficient solutions* to be compared objectively with inefficient alternatives.

Life-cycle costs are defined by the following equation:

$$LCC = C_o + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

where:

C_o = purchase price (Euro), including installation costs

$\sum$ = sum over the lifetime of the appliance, from year 1 to year n, where n is lifetime of the appliance (years)

C_t = annual operating and running expenses (Euro), which include costs for maintenance, costs for energy, costs for other resources (e.g. water) and disposal costs

r = Discount rate

In theory, this formula should not be used in cases where two or more building components or systems with different life-expectancies are compared with each other. However, most efficient components/solutions last at least as long, but generally longer, than inefficient alternatives. That is, efficient solutions which offer the least LCC costs, also generally offer equal or better service levels (longer lifetime) than inefficient alternatives and should therefore be chosen. However, in cases where the lifetime of the efficient component/solution is less than that of the inefficient solution, the comparison should be made based on annuities instead of net present values. The following formula should be used:

annuity A = LCC * r / $[1-(1+r)^{-n}]$.

LCC *methods* provide standard evaluation procedures of LCC for purchase decision makers. LCC methods offer standard transparent appraisal procedures which can be used by all those involved in appliance and "building" procurement to *identify* and *evaluate* efficient appliances, building components and integrated building solutions.

One relevant factor influencing decisions based on LCC is risk and uncertainty. Thus, for comparing different purchase options, the degree of risk and uncertainty are important factors. The sources of risk/uncertainty are diverse:

- risk of new or innovative technologies
- future changes in market prices
- the integration of new technologies

Therefore, energy-efficient solutions are a kind of insurance particularly against future price increases, which are very likely to appear in the next decades in Europe, when overcapacities have been melted down and capacity shortages will become obvious. This insurance benefit could be deducted from LCC by choosing a negative discount rate in the above formula. For most of the appliances the only "risk" (if any) that needs to be taken into consideration consists in fluctuations in the price for electricity. Energy-efficient appliances thus have a strategic advantage, because these products are often characterised by a higher share of investment costs relative to total costs. This means that energy-efficient solutions are more independent to future price fluctuations and changing market conditions.

9.1.2 Product and building component purchase specifications

Product and building component purchase specifications provide guidance to the purchase decision maker, based on *typical* life-cycle cost calculations of products and solutions. Purchase specifications make the efficient product – not the one with the lowest first cost – the simplest and most acceptable choice to buy. Such purchase specifications should already in the call for tenders restrict the choice to energy-efficient products and solutions, because the typical life-cycle cost calculations have proven that the restricted choice will be cost-effective.

Specifications can explain the physics or mechanics of technologies. However, specifications do not abrogate to the user the final choice between efficient and inefficient solution; Purchase specifications clearly identify the *minimum* acceptable performance level required of products and components. Only in the case of a very big value of a tender, the effort would be justified to perform a life-cycle cost assessment when selecting the winner among those products that meet the criteria, but may still differ considerably in energy efficiency.

9.1.3 Building performance standards

Building performance standards identify the goal of efficient building design for *commissioners* and *designers* of buildings, in terms of for example the energy use per useful floor space (kWh/m^2/year). Energy Performance Standards offer a significant advantage compared to other methods which aim to improve building energy efficiency. For:

Building owners and users:
Performance Standards provide a clear measure of building energy performance which can usually be readily translated into running costs.

Architects and designers
Performance standards provide creative freedom of choice in finding the optimal mix of:

- active technologies: for example artificial lighting systems
- passive solutions: for example spectrally selective glazing and window shading to provide summer cooling

9.1.4 The interaction between the tools

The three tools are complementary:

Ultimately the public administration should procure appliances and building components which offer minimum **life-cycle costs**. However, taking into account the current situation in public administrations, life-cycle costs analysis is mostly cost effective only for large purchases (for relatively large purchases buyers might be expected to spend the extra time to gather data on energy efficiency and purchase prices of alternative products). Nevertheless, it should be a general aim to lowering the threshold for using LCC in the public administrations. Some suggestions of how this can be done are given in Chapter 10. **Purchase specifications** provide a simplified procedure of determining LCC for the majority of small or medium sized purchases. Though useful for appliances, purchase specifications are not able to capture completely the large saving potential offered by improving buildings. **Building performance standards** provide an effective means of addressing the complex issue of developing efficient building systems, from the optimised combination of single component purchases.

The remaining chapters of this part (Chapters 10 and 11) discuss the above themes in more detail. Specifically:

- purchase specifications for products
- purchase specifications components and minimum performance standards in buildings

The essential characteristics of buildings component and appliances purchase specifications are the same, i.e. simple recommendations to direct the choice of a purchase, derived from an ex-ante analysis of the LCC costs of alternative energy efficient and energy inefficient solutions.

However on a number of issues, the task of defining purchase specifications for building components differs from appliances. Specifications for building components must generally consider:

- the absence of a component-specific energy label
- that energy use is determined by the system and not the single component
- that energy use is also affected by geographical location and the climatic conditions connected to it
- that a "passive" solution, i.e., a solution able to fulfil the function without the component in question, may represent the most effective choice

Thus purchase specifications for building components


PEEP

Guidelines and Requirements for Purchasing Ballasts

- *Efficient fluorescent lamp ballasts reduce energy use and saves the public sector money.*
- *By buying energy efficient components and products the public sector makes a concrete contribution to reducing the emission of Green House Gases, helping the EU its Kyoto reduction targets.*
- *By buying energy efficient components and products the public sector pulls the entire market to providing cleaner, higher quality goods and services.*
- ***EU Law requires** that components and products purchased by, or purchased for use by, **MS central governments and their agencies** respect the minimum requirements of PEEP energy efficiency guidelines (EU Directive 2005/.../...).*

Definitions

The table identifies the annual lamp usage at which CELMA Class A2 electronic ballasts and CELMA Class B2 low loss ballasts should be purchased for T8 fluorescent lamps.

System Type (W)	Number fo Ballasts		Low Loss (CELMA Class B2)		Electronic (CELMA Class A2)
	Standard (Low Loss	Electronic	From (hours/year)	To (hours/year)	above (hours/year)
2 x 18W					
4 x 18W					
1 x 36W					
2 x 36W					

Electronic ballasts are d

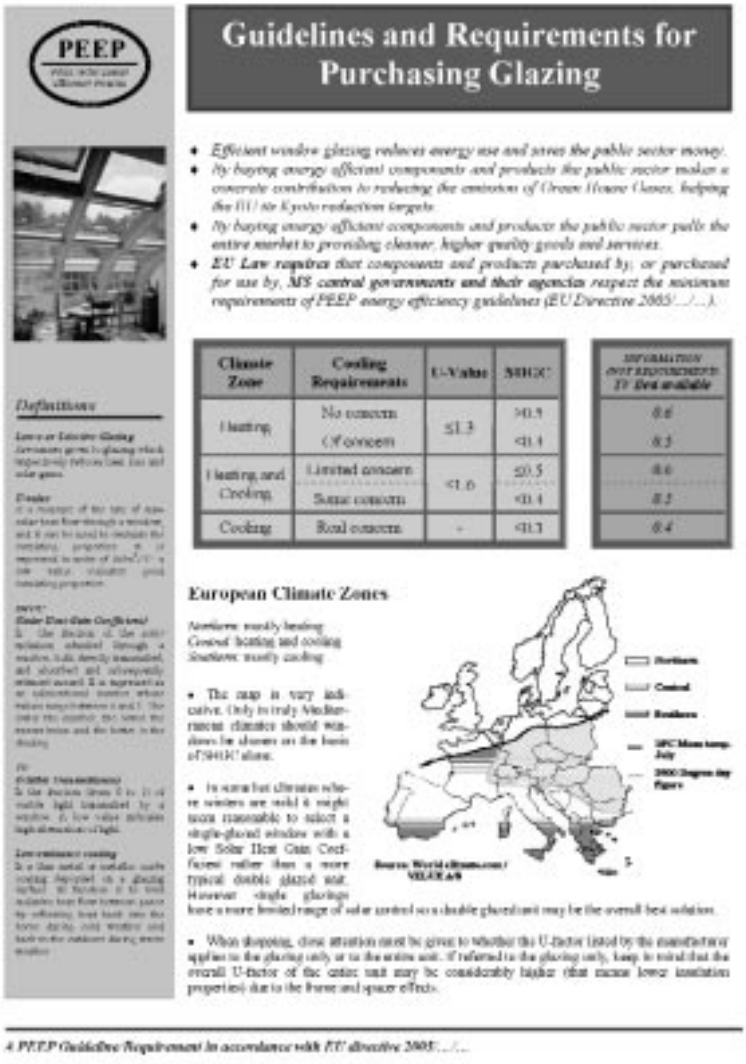
Other advantage of elec

Increased lamp lifetime
ballasts is typically of 1
This reduces both lamp

Have no audible hum

Reduces eye strain whi
- reduces the inciden
- improves worker pr

A PEEP Guideline Requirement in accordance with


PEEP

Guidelines and Requirements for Purchasing Glazing

- *Efficient window glazing reduces energy use and saves the public sector money.*
- *By buying energy efficient components and products the public sector makes a concrete contribution to reducing the emission of Green House Gases, helping the EU its Kyoto reduction targets.*
- *By buying energy efficient components and products the public sector pulls the entire market to providing cleaner, higher quality goods and services.*
- ***EU Law requires** that components and products purchased by, or purchased for use by, **MS central governments and their agencies** respect the minimum requirements of PEEP energy efficiency guidelines (EU Directive 2005/.../...).*

Climate Zone	Cooling Requirements	U-Value	SHGC	[illegible]
Heating	No concern	≤1.3	>0.5	0.6
	Of concern		<0.4	0.5
Heating and Cooling	Limited concern	<1.6	≤0.5	0.6
	Some concern		<0.4	0.5
Cooling	Real concern	-	<0.3	0.4

Definitions

European Climate Zones

Northern: mostly heating
Central: heating and cooling
Southern: mostly cooling

- The map is very indicative. Only in truly Mediterranean climates should windows be chosen on the basis of SHGC alone.
- In some hot climates where winters are mild it might seem reasonable to select a single-glazed window with a low Solar Heat Gain Coefficient rather than a more typical double glazed unit. However single glazings have a more limited range of solar control so a double glazed unit may be the overall best solution.
- When shopping, close attention must be given to whether the U-factor listed by the manufacturer applies to the glazing only or to the entire unit. If referred to the glazing only, keep in mind that the overall U-factor of the entire unit may be considerably higher (that means lower insulation properties) due to the frame and spacer effects.

Northern
Central
Southern

A PEEP Guideline Requirement in accordance with EU directive 2005/.../...

Figure 9.1. Example of how to integrate the information reported in the Prost Purchase Specifications for ballasts (PPS2) with an effective communication package for the public administration. (For a full version of these information sheets, see Appendix 2.)

Figure 9.2. Example of how to integrate the information reported in the Prost Purchase Specifications for glazing(PPS5) with an effective communication package for the public administration. (For a full version of these information sheets, see Appendix 2.)

are considered separately from appliance purchase specifications, but together with building performance standards. As such, Chapter 11 offers a single package for improving building energy efficiency.

Chapters 10 and 11 detail the process by developing specific purchase specifications, which;

i) are based on a objective analysis of life-cycle costs
ii) should coherently be updated in time in a transparent process

Indeed the purchase specifications defined in Chapters 10 and 11 have a temporal validity. Purchase specifications need to be updated periodically in response to changing energy prices, product costs and technological advances. The issue of developing a process by which to provide ongoing maintenance of purchase specifications, performance standards, and LCC tools, is considered under policy instruments.

9.2 Communication packages

Chapters 10 and 11 define a set of purchase specifications for 18 appliance and product categories and 10 building component and systems categories. The proposed specifications can be used by purchaser officers, for example in calls for tenders.

However though the specifications could be delivered to procurement officers in their present form it would be more reasonable and effective to suppose that specifications were delivered as part of a structured communication package.

Figures 9.1 and 9.2 provide an example of how the Purchase specifications for ballasts for linear fluorescent tubes and window glazing (developed in Chapter 11) maylook if integrated into a future communication package for the public administration.

The hypothetical Public Energy Efficiency Programme (PEEP) presents each individual purchase specification (in this case for window glazing and ballasts) on a two page information sheet. Each information sheet:

- highlights the advantages of using efficient products and components in general
- details any regulations requiring purchasing officers to procure efficient products, (the example considers an obligation to purchase energy-efficient products under an hypothetical European Directive)
- details the Component Purchase Specification as defined in Chapter 11 of this report
- provides a photograph of the technology which underlines the concrete nature of the proposed solutions, i.e. products marketed today
- provides an example of typical economic savings derived by following the specifications
- provides a short description of how the technology works (which reduces barriers to use by improving understanding)
- provides links to other sources of information, which offer more detailed explanations to those interested to understand deeper the technology

The complete (hypothetical) PEEP guideline package thus consists of information sheets relative to the entire range of products and building components defined in Chapters 10 and 11.

Obviously the PEEP guidelines in Figures 9.1 and 9.2 merely serve as a visual aid to imagining how the Purchase Specifications defined in Chapaters 10 and 11 could be developed into an effective tool for distribution within the Public Administration. (The prototype PEEP shown in Figures 9.1 and 9.2 are provided in full format as Appendix 2.)

The definition of the exact form of such a guideline package is beyond the scope of this project.

For some products, PEEP could be completed by a calculator on a PEEP web-site, calculating LCC of specific appliances according to the needs of the users, which can be specified online. For example, at http://www.spargeraete.de/ in Germany, the total running costs are shown by default when you type in what kind of appliance you are looking for and how often you will use it. This calculator could be expanded to an LCC calculator. By adding the purchase price (e.g., by allowing to choose between the price recommended by manufacturers and a price inserted freely) and some assumptions for the disposal and maintenance cost, one gets the LCC at a discount rate of 0%. One could even add a little game to create a value for the risk aversity of the user and thus a positive discount rate. It could also provide the option to select a discount rate preferred by the user.

10. Specific energy efficiency criteria and life-cycle costs for products

10.1 Introduction

Chapter 9 of the PROST report discussed general considerations when choosing between efficiency specifications and LCC methods. This chapter deals with specific methods for products and appliances.

In particular the following questions are analysed:

When are specific energy efficiency criteria suitable (based on the existing EU policies with regard to energy efficiency), in order to make an appropriate purchasing decision on products?

When is it necessary and justified to use a life-cycle cost approach, in order to reach an optimal purchasing decision for energy-efficient equipment in procurement?

10.2 Specific energy efficiency criteria for appliances and products

Section 10.2 discusses specific energy efficiency criteria for some groups of and products: domestic appliances and consumer electronics. These two groups of appliances are further discussed under section 10.4 (Lists of appliances and products – LCC versus specifications).

10.2.1 Specific energy efficiency criteria for white goods/domestic appliances

The EU Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances sets the framework for all kind of labelling activities within the EU. The framework directive sets out the way this information should be presented to the consumer in a general way while the specific implementing directives set out the required information for each group of appliances covered by the scheme in more detail.

Up to now implementing directives have come into force for the following appliances:

- electric refrigerators, freezers and their combinations
- household washing machines
- electric tumble dryers
- combined washer-dryers
- dishwashers
- household lamps
- room air conditioners
- ovens

The European labelling scheme is a mandatory scheme and assigns appliances to energy classes from A to G. The A-G scale ranks from the "best" (A) to the "worst" (G). Generally speaking, A-rated appliances represent the high energy-efficiency products available on the market, and life-cycle cost analysis is the backbone of the scheme. Thus, in case of household appliances, A-classification of an appliance is an indispensable criterion for an energy-efficient purchase decision. Studies show that the European labelling scheme is very successful and has a significant impact – since the introduction of the scheme, the European market has clearly shifted towards more energy-efficient appliances. But this shift of the market also makes it necessary to update the energy-efficiency indices from time to time. This is the reason why the A+ and A++ classifications are being introduced in early 2003.

Similar to the European labelling scheme for household appliances, a label scheme for new passenger cars has been introduced. (Directive 1999/94/EC of 13 December 1999 relating to the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars.) The purpose of this Directive is to enable consumers to make an informed choice relating to the fuel economy and CO_2 emissions when purchasing a new passenger car.

10.2.2 Specific energy efficiency criteria for office equipment and consumer electronics

The market for office equipment, in particular for personal computers and peripherals, is a world-wide (global) market dominated by multinational companies. Harmonisation of energy-efficiency requirements and standards is very important not only for public administrations; manufacturers and consumers will also benefit. In the discussion of possible actions to improve the efficiency of office equipment, it was decided to extend the "Energy Star" fromm the US Environmental Protection Agency (EPA) labelling programme to Europe. Thus, an Agreement (Council Decision of 14 May 2001, O.J. NO. L 172 of 26.06.2001) was signed in December 2000 between the US and the European Community. The agreement intends to co-ordinate energy-efficient labelling programmes for office equipment based on the EPA-Energy Star programme over the next five years. Based on this agreement, the EC passed a regulation (Regulation (EC) of the European Parliament and of the Council of 6 November 2001 NO. 2422/2001, O.J. NO. L 332 of 15.12.2001) to introduce the

Energy Star scheme in the Community.

The Energy Star scheme is a voluntary programme. Originally, the Energy Star specifications were met by about 25% of the most energy-efficient equipment available on the market. But as the market for office equipment is characterized by very short product cycles, this is no longer true since a larger share of the products meets the specification. In most European markets the Energy Star specifications represent a kind of minimum standard, which is fulfilled by most office equipment available. This fact shows on one hand that the Energy Star approach is working and influencing the development of the products and, on the other hand, that the criteria have to be updated on a short term basis in order to keep pace with the market development.

Beside the Energy Star activities, the "Group for Energy-Efficient Appliances" (GEEA), a loose co-operation of representatives from European national energy agencies and government departments is working with manufactures on voluntary information activities in the field of energy-efficient home electronics, office equipment and IT-equipment.

In general, the GEEA-label criteria are stricter than the Energy-Star criteria and can be seen as "forerunners" that lead towards future Energy Star requirements. Moreover, the GEEA-label scheme is not limited to office equipment, but includes consumer electronics as TVs, VCRs, DVDs, HIFI-equipment, etc. and other devices such as wall packs and battery chargers. The GEEA-label scheme is dynamically updated, which means that the criteria are revised regularly in close co-operation with manufacturers and industry involved. Hence, the GEEA-label schemes indicate that the appliance fulfilling these requirements have a high energy-efficiency profile.

10.3 Life-cycle costs for appliances and products

Generally in procurement, the initial purchase costs are usually the most decisive factor for selecting an appliance or a product. Operating costs and in particular energy costs are hardly considered in the procurement process. However, the running costs become more relevant, particularly for appliances with many annual hours of operation combined with long product life, such as lighting systems or cold appliances.

If a different procurement methodology would be chosen, a more profitable purchase decision with regard to costs and environment could be done (if rules for an overall assessment of appliances in order to consider life-cycle costs are applied).

The life-cycle cost of the appliance contains the purchase price as well as running costs. Design changes in favour of efficiency may increase the purchase price but at the same time provide so large savings in running cost of the life of the appliance, that the total life-cycle cost becomes lower. The minimum life-cycle cost is also known as the economic and technical energy savings potential level in most European studies. Often, this life-cycle cost is quite similar over a broad range of energy efficiencies and there is also room for interpretation that allows the assumption of the highest energy efficiency improvement possible. Furthermore, this life-cycle cost is often only slightly lower that that of the average model on the market (the reference model). (Note: LCC principles are discussed more in detail in Chapter 9.)

The following sections discuss life-cycle cost principles vs. energy efficiency specifications in more detail. When discussing *cost-effective* products, we mean that the extra purchase cost is recouped by the lower running costs to the consumer. By *feasible* technology we mean that the product represents proven technology, either on the market or very close to being on the market.

Other assumptions are *average usage patterns, current prices for electricity, water and equipment* and an *appropriate discount rate*.

The choice, level and the combination of these factors are subject to discussion. Therefore it will be necessary to develop public procurement tools to help procurement agents find the minimum life-cycle costs in a simple way.

The section below provides information about our recommended quantities and assumptions used to calculate life-cycle cost for appliances.

- *Purchase expense:* The purchase expense includes the retail price[1]. For more complex appliances, the installation costs are a relevant cost factor, too. For most of the appliances, energy efficiency and price are not necessarily related; price is often more a function of features and brand name.
- *Lifetime (or product life):* The lifetime is the time a certain appliance is in operation. This can vary strongly between different types of appliances. For household appliances, lifetimes range usually from 12 to 15 years, while for office equipment 3 to 5 years is a reasonable assumption.
- *Usage pattern*: To calculate the life-cycle costs, an "average usage pattern" for all different appliances must be defined, so that the consumption of resources such as energy and water can be estimated. The usage pattern is often estimated as operating hours per year and should reflect the actual usage of the appliances as far as possible. But it must be kept in mind that the average usage pattern can only be an approximation to reality.
- *Energy consumption:* In accordance with standardised

[1] **In general the retail price before taxes (e.g. excluding VAT) is used for the life cycle calculations. This should be done in order to reflect the prices directly related to a certain appliance.**

test procedures, the energy consumption for a specific mode or definite cycle is determined. For most appliances, the energy consumption (including costs for power) is the most relevant factor in order to calculate the life-cycle costs.

- *Electricity prices:* The electricity price (EuroCent/kWh) used in the life-cycle calculation should include future trends.
- *Discount rates:* Future operating expenses are discounted to the time of purchase, and summed over the life of the appliance. In order to assess all costs spent over the product life, adjustments must be made to place all values on a comparable basis. However, the question of the appropriate discount rate for an investment is complex and continues to be a subject of controversy among economists. With regard to the level of analysis and the nature and the objectives of the evaluating organisation, there are micro-economic and macro-economic ways of determining the discount rate (*cf. Oelert/Auer/Pertz 1988*). From a pure business economics point of view, the discount rate should reflect capital costs and alternative investment opportunities (i.e., money has real earning potential over time). Furthermore, the discount rate could take into account specific risks as they have been specified in Chapter 9.1.1 (risk premium). From a societal point of view, there is a moral problem with positive real discount rates: The ultimate consequence is that we give the current generation more rights and possibilities than future generations, because we value current assets higher than future ones. Therefore, in many public projects a real discount rate of 0% or 2% is chosen (*cf. Oelert/Auer/Pertz 1988*). However, since the PA's are more and more behaving like "normal" business companies while working for public welfare, it is recommended to use a slightly higher real discount rate as a compromise, e.g., 3%. The nominal discount rate of 5%, used for the calculations presented in this chapter, is based on a 10-year government bond yield. The European 10-year government bond is published by European Central Bank regularly. In 2000 it was 5,44% and in 2001 it was 5,03%.

10.4 Life-cycle costs versus specifications for each product

10.4.1 White goods and domestic appliances

Cold appliances

Definition

Cold appliances are one of the most electricity consuming appliances in the area of white goods. Cold appliances are used for storing food and beverages at a certain temperature level. Thus, they are classified in categories (1-10), based on temperature levels and type of construction.

1. Refrigerator without low-temperature compartment
2. Refrigerator/chillers with compartment at 5°C and or 12°C
3. Refrigerator with 0-star low-temperature compartment
4. Refrigerator with 1-star frozen food compartment
5. Refrigerator with 2-star frozen food compartment
6. Refrigerator with 3-star frozen food compartment
7. Refrigerator/freezer with 4-star frozen food compartment
8. Upright freezer
9. Chest freezer
10. Refrigerator/freezer with more than two doors or other appliances not covered above

Household cold appliances are covered by the EU label scheme.

Life-cycle costs versus specifications

The analysis of appliance data (see Fig. 10.1) show that there is no significant correlation between LCC and energy efficiency. The main reason for that are the relatively low share of operating costs over the lifetime of a appliance compared to the initial purchase price (in average the operating costs over the life time is about 70% of the initial purchase costs).

Moreover, a high energy-efficiency level has no direct influence to the purchase price of appliances (see Fig. 10.2). This indicates that other features are more relevant "price pushing" factors, e.g. brand name, specific features, design issues, market strategy of companies, etc.

Nevertheless, the analysis show that there are appliances on the market, which are characterised by an high energy efficiency and low life-cycle costs. These kind of appliances are the most interesting for procurement and in particular for public procurement. In order to choose these kind of appliances, it is not effective to use a life-cycle calculation because it does not lead necessarily to an energy-efficient procurement solution[2)] .

In order to achieve an energy-efficient decision in public procurement, a combination of the most decisive factors (energy efficiency and purchase price) can be recommended:

- *Go for a low energy efficiency index:* In particular for cold appliances the energy-efficiency index, which is used for classifying appliances into the energy-efficiency classes (A to G), is a perfect indicator to identify the energy efficient ones. Therefore, as a minimum level, an energy-efficiency index of lower than 0,55 should be chosen. This corresponds to the

[2)] **There are also appliances on the market, which are characterised by low life-cycle costs and low energy efficiency. These appliances show extremely low purchase prices.**

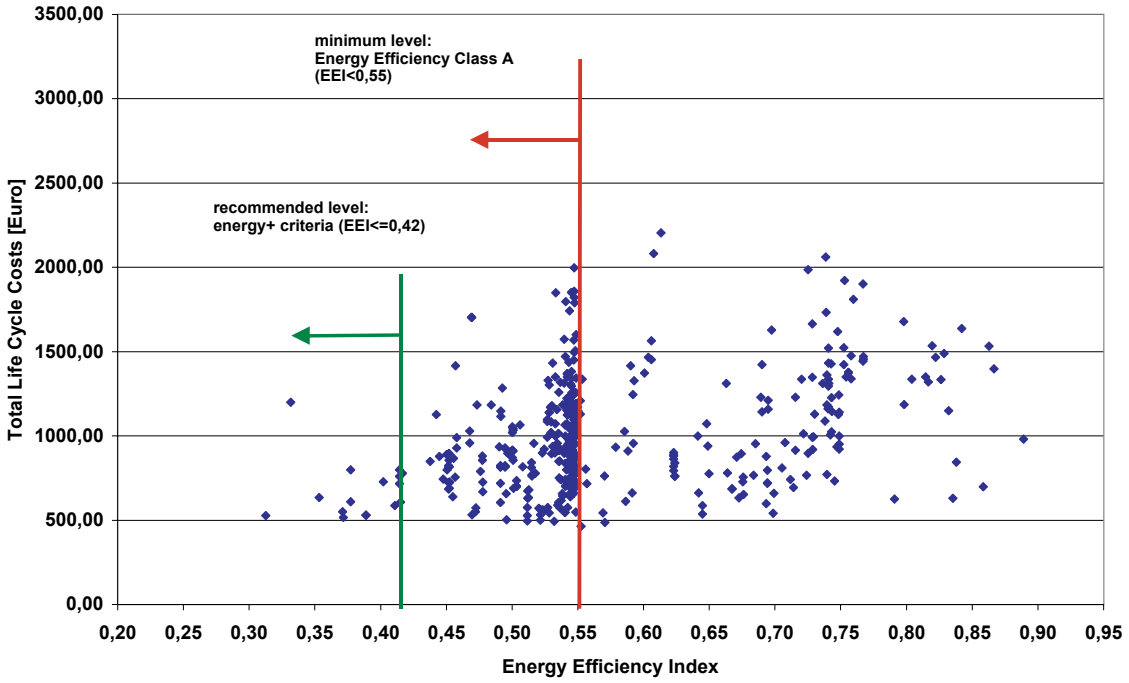


Fig. 10.1: Life-cycle costs versus energy-efficiency index of fridge-freezers (background data: appliances available on the Austrian market, lifetime: 12 years, discount rate: 5%, electricity price: 0,14 Euro/kWh).

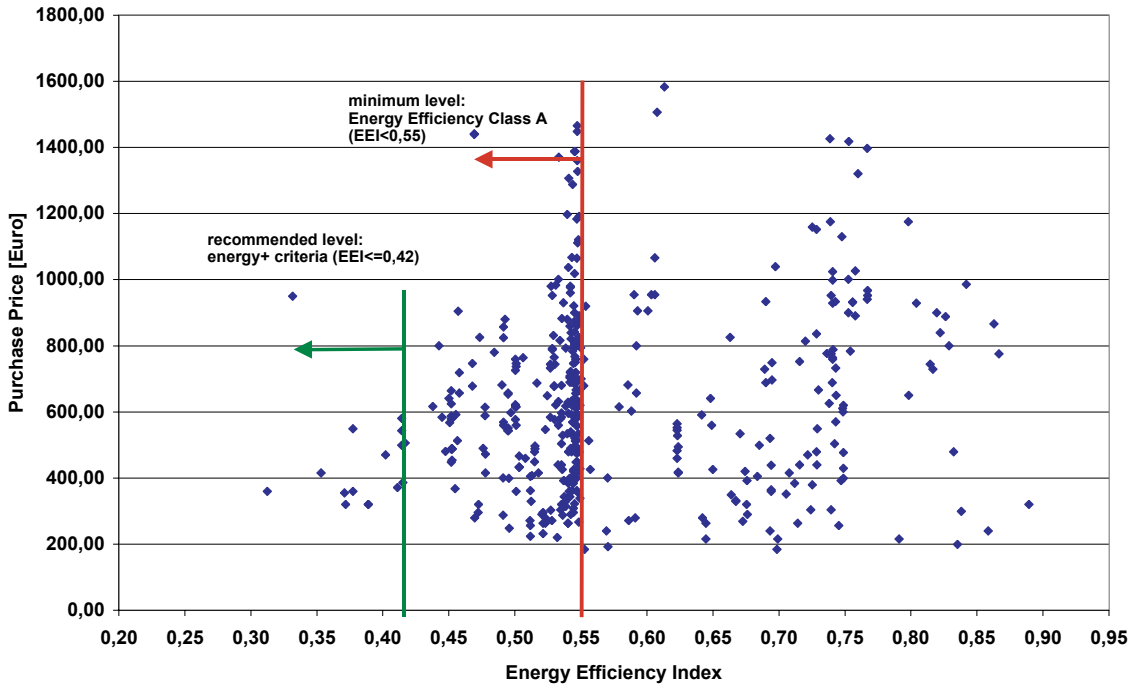


Fig. 10.2: Purchase price versus energy-efficiency index of fridge-freezers (background data: appliances available on the Austrian market, lifetime: 12 years, discount rate: 5%, electricity price: 0,14 Euro/kWh).

threshold for A-rated appliances within the EU-labelling scheme. As a lot of appliances already fulfil this criteria, a stricter level (EEI <= 0,42) is recommended to be used in public procurement. This is the level for energy+ appliances.
- *Go for a low purchase price* among those appliances fulfilling the energy efficiency requirements.

If both factors are combined in public purchasing an energy-efficient solution for an optimal price can be found.

Basic requirements

Minimum requirements: energy efficiency class A (EEI < 0,55)
Recommended requirements: energy+ criteria (EEI <= 0,42)

Washing machines

Definition

Electrical powered household washing machines (clothes washers) are covered by the EU label scheme, while commercial appliances are not. The EU label scheme gives information on energy efficiency, washing and drying performance.

As hot water within the washing cycle is usually heated by electricity, it should be considered if hot water could be taken from other sources (solar, gas, etc.).

Life-cycle costs versus specifications

The analysis of data concerning washing machines (see Fig. 10.3) leads to a similar results as for the cold appliances:
- There is no significant correlation between life-cycle costs and energy efficiency.
- The initial purchase price is dominating the life-cycle costs (in average the operating costs over the life time is about 85% of the initial purchase costs).
- A high energy-efficiency level has no direct influence on the purchase price of appliances (see Fig. 10.4).
- Life-cycle calculation it is not effective, because it does not lead necessarily to an energy-efficient procurement solution.
- A combination of the most decisive factors (high energy efficiency and low purchase price) can be recommended, in order to achieve an energy-efficient decision in public procurement:
  • *Go for a low energy-efficiency index:* For washing machines, the specific electricity consumption is used for classifying appliances according to the energy-efficiency classes (A to G). It is a suitable indicator to identify the energy-efficient appliances. Therefore, a recommended specific electricity consumption lower than <=0,19 kWh/kg can be recommended. This corresponds to the threshold for A-rated appliances within the EU-labelling scheme. Moreover, indicators describing the washing performance and drying rating have been introduced by the EU-label scheme. For both indicators an A-rating can be recommended. Also the possibility for a warm water inlet could be taken into account.

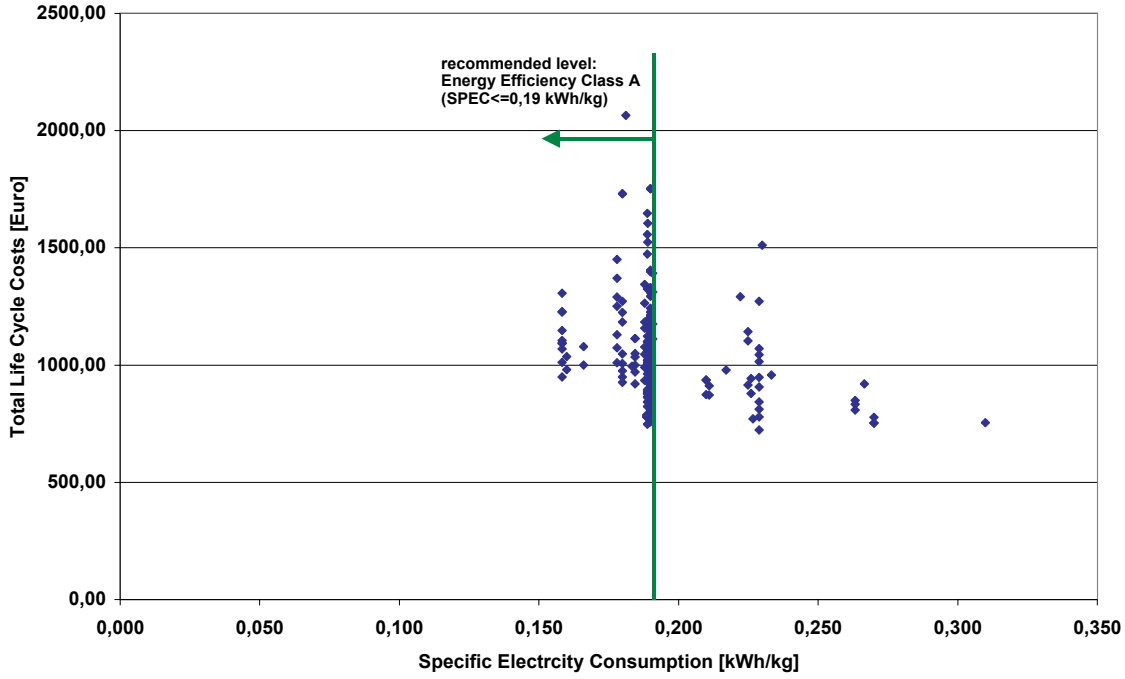


Fig. 10.3: Life-cycle costs versus specific electricity consumption of washing machines (background data: appliances available on the Austrian market, washing cycles: 220 per anno, lifetime: 12 years, discount rate: 5%, electricity price: 0,14 Euro/kWh, water price 2,2 Euro/m³).

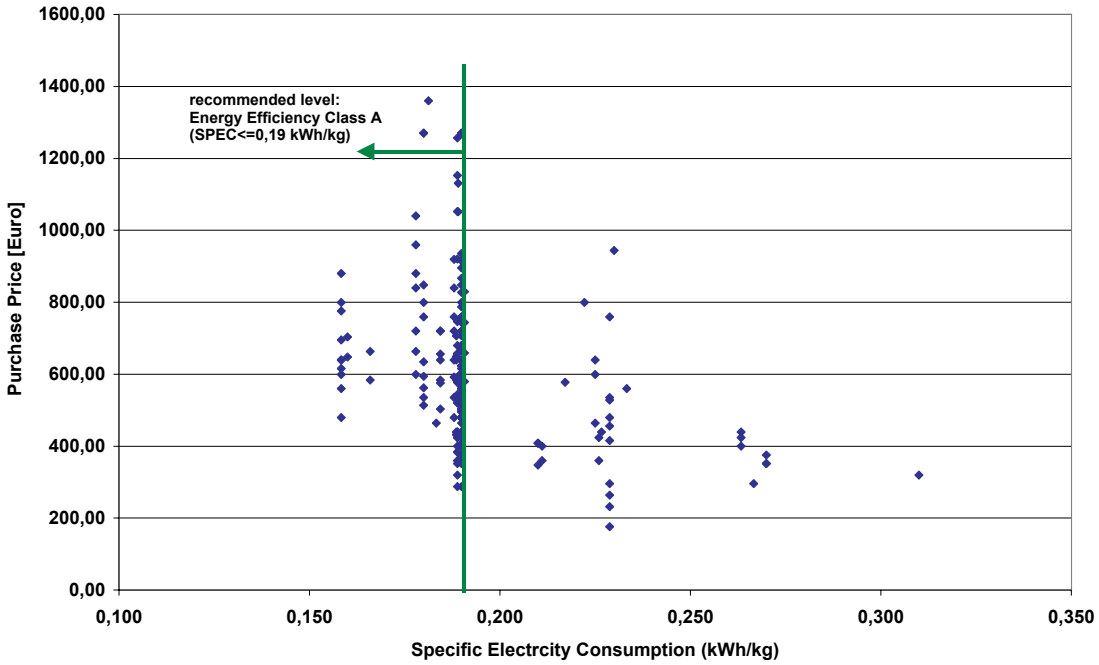


Fig. 10.4.: Purchase price versus specific electricity consumption of washing machines (background data: appliances available on the Austrian market, washing cycles: 220 per anno, lifetime: 12 years, discount rate: 5%, electricity price: 0,14 Euro/kWh, water price 2,2 euro/m³).

- *Go for a low purchase price* among those appliances fulfilling the energy efficiency requirements

Combined both factors, an energy-efficient purchase decision for an optimal price can be achieved.

Basic requirements

Recommended requirements: energy efficiency class A, washing performance A, drying rating A, possibility for warm water inlet

Dishwashers

Definition

For electric household dish washers an EU label scheme exists, focusing on energy efficiency and on cleaning or drying performance.

As hot water within the washing cycle is usually heated by electricity, it should be considered if hot water could be taken from other sources (solar, gas, etc).

Life-cycle costs versus specifications

The basics resulting from the analysis of the cold appliances and washing machines can be applied to this appliance group.

Requirements

Recommended requirements: energy efficiency class A, cleaning performance A, drying performance A, (possibility for warm water inlet)

Clothes dryers and tumble dryers

Definition

Tumble dryers are generally powered by electric energy. There also exist gas heated tumble dryers on the market, which have environmental advantages (but they are very rare on the market).

Electric household tumble dryers are covered by the EU label scheme, focusing on energy efficiency (So far only tumble dryers with an integrated heat pump are A-rated). Air vented tumble dryers generally need less energy than the condensing one.

Life-cycle costs versus specifications

The basics resulting from the analysis of the cold appliances and washing machines can be applied to this appliance group.

Requirements

Minimum requirements: energy efficiency class C
Recommended requirements: energy efficiency class A

Ovens

Definition

Ovens, in particular electric ovens, are a relevant energy consumer. This was the reason why the EU also launched a label scheme for these appliances focusing on energy efficiency. The corresponding Directive was published in May 2002. In the scope of the scheme are electric operated household ovens including ovens that are part of larger appliances. Not covered are ovens fu-

elled by other sources, portable ovens, non-fixed appliances with a mass of less than 18 kg, provided they are not designed for built-in installations. Beside electric ovens, it is necessary to consider gas-fired ovens, which have environmental advantages.

Life-cycle costs versus specifications

The basics resulting from the analysis of the cold appliances and washing machines can be applied to this appliance group.

Requirements

EU label scheme is going to be implemented; recommended requirements: energy efficiency class A.

In addition, it should be considered if gas-fired ovens are feasible.

Room air-conditioners

Definition

Room air-conditioners become more and more relevant within Europe. In order to improve the energy efficiency of the appliances, the EU has (April 2002) launched a label scheme for electric room air conditioners with a cooling capacity less than 12 kW.

Life-cycle costs versus specifications

The basics resulting from the analysis of the cold appliances and washing machines can be applied to this appliance group.

Requirements

EU label scheme is going to be implemented; recommended requirements: energy efficiency class A.

Information tools for white goods and domestic appliances

In order to make energy-efficient public purchasing possible, a procurement guide/toolkit could be developed focusing on energy-efficient household appliances. This guide should help and support public procurement agents to consider energy efficiency criteria in their procurement procedures:

This guide/toolkit should contain:

- general information on energy efficiency: energy efficiency indicators and criteria, existing label schemes and databases
- methodologies and recommendations to identify energy-efficient appliances
- model tender and evaluation
- best practice examples concerning energy-efficient public procurement

10.4.2 Office equipment

Monitors

Definition

A cathode-ray tube (CRT), flat panel display (e.g. a liquid crystal display) or other display device and its associated electronics. A monitor may be sold separately or integrated into the computer chassis. This definition is intended primarily to cover standard monitors designed for use with computers. The following may also be considered a monitor: mainframe terminals and physically separate display units.

Life-cycle costs versus specifications

Fig. 10.5 shows similar results as for white goods. For monitors, there is no significant correlation between life-cycle costs and the energy-efficiency specifications, which is reflected by the so called deep sleep mode. The low share of running costs over the lifetime of a monitor compared to the initial purchase price is seen asthe main reason for that fact. The running costs over the life time amount to up to 20% of the initial purchase costs.

The deep sleep mode is a key specification for qualifying for the Energy Star and Energy label scheme. A low level of the deep sleep mode has no influence to the purchase price of appliances (see Fig. 10.6). This indicates that other features are much more price relevant than the deep sleep mode.

However, there are monitors on the market, which are characterised by an high energy efficiency and low life-cycle costs, which are most interesting for public procurement. Also in this case, it is not effective to use a life-cycle calculation because it does not lead necessarily to an energy-efficient procurement solution. Hence, a quite similar approach (reach a high energy-efficiency level and a low purchase price) is necessary to obtain an energy-efficient purchase decision.

- *Go for highly energy-efficient products:* In the area of office equipment, the EU has introduced the "Energy Star" scheme form the US Environmental Protection Agency (EPA) labelling programme to Europe. In Fig. 10.5 and Fig. 10.6 the Energy Star threshold is given and it can be seen that almost all monitors qualify for it. Hence, the Energy Star criterion, as it is now, cannot be used for energy-efficient purchasing. It can be seen as an absolute minimum standard. This fact was already mentioned by EPA and EC. Accordingly, it is planned to update the Energy Star criteria according to the actual market situation in the near future (for monitors in beginning 2003). When this is done, the Energy Star scheme will become a useful guideline for public procurement again. A stricter threshold concerning deep sleep mode is used within the Energy label scheme, which is updated regularly. The Energy label level can be recommended to be used in public procurement in order to address the most energy-efficient products.
- *Go for a low purchase price* among those products fulfilling the energy efficiency criteria.

If both items are combined in public purchasing an energy-efficient solution for an optimal price can be found.

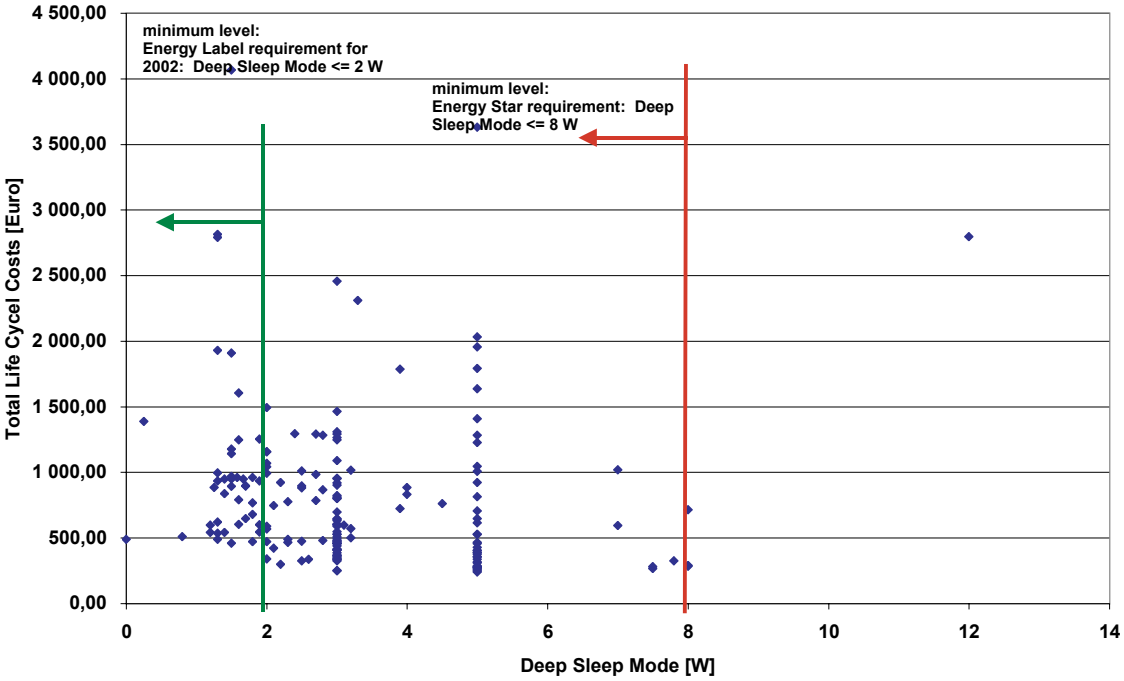


Fig. 10.5: Life-cycle costs versus deep sleep mode of monitors (background data: appliances available on the Austrian market, lifetime: 5 years, discount rate: 5%, electricity price: 0,14 Euro/kWh).

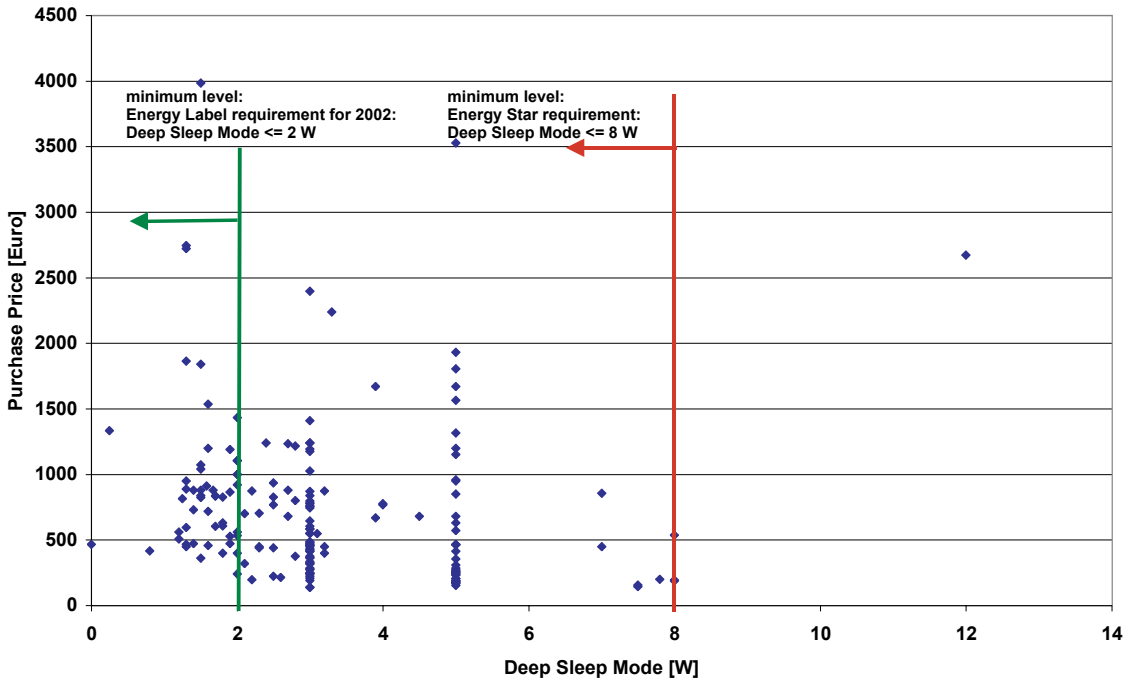


Fig. 10.6: Purchase price versus deep sleep mode of monitors (background data: appliances available on the Austrian market, lifetime: 5 years, discount rate: 5%, electricity price: 0,14 Euro/kWh).

Energy-efficiency requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (www.efficient-appliances.org)

Personal computers

Definition

A computer includes desktop, tower or mini-tower, or portable units, including high-end desktop computers, personal computers, workstations, network computer desktops, x terminal controllers, and computer-based point-of-sale retail terminals. The unit must be capable of being powered from a wall outlet, but this does not preclude units that are capable of being powered from a wall outlet as well as from a battery. This definition is primarily intended to cover computers sold for use in businesses or homes; it does not include computers sold or otherwise marketed as "File Server" or "Server".

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (http://www.efficient-appliances.org)

Printers

Definition

Imaging equipment manufactured as a standard model that serves as a hard-copy output device and is capable of receiving information from single-user or networked computers. In addition, the unit must be capable of being powered from a wall outlet. This definition is intended to cover products that are advertised and sold as printers including printers that could be upgraded to a multifunction device.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (www.efficient-appliances.org)

Copiers

Definition

A commercial reprographic imaging unit whose sole function is the production of duplicates from a graphic hard copy original. A copier must include an imaging system and a paper handling module. All black and white plain paper copier technologies are covered, though the intent is to focus on widely-used standard copier equipment such as light lens copiers. Standard-sized copiers designed to handle A4 or 8,5" x 11" paper and large format copiers designed to handle A2 or 17" x 22" paper or larger, are covered by this definition. Coping speed is seen as an important purchase criteria, which is directly linked to the energy consumption.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (www.efficient-appliances.org)

Fax machines

Definition

Imaging equipment, manufactured as a standard model, which serves as a hard-copy output device whose primary function is sending and receiving information. Plain paper fax machines are also covered under this definition (e.g. ink jet/bubble jet, laser/LED, and thermal transfer). The unit must be capable of being powered from a wall outlet. This definition is intended to cover products that are advertised and sold as fax machines.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
recommended requirements: Energy Label (www.efficient-appliances.org)

Scanners

Definition

A scanner is defined as an electro-optical device for converting colour or black-and-white information into electronic images that can be stored, edited, converted or transmitted primarily in a personal computing environment. Scanners defined as such are typically used for digitising hard-copy images. The definition intents to focus on widely-used desktop scanners (e.g. flatbed, sheet-fed and film scanners) and is directed to stand-alone scanners. It does not cover multifunctional products with scanning capabilities, network scanners (i.e. scanners that connect exclusively to a network and are capable of managing the scanned information for transmissions to multiple locations on the network) or scanners that are not powered directly by the building power supply.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (www.efficient-appliances.org)

Multifunctional devices

Definition and service requirement

A multifunctional device is a physically integrated device or a combination of functionally integrated components that produces hard copy duplicates from graphical hard copy originals as well as performing one or both of the following core functions: printing of documents (from digital information received from direct connect computers, networked computers, file servers and fax transmissions) or faxing (send and receive). A multifunctional device may also include scanning to computer file or any other capabilities. The device may be connected to a network and may output black and white, gray scale, or colour images. It is anticipated that a separate definition may ultimately be required to cover colour devices, because of likely technological developments related to color imaging, but for now these devices are included in this specification.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: Energy Star (http://europa.eu.int/comm/energy/en/ener-star-prog.html)
Recommended requirements: Energy Label (www.efficient-appliances.org)

Information tools for office equipment

In order to make energy-efficient public purchasing possible, a procurement guide/toolkit could be developed focusing on office equipment. This guide should help and support public procurement agents to consider energy efficiency criteria in their procurement procedures:

This guide/toolkit should contain:

- general information on energy efficiency: energy efficiency indicators and criteria, existing label schemes and product databases
- methodologies and recommendations to identify energy-efficient appliances
- model tender and evaluation
- best practice examples concerning energy efficient public procurement

10.4.3 Consumer electronics

TV-sets

Definition

Television receivers (TVs) for reception of analogue broadcasting as well as TVs for reception of digital broadcasting are covered.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: A voluntary agreement with industry (EACEM) states that from 1 January 2000, all TVs and VCRs they market will have a standby power use less than or equal to 10W. Moreover, the average standby power consumption of all the units sold by a given manufacturer will not exceed 6W. Hence, 6W for standby should be an absolute minimum requirement.
Recommended requirements: Energy Label

VCRs and DVDs

Definition

Non-portable videorecording equipment for household use includes the following types of appliances:

- appliances with only playback function: e.g. Video Cassette Player or DVD-player
- appliances with playback and recording functions: e.g. a Video Cassette Recorder (VCR) or a DVD-recorder
- combinations of Television Receivers and Video Cassette Recorders (TV/VCR combi): a TV and a VCR integrated in the same casing

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Minimum requirements: A voluntary agreement with industry (EACEM) states that from 1 January 2000 all TVs and VCRs they market will have a standby power use less than or equal to 10W. And the average standby power consumption of all the units sold by a given manufacturer will not exceed 6W. So 6W for standby should be an absolute minimum requirement.
Recommended requirements: Energy Label

Audio sets and audio components

Definition

Non-portable audio equipment includes the following type of appliances:

- Audio sets (e.g. midi, mini, micro sets): equipment consisting of an amplifier and various (but at least two) functional components (tuner, cd-player,

cassette-player, etc.) integrated in one casing, and (at least) two loudspeakers.
- Audio components: stand-alone equipment for one audio function (amplifier may be integrated). Hence, a portable radio (tuner, amplifier and loudspeaker integrated in one case) can be considered as an audio component.

Life-cycle costs versus specifications

The basics resulting from the analysis of the monitors can be applied to this appliance group.

Requirements

Recommended requirements: Energy Label

Information tools for consumer electronics

In order to make energy-efficient public purchasing possible, a procurement guide/toolkit could be developed focusing on consumer electronics. This guide should help and support public procurement agents to consider energy efficiency criteria in their procurement procedures:

This guide/toolkit should contain:

- general information on energy efficiency: energy efficiency indicators and criteria, existing label schemes and product databases
- methodologies and recommendations to identify energy-efficient appliances
- model tender and evaluation
- best practice examples concerning energy efficient public procurement

10.4.4 Lighting

Outdoor and street lighting

Definition and Status quo

Outdoor lighting is a very relevant cost factor for public administrations. This is in particular true for big municipalities, where about 30% to 50% of the energy costs are spent for outdoor lighting. Street lighting gives orientation to drivers and therefore helps to prevent accidents. Lighting in outdoor areas such as civic, commercial and industrial centres, parks, pedestrian areas is necessary for orientation and for safety reasons.

Sometimes there are problems with the implementation of new lighting technologies: it is often not possible to switch light sources immediately (new fixtures are necessary) and the installation of new control systems is for technical reasons not always possible.

Life-cycle costs versus specifications

For street lighting in general, the costs related to the energy consumption are much higher than the purchase costs. Therefore a life-cycle cost calculation is useful and recommended. Usually high-pressure sodium lighting systems with electronic ballasts are cost-effective compared to mercury vapour lighting systems and should thus be preferred. Even the exchange of existing mercury vapour lighting systems to high-pressure sodium lighting systems with electronic ballasts is cost effective in most cases.

Requirements

- only energy-efficient lamp technologies wherever possible, such as metal halide, high-pressure sodium and compact fluorescent sources should be used. (Fluorescent sources that are not suited for low temperature operation in cold climate zones should not be used for outdoor lighting purposes.) Mercury vapour lighting systems and incandescent lighting sources should be avoided
- use life-cycle cost calculation
- well advanced control systems as daylight, time controlled or voltage reduction systems in low traffic periods must be foreseen

Traffic signals

Definition and status quo

For traffic safety, traffic lights must fulfil a lot of optical and technical requirements. Traffic lights must be seen by road users under all weather conditions and must be robust and reliable in technology. As traffic lights have a "legislative role", it is very important that road users can trust in the systems controlling traffic lights.

Life-cycle costs versus specifications

In general, the same reflections on street lighting are also valid for traffic signals. The costs related to the energy consumption are higher than the purchase costs. Therefore, a life-cycle cost calculation is useful and recommended.

Still, tungsten halogen lamps are very common in traffic signals, but traffic lights with light-emitting diodes (LED:s) as light source have become more and more popular over the last years. Sometimes there are problems by implementing the new technologies: generally it is not possible to switch light sources immediately (new fixtures are necessary).

Traffic signals based on LED technology use significantly less energy use (80 - 90%) and have longer life (up to 10 years) compared to less than two years for conventional traffic signal lamps.

Requirements

- use LED-based technology (however, the optical efficiency in a signal application of the LED is higher than that of incandescent, which means that much fewer watts are needed to produce the same signal effect)
- use life-cycle cost calculation

Information tools for lighting

A procurement guide/toolkit could be developed focusing on outdoor lighting and traffic signals. This guide should support public procurement agents to consider energy efficiency aspects in their procurement routines:

This guide/toolkit should contain:

- general information energy-efficient lighting technologies (high-pressure sodium and compact fluorescent light sources, advanced control systems, LED based technology for traffic signals, etc.) and corresponding product databases
- methodologies to identify the energy-efficient technologies (life-cycle cost calculator for outdoor lighting and traffic signals)
- model tender and evaluation
- best practice examples concerning energy-efficient public procurement in the area of lighting

10.4.5 Transport equipment

Passenger cars

Status quo

The European Parliament passed a directive on car labelling, designed to achieve significant fuel savings and, as a result, reductions in CO_2-emissions by providing future buyers with information on passenger car consumption. The Directive lays down minimum information requisites, but it is up to the Member States to establish the margin of action beyond those minimums. Information on fuel consumption and costs has a proven effect on energy savings and CO_2-emissions reduction. Since there is a general trend throughout Europe to buy larger cars with increasingly high fuel consumption, information is even more necessary than ever.

The implementation of the Label Directive is different from one Member State to another, so it is quite complicated to compare cars directly on the label information in all Europe.

Life-cycle costs versus specifications

Naturally passenger cars, which have a low purchase price (small cars) use less low fuel than expensive cars, because they have less weight and lower powered engines. This indicates that low initial purchase costs are related to life-cycle costs and low fuel consumption. Thus, a combination between minimum requirements for CO_2-emissions and low initial purchase cost could be recommended for public procurement routines.

Current fuel consumption related specification of cars, which are available on the market, vary within a broad range. The corresponding limits for the specific CO_2-emissions and specific fuel consumption is given in the table below.

Requirements

Recommended requirements:

- 140 g/km CO_2-emission (the members of the European Automobile Manufacturers Association (ACEA) committed in a voluntary agreement to achieve a CO_2-emission target of 140 g/km CO_2 for the average of their new cars sold in the EU by 2008)
- diesel cars should have a particulate filters
- measures should be taken into account to avoid "over motorization" of cars
- beside "normal oil fuelled" cars a option for hybrid, electric and/or fuel cell vehicles should be taken into account

Trucks and goods vehicles for public purposes

Status quo

In particular in the public sector, a lot of trucks are used, which are usually fuelled by diesel. As a first option, energy-efficient diesel trucks in combination with a particulate filter should be considered by public procurement, and as a second option bio-diesel fuelled could be taken into consideration. (It takes time to build an infrastructure for bio-diesel problems with implementation: bio-diesel-infrastructure is missing.)

Life-cycle costs versus specifications

The average diesel consumption for trucks vary from about 22 l/100km to about 35 l/100 km in Europe. This value is an average, because a standardised measurement cycle for the fuel consumption under standardised conditions (freight and velocity) is missing.

Moreover, as the costs related to the fuel consumption are significant compared to the purchase costs (in the same order of magnitude), a life-cycle cost calculation approach is useful and could be recommended. But it must be checked that the information in tenders given by manufacturers concerning fuel consumption reflect the actual fuel consumption.

Requirements

Recommended requirements:

- use life-cycle cost calculation
- diesel trucks should have particle filters
- consider bio-diesel fuelled trucks

Buses

Definition and service requirement

Buses play an important role in public procurement (in particular for bigger municipalities) and they are mostly fuelled by diesel. A first option is to go for energy-efficient diesel buses with a particle filters, a second option for bio-diesel fuelled buses (it takes time to build an infrastructure for bio-diesel problems with implementation: bio-diesel-infrastructure is missing).

Life-cycle costs versus specifications

The average diesel consumption for buses vary from about 19 l/100km to about 32 l/100 km in Europe. The considerations on trucks can be applied to buses.

Requirements

Recommended requirements:

- use life-cycle cost calculation
- diesel trucks should have particle filters
- consider bio-diesel fuelled trucks

Information tools for transport equipment

A procurement guide/toolkit could be developed focusing on transport equipment. This guide should support public procurement agents to consider energy efficiency aspects in their procurement routines:

This guide/toolkit should contain:

- general information energy-efficient transport equipment and product databases
- guide and education scheme for energy-efficient driving (eco driving)
- methodologies to identify the energy-efficient vehicles (life-cycle cost calculator for trucks and buses)
- identification and development of representative energy efficiency specifications in particular for trucks (e.g. litre/ ton km) and busses (e.g. litre/seat km or litre/person km)
- model tender and evaluation
- best practice examples concerning energy-efficient public procurement for transport equipment

10.5 Summary and conclusions

According to pure economic theory, a life-cycle cost calculation is always preferred. However, the problems for decision makers in public administrations are the transaction costs. Gathering sufficient information to set reasonable assumptions for the different variables in this calculation (lifetime, discount rate, expected developments of energy costs, etc.) requires a lot of work. Therefore, and this is shown in the indicative analysis, for most of the appliances it is not useful to use life-cycle cost calculation to reach an energy-efficient and a cost effective purchase decision in public procurement.

Furthermore, life-cycle costs in general are often not correlated to a high energy efficiency level (though it is possible to identify appliances which are energy-efficient and which provide close to minimum life-cycle costs). In fact there are appliances on the market, which are characterised by a low energy efficiency level and low life-cycle costs, by high energy-efficiency and high life-cycle costs, by low energy efficiency and high life-cycle costs and by high energy efficiency and low life-cycle costs. The last mentioned combination is of course the most interesting one for public procurement.

The same is valid for energy-efficiency level versus initial purchase price. In general, a high energy-efficiency level has no direct influence on the purchase price of appliances. This indicates that other features are more "price relevant" than energy efficiency. It it is possible to find very energy-efficient appliances costing the same or less as energy-efficient ones.

Most of the appliances are characterised by relatively high initial purchase prices compared to relatively low running costs over the lifetime. This is valid for most of the appliances groups.

- For the product groups like cold appliances, personal computers, monitors, etc., the almost only influencing factor of the running costs is the electricity consumption times electricity price over the product life. In general, the costs for electricity over the product life are low compared to the purchase costs.
- For the product groups washing machines, dishwashers, copiers and printers, the costs for electricity over the product life are low compared to the purchase costs and to other kind of running costs (costs for water consumption, costs for detergents, etc.).

In particular in these cases, it is not effective to use a life-cycle calculation because it does not necessarily lead to an energy-efficient procurement solution. There are appliances on the market which are characterised by low life-cycle costs and low energy efficiency level. These appliances show extremely low purchase prices and low energy efficiency level.

However, a combination of energy efficiency and purchase price is a possibility in order to achieve an energy-efficient purchase decision. The energy-efficiency requirements should have a link to policy instruments developed in Europe and their levels should roughly be based on the best 25% available products. If the energy efficiency requirements are too "soft", an energy-efficient purchase decision is not possible by this procedure and energy-efficient public purchasing has no market relevance. On the other hand, if the energy-efficiency requirements are too strict, no products will be offered below the tenders.

If both factors (high energy efficiency and low purchase costs) are combined in public purchasing, an energy efficient solution on an economical optimal basis can be found.

- For some product groups, the running costs related to energy consumption over the lifetime are significantly higher (e.g. outdoor lighting, traffic signals) or are in the same order of magnitude (buses and trucks) than the initial purchase costs.

CO_2-emission [gram/km]

Gasoline	**min:** 118 g/km (MCC Smart)	**max:** (without sport cars): 398 g/km (Range Rover)
Diesel	**min:** 86 g/km (Audi A2)	**max:** 304 g /km (Range Rover)

Fuel consumption [liter /100km]

Gasoline	**min:** 4,9 l/100km (MCC Smart)	**max:** (without sport cars): 16,4 l/100km (Range Rover)
Diesel	**min:** 3,2 l/100 km (Audi A2)	**max:** 11,4 l/100 km (Range Rover)

In this case, a life-cycle cost calculation is useful in order to reach an energy-efficient purchase decision. In this context an EU-wide and common methodology to calculate the life-cycle costs has to be developed, which is accurate enough to lead to optimal results and which is easy and practicable to use in public procurement routines.

Nevertheless, energy-efficient appliances have a strategic advantage because these products are characterised by a relatively higher share of investment costs compared to total life-cycle costs (investment costs plus running costs over the life time). This means energy efficient appliances are more independent to future price fluctuations and changing market conditions. A life-cycle costs approach can be used to make it transparent.

Table 10.1. Summary of the public procurement recommendations, which enable an energy-efficient purchase decision

	Energy Efficient Public Procurement	
Appliances/Products	low purchase price among those appliances fulfilling the energy efficiency requirements	life-cycle cost calculation
Cold appliances	minimum requirements: energy efficiency class A (EEI < 0,55) recommended requirements: energy+ criteria (EEI <= 0,42)	–
Washing machines	recommended requirements: energy efficiency class A, washing performance A, drying rating A, possibility for warm water inlet	–
Dishwashers	recommended requirements: energy efficiency class A, cleaning performance A, drying performance A, possibility for warm water inlet	–
Clothes Dryers/Tumble Dryers	minimum requirements: energy efficiency class C recommended requirements: energy efficiency class A	–
Ovens	recommended requirements: energy efficiency class A, gas-fired ovens are feasible	–
Room air conditioners	recommended requirements: energy efficiency class A	–
Monitors	minimum requirements: Energy Star recommended requirements: Energy Label	–
Personal computers	minimum requirements: Energy Star recommended requirements: Energy Label	–
Printers	minimum requirements: Energy Star recommended requirements: Energy Label	–
Copiers	minimum requirements: Energy Star recommended requirements: Energy Label	–
Fax machines	minimum requirements: Energy Star recommended requirements: Energy Label	–
Scanners	minimum requirements: Energy Star recommended requirements: Energy Label	–
Multifunctional devices	minimum requirements: Energy Star recommended requirements: Energy Label	–
TV-sets	minimum requirements: 6W for standby recommended requirements: Energy Label	–

	Energy-efficient public procurement	
VCRs and DVDs	minimum requirements: 6W for standby recommended requirements: Energy Label	–
Audio-sets and Audio components	recommended requirements: Energy Label	–
Outdoor and street lighting	–	use energy-efficient lamp technologies: metal halide, high-pressure sodium, and compact fluorescent sources use life-cycle cost calculation use advanced control systems (daylight, time controlled or voltage reduction)
Traffic signals	–	use LED-based technology use life-cycle cost calculation
Passenger cars	recommended requirements: 140 g/km CO2-Emission diesel cars should have a particulate filters avoid "over motorization" of cars option for hybrid, electric and/or fuel cell vehicles should be taken into account	–
Trucks and goods vehicles	–	use life-cycle cost calculation diesel trucks should have particle filters
Buses	–	use life cycle cost calculation diesel buses should have particle filters

11. Measures and tools for improving the energy efficiency of buildings

This chapter considers in detail the instruments for increasing energy efficiency in the public sector building stock through purchase specifications and Minimum Performance Standards (MPS). It furthermore briefly considers the use of best practice guidelines, minimum requirements for passive cooling and life-cycle cost (LCC) methods.

Purchase specifications provide guidance in the choice of technologically comparable solutions mainly for building components and units of installed equipment; for example, to define/assist the choice between inefficient and efficient versions of light sources, ballasts or boilers. Purchase specifications are based on ex-ante defined typical life-cycle cost (LCC) calculations of products and solutions considering typical usage patterns.

The report provides summary specifications for nine component ranges, and defines detailed specifications for a further six. The detailed specifications provide a comprehensive purchase specification, articulated for example on hours of use of the component or geographical location of the building and importantly detail the evaluation method, which provides for transparency, and allows for replication and maintenance of the specifications in time.

Minimum building performance standards identify the ultimate goal of efficient building design for those in charge of *commissioning* and *designing* buildings. Performance standards offer a significant advantage compared to other methods which aim to improve building energy efficiency.

Building owners and users:
For this group minimum performance standards provide a clear measure of building energy performance, which can usually be readily translated into running costs.

Architects and designers:
For architects and designers, minimum performance standards provide creative freedom of choice in finding the optimal mix of:

- *active technologies:* for example artificial lighting systems
- *passive solutions:* for example spectrally selective glazing and window shading to provide summer cooling

Minimum performance standards are proposed for new and refurbished building stock in the public sector across Europe. The level of the standard is determined by considering international experience in the development of low energy buildings. An important consideration in the respective section of this chapter is the process, by which minimum performance standards could be effectively introduced into the public sector, in light of, and in synergy with the forthcoming EU Directive on the energy performance on buildings.

Though recognising purchase specifications and minimum performance standards to be effective tools, other methods can be applied:
Best practice guidelines define selected pathways to

Purchase specifications vs. performance standards

Ultimately, public administrations (PAs) should procure appliances and building components which offer minimum life-cycle costs. However, the application of a life-cycle cost analysis is generally only cost-effective for large purchase volumes (only for relatively large purchases may buyers be expected to spend the extra time to gather data on energy efficiency and purchase prices of alternative products).

Purchase specifications therefore provide a simplified procedure of determining LCC for the majority of small or medium sized purchases. Though useful for appliances, purchase specifications are not able to capture completely the large saving potential offered by improving buildings.

Building performance standards provide an effective means of addressing the complex issue of developing efficient building systems, through the optimised combination of single component/unit purchases towards optimised systems at minimum LCC, based on previous design experiences. An important tool in this respect is the method of integrated building design, i.e., simultaneously optimising the design of building shell, heating, ventilation, air conditioning, lighting, and appliances in order to minimise energy demand. However, at total investment volumes for a new build or refurbishment project above a certain threshold, a life-cycle cost analysis should be carried out already during the design phase. This threshold could be 250 000 Euros, as stated for example in the internal guidelines of the City of Frankfurt am Main.

improved energy efficiency by defining an optimised combination (in terms of investment/running costs) of equipment choice, system design, maintenance and operational schedules. Guidelines, which respect national building regulations provide voluntary but concrete pathways to improved energy efficiency for system designers.

As an example for such guidelines, a translation of the guidelines provided by the *Deutscher Städtetag, Arbeitskreis Energieeinsparung* (the German association of medium and big cities, working group energy conservation) is included as Appendix 7. These guidelines also contain a number of purchase specifications and minimum performance standards.

Best practice guidelines are likewise useful for promoting the adoption of passive solutions for providing summer space comfort, however:

Minimum requirements for implementing passive cooling strategies as a prerequisite to installing active air conditioning systems are merited, given that the increasing diffusion of active air conditioning systems is a priority issue to address for the EU. Moreover, failing to avoid the initial installation of active air conditioning systems represents a lost opportunity for achieving energy savings difficult to recover in the medium term.

A recommendation to require the implementation of passive cooling strategies as a prerequisite to the introduction of active air conditioning systems is made. (Nevertheless, the report also defines a purchase specification for active air conditioning units).

Life-cycle cost (LCC) methods provide standard evaluation procedures of determining LCC for purchase decision makers for larger investment volumes, or in any case when purchase specifications prove inadequate to describe the specific conditions operated by a public administration. LCC methods offer standard transparent appraisal procedures, which can be used by all those involved in appliance and "building" procurement to identify and evaluate efficient building components, system designs, and alternative passive solutions.

Purchase specifications and minimum performance standards both aim to reduce and minimise life-cycle costs for operating building stock. The general concepts of determining life-cycle costs are considered in Chapter 9. This chapter considers the issues pertinent to developing standard LCC methods specific to building components and systems.

11.1 Purchase specifications

Purchase specifications define minimum requirements to apply when purchasing components and systems for installation in buildings used by the public sector in Member States. Six detailed and nine summary specifications have been developed.

Specifications can be used in any purchase made by the public sector, irrespective of the size (volume or value) of the purchase.

Specifications are based on ex-ante LCC calculations. By identifying minimum LCC solutions, specifications allow contracts to be awarded on the criteria "most economically advantageous offer", based on the (ex-ante) quantified reduction in running costs (energy and maintenance).

The specifications define which components and systems to purchase. Generally, no attempt is made to package the specifications in a format adaptable to specific applications, for example by integrating specifications into standard texts which could be used without modification in tender documents.

However, Figures 1 and 2 in Chapter 9 provide an example of how the purchase specifications defined in this report could be integrated into an effective communication package for the public administration. The figures show four pages from a hypothetical Public Sector Energy Efficiency Programme (PEEP) catalogue of purchase recommendations/requirements (the full size pages are given in Appendix 2). Two purchase recommendations/requirements are defined for ballasts and glazing based on the information (specification and economic analysis) reported in the respective PROST purchase specifications, PPS2 and PPS5.

The issue of how to effectively communicate the purchase specifications to the public sector is considered in more detail in Chapter 9.

Table 11.1 offers an overview of the range of solutions available for improving the energy efficiency of building stock, and the type of purchase specification which can direct the public sector to improved energy efficiency.

The table also serves to define the terms "building components" and "building systems" as used in this report.

The purchase specification explicitly recalled in Table 11.1 are based directly on purchase specifications actually operated by institutions in the public sector in Europe and elsewhere (for example the Frankfurt City guidelines in Germany and the FEMP Purchase Guidelines in the USA), with only a minimum elaboration by the presenting working group. The explicit specifications reported in Table 11.1 are termed Likely Specifications and are recommended in lieu of a more detailed targeted analysis as conducted for the components listed in Table 11.2. (The building policy tool in Chapter 10 considers the process by which the purchase specifications defined in the present work might be completed and updated in time at European level through a co-ordination of national working groups.)

However, though the likely specifications are not founded on a detailed LCC analysis within the present study, it is the opinion of the working group that the specifications do lead to minimum LCC. This is both from analogy with those components for which the detailed LCC analysis conducted in the present study provided specifications which generally varied only slightly

from existing public sector specifications (for example the FEMP guidelines in the US), and more generally based on the expert opinion of the working group.

11.1.1 Overview of purchase specifications

In Table 11.1 (overleaf) energy-efficient solutions are ordered on the basis of building service requirement:

- indoor lighting
- indoor winter space comfort
- indoor summer space comfort
- sanitary hot water provision
- building services (miscellaneous)

In many cases, improvements to the energy efficiency of active systems might represent the only feasible solution to reducing energy use in buildings. However, by articulating information, even in relation to active systems on the basis of service provision, we begin to open horizons and stimulate thought on how to integrate passive solutions into buildings. Though seemingly trivial, the change of emphasis from active systems to service requirements represents an important cultural change in building design and maintenance, and should be underlined on all occasions.

For each active or passive building component, a purchase specification is identified.

In the case of active components and systems the purchase specification refers to the solution to be improved. For example:

- for incandescent lamps, a Likely Purchase Specification to "Purchase a CFL" is made
- for heat generators a Likely Purchase Specification to "Purchase condensing gas boilers is made"
- and for condensing gas boilers a set of minimum efficiency requirements are specified

For passive solutions the general specification "always consider when refurbishing" is made.

Comments are given in brackets.

Table 11.1

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
Indoor lighting		Lamps (light sources)	T12	70 lm/W	PPS1	
			T8 18W electromagnetic ballast	52-75 lm/W		
			T8 36W electromagnetic ballast	65-93 lm/W		
			T8 36W electronic ballast	73-105 lm/W		
			T5 35W electronic ballast	97-104 lm/W		
			incandescent	11-19 lm/W		Purchase CFL
			halogen	11-23 lm/W		
			CFL (integral)	30-65 lm/W		
			CFL (pin)	45-87 lm/W		
			induction (self ballasted	48 lm/W		
			induction (pin based	71 lm/W		
		Ballasts	conventional electromagnetic	91 W (for 2*36 W T8 Tube Luminaire)	PPS2	
			low loss electromagnetic	86 W (for 2*36 W T8 Tube Luminaire)		
			electronic	71 W (for 2*36 W T8 Tube Luminaire)		
		Luminaries		(considering downward efficiency only)*		
			diffuser/prismatic for T8	42-62%	PPS3	
			white painted reflectors for T8	55-68%		
			aluminium reflectors T8	57-73%		
			aluminium reflectors T5	66-76%		
			aluminium reflectors CFL 55W G11	63-90%		
			industrial	58-84%		
	Light source/ Ballast/ Luminaire		T8/electromagnetic/prismatic	40 lm/W	PPS4	
			T8/electronic/specular	60 lm/W		
			T5/electronic/specular	61 lm/W		
	Light control/ Light source/ Ballast/ Luminaire		manual			(Probably best tackled through best practice guides)
			timers	energy savings of 10-35% reported		

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
			occupancy sensor	common energy savings: officers 1-2 persons 25-30%, offices open space 20 -25%, rest rooms 30-75%, corridors 30-40%, storage areas 45-65%, meeting rooms 45-65%, warehouses 50-75%		
			daylight sensor			
			improved zoning/improved accessibility			
			integrated automatic control systems			
	PASSIVE					Always consider passive solutions when refurbishing
			prismatic glazing			(Probably best tackled through best practice guides)
			light shelves	day lighting commonly provides energy savings of 30-70%		
			light well/light duct			
Winter space comfort		Heat generator	standard fuel oil (single or two stage burner)	91% at 30% of nominal load		Purchase condensing gas boiler or if no gas connection, condensing fuel oil
			gas standard (single stage /two stage burner)	93% at 30% of nominal load		Purchase condensing gas boiler
			condensing gas	108% at 30% of nominal load		Minimum efficiency requirements
			from 10 kW a 70 kW			
			at 75°/60°C			100%
			at 40°/30°C			103%
			greater than 70 kW			
			at 75°/60°C			101%
			at 40°/30°C			104%
	Control + Emitters +Distribution +Heat generator		outdoor thermostat			(Probably best tackled through best practice guides)

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
			indoor thermostat thermostatic valves			
	Distribution +Heat emitters +Heat generator		hydronic +radiators+standard gas boiler			Install radiant panels+condensing gas
			hydronic+radiant panels+condensing gas boiler gas radiant panels	from 10 to 35% in offices, > 50% in large spaces with high ceilings, e.g. sports halls, exposition spaces		(These systems offer particularly high savings in large spaces such as sports hall, conference rooms and churches)
	PASSIVE					Always consider Passive Solutions when refurbishing
			low E glazing	advanced glazing often provides savings of 20% in heating and cooling	PPS5	
			improved wall and roof insulation	maximum heating demand of 35 kW/m²/year compared to > 100 kWh/m²/year typical in EU		(Would be possible to develop a purchase recommendation to identify insulation materials with highest U values, and identify the thickness offering the minimum life cycle cost)
			heat exchangers large glazed surfaces			(Probably best tackled through best practice guides)
Summer space comfort						Always consider passive solutions before introducing air- conditioning units. This ideally should be made a requirement as in the case of Switzerland.
		Air conditioning units	air cooled < 12 kW (room air conditioners)			Purchase water cooled models if water technically possible
			split	1.54 < EER < 3.56		Purchase EU Class A labelled models (EER > 3.2)
			multi split	1.91 < EER < 3.74		Purchase EU Class A labelled models (EER > 3.2)

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
			packaged double duct packaged single duct	1.88 < EER < 2.97 1.35 < EER < 3.09		Purchase split system
			water cooled < 12 kW (room air conditioners)			
			split	2.7 < EER < 3.6		Purchased packaged water cooled
			packaged	2.26 < EER < 5.42		EU Class A labelled models (EER > 4.4)
			air sourced < 19 kW, three phase			
			split or single package			Energy Star, i.e. EER > 3.81
			air sourced from 19 kW to 40 kW			
			split or single package			Energy Star, that is EER > 3.22
			air sourced from 40 kW to 73 kW			
			split or single package			Energy Star, that is EER > 3.17
		Ceiling fans	ceiling fans	Energy Star labelled ceiling fans move at least 20% more air than a typical ceiling fan per watt of power consumed.		Purchase Energy Star Products, summarily Low Speed, 4.39 m^3/min. W, Medium Speed, 3.11 m^3/min./W, High Speed, 2.12 m^3/min.W.*
	PASSIVE					Always consider Passive Solutions be-ore introducing air- conditioning units. This ideally should be made a require-ment as in the case of Switzerland.
			selective glazing	advanced glazing often provides savings of 20% in heating and cooling	PPS5	
			window shading			(Probably best tackled through best practice guides)
			increased thermal mass natural night ventilation increase roof albedo	can reduce peak cooling demand by 10-15%		

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
Sanitary hot water	PASSIVE		low flow taps	reduce hot water requirements by 50-70% on the single tap.		Purchase low-flow aerators : • < 3 l/min for wash basins • < 7 l/min for showers Purchase standard taps when tap used predominantly to fill recipients (for example buckets or bath) . Purchase variable low-aerators, 3-8 l/min for mixed used taps.
			solar panels			(Purchase specifications could be developed indicating minimum plate efficiency etc. However, procedural guides/requirements would also be useful)
Building service (miscellaneous)			pumps	centrifugal with three speed flow regulation or valve control		Purchase variable speed controlled pumps or electronically commutated variable speed pumps.
			centrifugal, normal A/C motor with variable speed control	from 30% - 50% savings over standard three speed pumps		Purchase electronically commutated variable speed pumps. (Electronically commutated and permanent magnet motors variable speed motors have recently been introduced onto the market by a number of manufacturers. The marginal cost with respect to variable speed pumps is often limited. Though the issue needs further analysis, first indications are that EC pumps are cost-effective under normal use conditions and should always be chosen).

Service requirement	System	Components	Technology requirement (comments)	Range of efficiency or efficiency gains	PROST Purchase Specifications	Purchase specification/ efficiency
			Centrifugal, new electronically commutated/ permanent magnet motors with variable speed control	from 60% - 80% savings over standard three speed pumps		(Best practice guides are required for correctly sizing pumps and correctly tuning other aspects of ductwork along the lines of the Swiss Ravel guides)
		Industrial transformers, single phase				
			(kVA)			(Minimum acceptable efficiency)
			15			(97.9%)
			25			(98%)
			37,5			(98.2%)
			50			(98.3%)
			75			(98.5%)
			100			(98.6%)
			167			(98.7%)
			250			(98.8%)
			333			(98.9%)
		Industrial transformers, three phase				
			(kVA)			
			15			(97%)
			30			(97.5%)
			45			(97.7%)
			75			(98%)
			112,5			(98.2%)
			150			(98.3%)
			225			(98.5%)
			300			(98.6%)
			500			(98.7%)
			750			(98.8%)
			1000			(98.9%)

*Only the salient points of the Energy Star requirements are reported in the present table. Depending on the technology the actual Energy Star requirements are more articulated as reported here.

11.1.2 Detailed PROST Purchase Specifications

Table 11.2 lists the components and systems for which detailed purchase specifications have been developed within the present project. As already seen these are also indicated in the overview Table 11.1, with the acronyms PPS.

The detailed PROST Purchase Specifications are reported below. Each detailed PROST specifications is based on a detailed related analysis collated in the appendices.

For each building component/building system, the analysis is articulated on the following sections:

- specification
- example of savings and costs
- considerations on specified efficiency levels
- existing national purchase specifications
- further study

Developing the specifications and determining subsequent typical savings which result from their applications requires defining typical system types, operating and economic conditions as commonly installed/enjoyed by the public sector in Europe.

Table 11.3 details the general considerations adhered to in the choice of values to assign to the principle variables affecting the evaluation. Generally the attempt is made to choose conservative values. However many variables (for example operating hours) are specific to a technology and otherwise each analysis makes a number of exceptions to the general considerations to reflect the idiosyncrasies of the technologies or the data available.

Table 11.2.

Detailed PROST Purchase Specification	Building component /system	Comment
PPS 1	Fluorescent tube lamps	For linear fluorescent tubes
PPS 2	Ballasts	For linear fluorescent tubes
PPS 3	Luminaires	Standard work place, Special work place and Industrial for T8 linear fluorescent tubes
PPS 4	T5 luminaire systems	Considers when to switch from T8 luminaire, tube and ballast combinations to T5 alternatives.
PPS 5	Glazing	

Table 11.3. General consideration on values applied to variables in the component and system LCC analysis.

	Typical value considered	Considerations guiding the choice of typical value
System power		Expert opinion based combined with technology reviews
System usage	3 600 hours/year	Considering 16 hours per 220 days. Even though the main staff working shifts maybe less, components are generally (for example lighting, heating system circulation pumps) switched on for longer periods.
Component lifetime		Generally conservative estimate compared to the full technical lifetime. The estimate considers that organisational changes are not uncommon and often lead to changes to infrastructure with components and systems being replaced before their natural technical lifetime.
Discount rate	8%	The public sector has a wider societal objective than achieving direct economic gain and a lower rate of 5% might be considered a more reasonable requirement. However, here we apply a more conservative 8% to be on the safe side with the economic result.
Energy price	0.1 Euro/kWh	Typical price for public sector from cross country surveys
Component purchase price		Applying common discounts to manufacturer list prices. For each technology prices where taken from the most important manufactures in Italy.

PROST Purchase Specification for fluorescent tube lamps (PPS 1)

Additional recommendations

The recommendations do not apply to T8 fluorescent lamps with a colour rendering index (CRI) greater than 90. Use fluorescent lamp with a CRI greater than 90 only where explicitly required by building codes or other ergonomic guidelines, since these lamps are roughly 30% less efficient than other recommended triphosphor tubes.

The EU Directive 98/11/EC was introduced in July 1999, and required cross country compliance by January 2001. In the case that products are not categorised according to the EU Directive 98/11/EC, purchase officers should refer to Table 11.5 and Table 11.6.

Table 11.4. Purchase recommendations for linear T5, T8 and T12 fluorescent tube lamps.

	Tube nominal power	Recommended efficiency (According to EU Directive 98/11/EC defining Energy Label for household lamps)
T5	14W	Class A
	35W	Class A
T8	18W	Class A
	36W	Class A
	58W	Class A
T12		Replace where possible with T8

Table 11.5. Minimum efficiency requirements for T8 fluorescent tubes powered by standard electromagnetic ballasts, as usually reported in product catalogues.

	Tube nominal power	Colour rendering index (CRI)	Range of efficiency (lumen/watt)	Recommended efficiency (lumen/watt)
T8	18W	< 90	52-75	75
		> 90	55-58	55
	36W	< 90	65-93	93
		> 90	64-65	64

58 W lamps are common in some countries. Future guidelines may have to be amended to incorporate these lamps.

Table 11.6. Minimum efficiency requirements for T5 fluorescent tubes powered by electronic ballasts. The table reports the nominal luminous efficiency of T5 tubes operating at 35°C.

	Tube nominal power	Colour rendering index (CRI)	Range of efficiency (lumen/watt)	Recommended efficiency (lumen/watt)
T5	14W	80 < CRI < 90	89-96	96
	35W	80 < CRI < 90	97-104	104

PROST Purchase Specification for ballasts (PPS 2)

Table 11.7. Annual lamp usage at which CELMA Class B2 low loss and Class A2 electronic ballasts should be purchased for use with T8 fluorescent lamps.

System type	Number of ballasts		Low loss (CELMA Class B2)		Electronic (CELMA Class A2)
(W)	Standard/Low loss	Electronic	from (hours/year)	to (hours/year)	above (hours/year)
2 x 18W	1	1			
4 x 18W	2	2	600	1 500	
1 x 36 W	1	1			1 500
2 x 36 W	2	1	-	-	700
1 x 58 W	1	1	-	-	700
2 x 58W	2	1	-	-	700

PROST Purchase Specification for luminaires (PPS 3)

Table 11.8. PROST minimum "downward" efficiency recommendations for luminaires.

Luminaire Type		Luminaire Downward Efficiency		
	IP	Average (%)	Best (%)	Recommended (%)
Standard workplace/office, Louvered for VDT	< 54	62	73	67
Special workplace (e.g. laboratories, kitchens)	54 < IP < 65	49	60	56
Industrial	> 65	69	85	73

Note

IP = International Protection (as defined by IEC)

IP 20: Protected against penetration of solid parts with a diameter greater than 12 mm and not protected against liquids

IP 40: Protected against penetration of solid parts with a diameter greater than 1 mm and not protected against liquids

IP 54: Protected against dust and splashes of water

IP 65: Protected and against dust and jets of water

Luminaire efficiency and indirect lighting

Ratio of light output from luminaire (in lumens) and total light output from the light source (in lumens) which it holds.

The recommendation is based only on downward (direct) luminaire efficiency. Higher efficiencies (up to 90 % or above) can be achieved by combined downward and upward (direct and indirect) luminaries. However, this requires maintaining light ceilings and walls. For caution, we have therefore not included direct/indirect lighting efficiencies in our recommendations, but recommend to assess if further savings are realistic with direct/indirect lighting depending on the circumstances. Solutions with 100% indirect lighting and localized task lighting may yield very high system efficiency, but is beyond the scope of these purchase specifications.

To be applied to all purchases.

Replacing a single luminaire with a more efficient model has the following advantages.

- It increases the possibility of using a limited number of lamps in a multiple lamp luminaire
- It increases the level lumination and thus decreases the probability that users will introduce additional portable light sources (for example desk lamps)

When refurbishing or replacing many luminaries, using more efficient luminaries allows the total installed power to be reduced.

PROST Purchase Specification for T5 luminaire systems (PPS 4)

Table 11.9, Table 11.10, Table 11.11 and Table 11.12 indicate under which annual use conditions alternative lighting system prove economic.

Additional recommendations

T5 fluorescent tubes are *not* available with a colour rendering indexing of 90 or above. They can not be used therefore in certain specialist applications; for example in hospital operating theatres, dental studios and cloth retailers.

Comments

The recommendation compares the economics of T5 systems compared to T8 systems with electronic ballasts. The economics of using T8 systems with electronic ballasts rather than T8 systems with standard ballasts is considered in another PROST recommendation.

Considering total lifetime costs, systems with electronic ballasts represent the most economic solution under almost all conditions.

T5 2 x 35W systems can prove cost-effective compared to T8 2 x 36W systems, if it proves possible to reduce the number of the former installed luminaires with respect to the latter. Though Table 11.10 indicates this to be a factor of space surface area, this is slight simplification and generally savings can be achieved only by ensuring a correct design of the plant.

T5 luminaires provide an economic alternative to T8 4 x 18W systems (with electronic ballasts) if the conditions in Table 11.11 and Table 11.12 are met.

The choice of T8 4 x 18W systems rather than T8 2 x 36W systems will depend on non economic considerations (space ergonomics, aesthetics, etc.).

Table 11.9. Overall choice of system

System type		When alternative system is economic		
		T8 4x18W	T5 2x35W	T5 4x14W
T8	2x36W (34W)	Never	If correctly designed See Table 10	Never
T8	4x18W (16W)	-	Most likely See Table 11	See Table 12
T5	4x14W	See Table 12	Always	-

Table 11.10. The maximum marginal purchase price at which T5 2x35 W luminaires prove economic compared to T8 2x36W luminaires with electronic ballasts. That is, T5 2x35 W luminaires should be chosen over T8 2x36 W models if the purchase price of the T5 compared to the T8 luminaire is less or equal to the figure reported in the last row of the table.

For spaces above 80m²

Annual use	(hours)	2 000	3 000	4 000	8 000
Acceptable extra cost for T5 Luminaire + Tubes	(Euro)	16	17	18	21
Likely additional lamp cost per T5 tubes	(Euro)	5.3	5.3	5.3	5.3
Acceptable extra cost for T5 Luminaire	(Euro)	11	12	12	15

Table 11.11. The maximum marginal purchase price at which T5 2x35 W luminaires prove economic compared to T8 4x18W luminaires with electronic ballasts. That is, T5 4x14 W luminaires should be chosen over T8 4x18 W models if the purchase price of the T5 compared to the T8 luminaire is less or equal to the figure reported in the last row of the table.

Annual use	(hours)	2 000	3 000	4 000	8 000
Acceptable extra cost for T5 Luminaire + Tubes	(Euro)	71	87	103	166
Likely additional lamp cost per T5 tubes	(Euro)	-1.5	-1.5	-1.5	-1.5
Acceptable extra cost for T5 luminaire	(Euro)	73	89	104	167

Table 11.12. The maximum marginal purchase price at which systems composed of T5 4x14 W luminaires prove economic compared to T8 4x18W luminaires with electronic ballasts. That is, T5 4x14 W luminaires should be chosen over T8 4x18 W models if the purchase price of the T5 compared to the T8 luminaire is less or equal to the figure reported in the last row of the table.

Annual use	(hours)	2 000	3 000	4 000	8 000
Acceptable extra cost for T5 Luminaire + Tubes	(Euro)	13	19	26	51
Likely additional lamp cost per T5 tubes	(Euro)	7.6	7.6	7.6	7.6
Acceptable extra cost for T5 luminaire	(Euro)	5	12	18	44

PROST Purchase Specification for glazing (PPS 5)

Table 11.13. Minimum acceptable performance characteristics of windows (Insulating Frame and Glazing Units)

Climate zone	Cooling requirement	U Value (W/m² K)	SHGC	*Tv/Best available**
Heating	no concern	″1.3	≥0.5	*0.6*
	of concern		″0.4	*0.5*
Heating and cooling	limited concern	″1.6	″0.5	*0.6*
	some concern		″0.4	*0.5*
Cooling	real concern	-	″0.3	*0.4*

SHGC = Solar Heat Gain Coefficient; Tv = visible transmittance

** The column provides information only, it is not part of the requirement.*

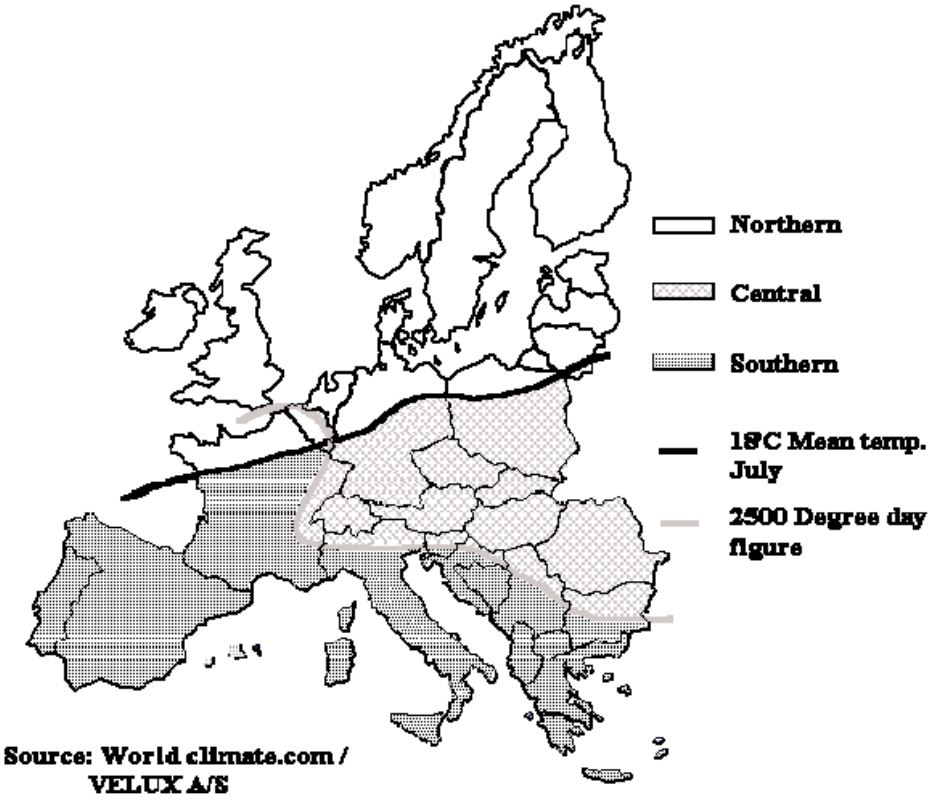


Figure 11.1: European climate zones. Source world climate.com from British Fenestration Rating Council web-site.

Northern = Mostly heating
Central = Heating and cooling
Southern = Mostly cooling

Comments

- The map is very indicative. Only in truly Mediterranean climates should windows be chosen on the basis of SHGC alone.
- In some hot climates where winters are mild it might seem reasonable to select a single-glazed window with a low Solar Heat Gain Coefficient rather than a more typical double glazed unit. However, single glazings have a more limited range of solar heat gain control so a double glazed unit will usually be the overall best solution.

11.2 Minimum performance standards

11.2.1 Heating and ventilation

Table 11.14 identifies the recommended maximum level of *delivered thermal* energy consumption to provide:

- hot water
- space heating

and *delivered electrical* energy for

- space ventilation

in public sector **office space** in all EU Member States. The limits consider that delivered electrical energy is multiplied by 2.5.

Significant experience shows that the limits (the minimum performance standards) reported in Table 14 can be achieved cost-effectively whilst maintaining high levels of space comfort in buildings (cf. Appendix 4). In many Member States the limits represent an notable improvement, (up to 120%), on those limits derived from existing building codes. In a few cases the limit actually equates closely with those currently imposed by existing Member States building codes. Where existing limits are already restrictive (compared to the average EU condition), the Member States should nevertheless aim to introduce tighter requirements for public sector building stock (say a 20% improvement).

However though the above limits are cost-effective, a number of issues need to be addressed before any obligation could be placed on the public sector in this sense.

Table 11.14: Recommended Minimum performance standards (maximum delivered energy)for space heating, hot water and space ventilation in new and restructured office space

	MJ/(m²/year)	kWh/(m²/year)
Existing buildings	250	70
New buildings	145	40

Table 11.15: Recommendations for the maximum auxiliary electricity demand of central heating systems

Framework	Maximum value for the annual auxiliary electricity demand of central heating systems
New build and refurbishment with thermal insulation	0.8 kWh/(m²*a)
Refurbishment without thermal insulation and special types of use	1% of the annual useful energy demand for space and water heating

Source: HMUEJFG 2000

The analysis conducted (Appendix 4) considers the issues at stake, including restrictions, opportunities, and synergies presented by the forthcoming EU Directive "on the energy performance of buildings" (the EU Buildings Directive). The text explains the choice of limits and the importance of the recommendations/actions listed above.

11.2.2 Indoor lighting

Requirements on indoor lighting levels, as well as design regulations, appear to differ across the EU. The energy consumption furthermore strongly depends on the required lighting levels and the annual hours of use of a lighting system. The latter are in turn depending on the type of control (manual, timer, occupancy, daylight, or combinations).

It has therefore not been possible to develop a general recommendation for a minimum performance standard for indoor lighting. However, the recommendations on maximum energy consumption level to achieve given in the guidelines of the Deutscher Städtetag (cf. Appendix 7) provide a benchmark of what is economically feasible in the EU with current lighting technology and careful design of lighting systems and controls:

"At an illumination level of 300 lux, an installed power of 10 W/m² must not be exceeded, the target value is 7.5 W/m². At an illumination level of 500 lux, the maximum value is 15 W/m², the target value is 11 W/m². These levels can be achieved, if lamps with a lighting efficiency of at least 50 lm/W and luminaires with a lighting efficiency of at least 80% are used. Generally, electronic ballasts must be used."

11.2.3 Circulation pumping

Among the purchase specifications, we also recommend the use of speed-controlled pumps. However, the pump itself is only one part of a water circulation system. The system itself, with all the pipes and valves and secondary circuits in a complex public building, often presents higher opportunities for reducing energy demand. Hydraulic equilibration between the different rooms/heating panels is an important tool to reduce to a minimum the pump power required to get every room warm.

It has not been possible to develop minimum performance standards in the current project due to lack of time. However, optimising pumping systems can achieve energy consumption values below the thresholds given in the following table, which are taken from a guideline published by the state of Hessen (Germany).

11.2.4 Integrated building design

Integrated building design is a method for achieving the minimum performance standards with no or limited extra costs compared to national building codes or separate good design practices.

In the design of new complex buildings as well as in the refurbishment of old lighting and HVAC systems, very much can be gained by an integrated design approach, in which the different engineers and planners co-operate from the beginning, instead of each working separately as in the traditional planning. For instance, the building envelope with its orientation and insulation determines the need for heating, lighting, and cooling; the installed power of electronic office equipment and of lighting determines the need for cooling and ventilation, etc.

In a recent example, such an integrated design applied to the new police headquarters in Frankfurt/Main was able to reduce the planned electricity consumption by 4.3 million kWh/year (55%), and the planned peak load by 1 500 kW (42%) compared to a first, traditional building design. The reduced electricity consumption and peak load will save 330 000 Euro/year in electricity costs. Furthermore, the lower need for equipment in ventilation, air conditioning, and water heating **reduced** the investment costs by ca. 1.3 million Euro.

In some countries, like the Netherlands (in the Energieprestatienorm for service buildings), Switzerland (in the SIA 380/1 and 380/4 building guidelines on heating energy and electricity), and on the Länder level in Germany (in two guidelines by the government of Hesse), guidelines for integrated building design have been developed and used in practice. They usually include "good practice" benchmarking values (equivalent to the minimum performance standards proposed here) and "best practice" target values for the specific consumption (in kWh/m^2/a), e. g., for lighting and HVAC (both heat and electricity), that can be achieved by integrated building design.

Such benchmarking values are partly country-specific; but what can and should be **harmonised** at the European level is the **existence** of such integrated building design guidelines and benchmarks, as well as the professional training and building purchaser motivation programmes that are necessary as a complement to the design guidelines.

11.2.5 Recommendations and actions

Member States should:

Introduce a recommendation (for local and regional public administrations, if a requirement is legally not feasible) or requirement (at least for central government agencies) for minimum performance standards specific to the public sector, as set out in Table 11.14, plus additional requirements for indoor lighting and circulation pumping.

Ensure that present and future national energy performance standard methodologies cover sufficient technologies (both depth of analysis and range of solutions) to allow any minimum performance standards specific to the public sector defined in Table 11.14 to be met.

Implement the requirements in line with the deadline for national implementation of the EU Buildings Directive (most likely by January 2006).

Prepare for the effective application of the minimum performance standards, for example by:

- ensuring the limits can be met within the terms of national Energy Performance Standard methodologies
- communicating in advance the requirements to the public sector
- promoting integrated building design (for example training designers in the use of integrated modelling software, and providing the necessary weather files for different climatic zones of Member States)

Seek synergy between the processes of introducing national and public specific minimum performance standards (for example in the development of communication programmes).

Define public sector specific minimum performance standards at a level which ensures the greatest long term economic savings for the public sector.

Periodically review and update performance standards, at least in line with frequency set out in the EU Buildings Directive (i.e. at least every five years).

11.3 Best practice guidelines

Best practice guidelines describe selected pathways to improved energy efficiency by defining an optimised combination (in terms of investment/running costs) of equipment choice, system design, maintenance and operational schedules. Guidelines provide *voluntary* but concrete pathways to improved energy efficiency for system designers, which respect national building codes. Best practice guidelines are an important tool for improving the energy efficiency of building service provision; for example indoor lighting, and winter space comfort.

Guidelines though following common themes need to be articulated on a country by county basis, in consideration of the national building codes.

11.3.1 Recommendations and actions

Define best practice guidelines for the design and management of passive solutions and active building systems.

11.3.2 Further considerations

Best practice guidelines and purchase specifications are complementary tools addressing different barriers to achieving improved energy efficiency of public sector building stock.

- *Best practice guidelines* describe selected pathways to improved energy efficiency by defining an optimised combination of equipment, design practices, maintenance and operational schedules

- *Purchase specifications* work mainly to ensure that an existing decision to purchase a component or system, results in the acquisition of the most energy-efficient solution possible. Though purchase specifications may also inspire purchasing officers to make non programmed changes to equipment, and replace installed standard components with more efficient cost-effective solutions.

In reality, there is overlap of the themes covered by each tool, specifically best practice guidelines often define the requirements of new equipment, though the emphasis, and means of presentation remains clearly distinct between the two.

Detailed purchase specifications currently represent the more innovative solution, and hence the emphasis given within this report. However, a structured programme to improve energy efficiency in the public sector requires definition of and access to both type of tools (purchase specifications and best practice guidelines).

The *Deutscher Städtetag, Arbeitskreis Energieeinsparung* (the German association of medium and big cities, working group energy conservation) has prepared energy guidelines for municipal administrations. The guidelines bundle the basic principles for design, operation, and energy management in one central regulation. The energy guidelines do not provide general principles for dealing with energy issues, but rather a summary of concrete instructions for design and operation, as well as regulations of responsibilities for achieving improved energy efficiency in building stock. The Deutscher Städtetag guidelines cover:

- architecture
- constructive heat protection
- heating systems
- ventilation and air conditioning
- sanitary systems
- lighting and other electrical systems
- monitoring and control systems

The guidelines are collated as Appendix 7 to the PROST report and provide just one example of the type of guidelines it would be possible to develop, though the exact procedures to apply in each Member State would require a country by country analysis. Also we underline the fact that only the *text* of the *Deutscher Städtetag, Arbeitskreis Energieeinsparung guidelines* is annexed to the report. To be effective, the guideline content would need to be integrated into a suitable user friendly communication package, in the same way that the PROST Purchase Specifications should be integrated into a PEEP type communication package (see Chapter 9 and Appendix 2).

The energy efficiency of all building services (indoor lighting, winter space comfort), would benefit from the definition, and diffusion of well structured and clear best practice procedures, throughout the public sector. However the best practice guidelines become a particularly valuable tool when aiming to promote the adoption of passive solutions. Indeed seldom, if ever is it possible, to propose a passive alternative to an active technology through a standard purchase specification.

For example, a purchase specification which informed purchase officers to always replace T8 luminaries with light shelves, light wells or larger glazing areas would be unrealistic. Though light wells, light shelves and increased glazing offer the potential for significant energy savings their use is feasible only under certain conditions, which require a building-specific analysis.

11.4 Requirements for passive cooling

Best practice guidelines are useful for promoting the adoption of passive solutions for providing summer space comfort. However, contrasting the currently increasing diffusion of active air conditioning systems, is a priority issue for the EU and a more stringent policy by the public sector for limiting the uptake of active systems and ensuring the application of passive alternative is merited.

11.4.1 Recommendations and actions

- define minimum requirements of building structure, composition and layout (for example thermal inertia, use of window shading) for improving indoor summer comfort without the use of active air conditioning systems
- ensure that minimum requirements are met before the introduction of any active air conditioning system
- allow the introduction of active air conditioning systems only if subsequent to the implementation of the minimum requirements, indoor comfort standards are still unsatisfactory

11.4.2 Further considerations

Best practice guidelines represent an effective means to accessing the saving potential offered by implementing passive techniques for achieving summer space comfort, and their use should be promoted. For example the *Deutscher Städtetag, Arbeitskreis Energieeinsparung* energy guidelines define procedures for introducing external sun shades, improving air tightness, avoiding thermal bridges and use of night cooling to improve indoor summer comfort levels.

However, providing low energy summer space comfort is in many respects a rather unique problem compared to improving the energy efficiency of other building services (for example lighting, space heating). As the EU Buildings Directive recalls (premise 13):

> Recent years have seen a rise in the number of air-conditioning systems in southern European countries. This creates considerable problems at peak load times, increasing the cost of electricity and disrupting the energy balance in those countries. Priority should be given to strategies which enhance the thermal per-

formance of buildings during the summer period. To this end, there should be further development of passive cooling techniques, primarily those that improve indoor climatic conditions and the micro climate around buildings.

Though there is considerable growth in the use of active air conditioning systems which has created problems of peak load in recent years, most office buildings in the public sector in Europe currently still have no active air conditioning systems. Though guidelines can be developed which address the transition from active to passive solutions, clearly the emphasis should be to avoid the initial installation of active air conditioning. The installation of an active air conditioning system, where none actual exists in the immediate term, leads to an increase in energy consumption, however in the medium term represents a considerable lost opportunity since:

- users will generally only consider replacing the air conditioning system after the initial investment has been "repaid" through service provision over time
- it provides expectations of indoor space temperature levels, which can be more difficult to meet through passive solutions and hence hinders the future passage to passive systems. (Though passive solutions may not deliver the same constant temperature levels, they can deliver acceptable service levels in terms of air flow, noise, and daily variation in temperature and moisture, and overall comfort)

Given the importance in general of adopting passive solutions for achieving indoor summer comfort, as recalled by the (draft) EU Buildings Directive, and given that there are considerable lost opportunities in failing to avoid the installation of active systems in the first place, the most efficacious method to ensure uptake of passive solutions by the public sector would be to define minimum requirements for the application of passive solutions to achieve indoor space summer comfort.

The Swiss building regulations achieve just this. The use of air conditioning is severely restricted: obtaining a permit to install air conditioning requires that designers show that it is really unavoidable and that there are no other low-energy-consuming alternatives that will produce comfortable ambient conditions inside the building. The engaged engineering office has to submit a proof of cooling demand at the local building control authority. Requirements for the proof of demand are listed in the SIA standard 382/3. The space or buildings have to fulfil criteria in relation to:

- envelope insulation and air tightness
- thermal inertia
- solar gains
- internal gains
- comfort levels (maximum temperature level)

A more detailed description of the Swiss requirements are given in Appendix 7.

Though an efficacious solution, it is not possible to apply the Swiss regulations unaltered across Member States since:

- the complexity of building thermal performance make requirements highly location specific
- standards of thermal summer comfort differ between countries; requirements providing acceptable indoor standards in Switzerland might prove unacceptable elsewhere

However, such technical problems can be overcome given the political will to implement such a stringent policy.

The adoption of public sector minimum performance standards, as proposed elsewhere in this report, would also be a stimulus for the implementation of passive solutions for achieving summer space comfort. Minimum performance standards focus on the overall energy consumption of the building. This integrated performance approach stimulates the design of good building, and related systems.

However, the introduction of minimum performance standards specific to the public sector cannot be realistically expected before 2006 (see the detailed discussion on MPS in the Appendices). Moreover, even supposing that public sector minimum performance standards are introduced, it would be advantageous anyway to implement minimum requirements on passive cooling along the lines of the Swiss building regulations, in order to effectively facilitate the implementation of passive cooling strategies.

11.5 Life-cycle cost methods for buildings

LCC methods and tools make LCC analysis easy, such that it does not complicate the standard procurement process

- provide transparent procedures which allow LCC to be undertaken within the context of tender processes

There is no standard acceptable form for LCC Methods. Generally there are two categories of solution to consider:

- active solutions
- passive solutions

Provided with the present report is as an example of an electronic spreadsheet useful for determining the LCC of electromagnetic and electronic ballasts and determining the comparative lifetime savings. The spreadsheet is provided in proprietary Microsoft Excel and **Open Source**, Star Office versions. A print out of the sheet, is provided as Appendix 5.

The spreadsheet provides only an indication of the general type of tool it is possible to develop for *active components*. Though completely functional, it is limited

both in consideration of the technologies (only ballasts for T8 18W systems) covered and in its ease of use. With further development a more flexible tool could be produced allowing LCC to be determined for electromagnetic, low loss and electronic ballasts (including dimmable) for different types of of system; for example T8 36W, T5 14W, 28W. Users could define the system type, operating conditions and economic variables through dynamic linked lists.

Determining LCC for *passive solutions* is more complex. To determine the costs and benefits of using passive solutions (for example selective glazing) in a specific building general requires developing a thermodynamic model of the building in a suitable software environment (for example DOEII, Energy Plus, TRANSYS). Developing software libraries of representative national building stock from which designers could quickly introduce and evaluate the proposed passive solutions could be a useful tool in this sense.

Both issues are considered in further detail below.

11.5.1 The need for LCC methods and tools

The first section of this chapter considers the general issues of determining LCC for products, building components and systems, from which we have:

$$LCC = C_o + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

where:

C_o = purchase price (Euro), including installation costs

$\sum$ = sum over the lifetime of the appliance, from year 1 to year n, where n is lifetime of the appliance (years)

C_t = annual operating and running expenses (Euro), which include costs for maintenance, costs for energy, costs for other resources (e.g. water) and disposal costs

r = Discount rate

In theory, this formula should not be used in cases where two or more building components or systems with different life-expectancies are compared with each other. However, most efficient components/solutions last at least as long, but generally longer, than inefficient alternatives. That is, efficient solutions which offer the least LCC costs, also generally offer equal or better service levels (longer lifetime) than inefficient alternatives and should therefore be chosen. However, in cases where the lifetime of the efficient component/solution is less than that of the inefficient solution, the comparison should be made based on annuities instead of net present values. The following formula should be used:

annuity A = LCC * r / $[1-(1+r)^{-n}]$.

Purchase specifications provide a simplified procedure of determining LCC for the majority of small or medium sized purchases. Purchase specifications identify building components which provide minimum LCC considering typical system types, operating and economic conditions installed/enjoyed by the public sector in the Member States.

In a number of situations the general purchase specifications may prove inadequate:

- when the operating and economic conditions enjoyed by a specific public institution differ notably from the typical conditions on which the purchase specification is based (for example different energy prices, discount rates, hours of use)
- when the public authority is undertaken a large purchase and needs a more accurate estimation of costs and savings
- when there is a need to evaluate components or solutions not covered by the purchase specifications

This need may manifest itself within the context of a tender process.

- If the tender is to be awarded on the criteria "economically most advantageous offer", considering lifetime energy and maintenance costs, bidding suppliers will be required to provide an analysis of LCC of proposed solutions.

Though in appearance the equation above is relatively simple, undertaken an LCC calculation can be non trivial; it requires for example collecting and correlating a notable amount of information from different sources (suppliers, administrative officers, facilities departments).

Further, any need to determine LCC must contend with the limited resources of public authorities; both in relation to the technical preparation of the staff charged with undertaking the analysis and the time available to collect the necessary information (for example component costs and energy prices) and perform the calculation.

Generally there are two categories of solutions to consider:

- active solutions
- passive solutions

Of the two, determining LCC for active systems generally proves the easiest. There is a direct, explicit linear relationship between the component power or efficiency and annual energy costs. The formula to determine annual running costs can be readily implemented for example in an electronic spreadsheet, as in the prototype tool provided with this report.

However, there can also be none linear effects on annual running costs when installing energy- efficient active components. Lowering the installed power of components (for example lighting systems) can reduce cooling loads on air conditioning systems in the summer and increase the need for heating in the winter, with consequential impacts on running costs. The issue of dealing with such non linear secondary effects is de-

batable. In the context of providing LCC tools, it would reasonable to ignore them.

Ideally, spreadsheet tools would be developed for families of components; for example heat generators, pumps, luminaires, fluorescent lamps. Tools providing a general LCC analysis can be useful for evaluating none standard products. However, generality tends to place more onus in the definition phase which increases complexity of use.

Spreadsheet tools are effective in view of the widespread knowledge and use of spreadsheet environments.

Determining LCC for *passive solutions* is more complex. The effect for example of selective glazing, improved wall and roof insulation, ground heat exchangers, modified roof albedo, and window shading on building heating and cooling system loads are highly non linear. Annual running costs can only be determined for specific conditions by developing a thermodynamic model of a building (new or refurbished). Readily available, and in part free, software greatly assist this task (for example DOEII, Energy Plus, TRANSYS) for technicians, though these are complex software environments and technicians require suitable training. However, the task of developing a model is time consuming, even for experts. It is therefore a task for policy to develop models. The use of these models is not only a task for public building departments themselves, but should also be made a condition for engineers when commissioning the design of buildings.

A possible solution to assist this operation would be to develop base case standard models representative of national building stock in a suitable software environment. More precisely the library would provide a collection of models articulated for example on:

- age of construction (construction materials)
- type of construction (for example school, office, town hall)
- style of construction (for example standard, glass facade)
- form of construction (for example long horizontal, high rise)

And for each building type define:

- standard installed systems (lighting, heating and cooling)
- schedules (presence of people, heating, cooling and lighting system operating hours)

The library would provide the technicians with an advanced starting point from which to evaluate the proposed passive and standard solutions. Though developing such a library would be resource intensive it would:

- in the short term assist the uptake of modelling software by designers charged by the public administration; a necessary first step if the design of low energy intensive, high quality buildings is to become common place
- in the long term avoid duplication of work by the different architects and designers charged with implementing passive solutions in buildings

Overall, it is the task of an EU and national programme for energy efficiency in public buildings to develop easy-to-use LCC models. A starting point can be existing LCC models, such as the spreadsheet used by the City of Frankfurt am Main (available for download at: www.stadt-frankfurt.de/energiemanagement), or ongoing processes, such as the effort of the European Commission (DG Enterprise, Competitiveness of the Construction Industry Action Plan, Sustainability Task Group 4) to create a method for the assessment of Whole life costs in construction. In that effort, it is the objective to create a method, whose results of least whole life costs (equivalent to LCC) can be interpreted as fulfilling the economically most advantageous tender.

Part 3

Scenarios and potentials

12. The energy, CO_2 and fiscal potential of a European PROST programme

12.1 Objectives and scope

The main objective of this task has been to outline a number of policy scenarios for the public sector in the EU to demonstrate how their purchasing practices could influence the energy efficiency.

We have quantified country by country the savings potential in annual energy, greenhouse gas emissions, and costs from activities in the public sector purchasing.

The modeling associated with the scenarios is based on a simple spreadsheet-based tool and on available statistics or best-estimates of energy use and purchasing practices by the European public sector.

We have included both the EU-15 and Candidate Countries in the analysis to give a) national estimates of savings potential but also b) aggregated estimate of impacts on a European level. This has necessitated data collection from 20 countries and modifying the tool according to what data has been readily available. It should be noted that the study makes no attempt at estimating the positive energy and CO_2 effects that could be reached through a wider market transformation beyond the public sector, although these effects may be significant.

The scenarios demonstrate in aggregated form the influence of different policy options and possible use of

- "top-down" national policies on energy-efficient purchasing
- models for "bottom-up" programs developed initially at the local grassroots level
- opportunities for co-operation among government agencies
- more direct collaboration through aggregated purchasing programmes, complementary efforts such as energy rating/labeling or subsidies for efficient products, partnerships with manufacturers and sellers of efficient products
- proposed indirect incentives to government agencies to incorporate energy-efficient purchasing

SOLPROS from Finland has developed the methodology and model and prepared the scenarios. FEWE from Poland has been partly responsible for data collection.

12.2 Modeling approach and structure

In order to estimate the impacts of different strategies on the energy use and energy efficiency in the public sector, a calculation tool was designed. The idea here was to keep the tool as simple as possible and to rely on easily available input data that could be found from the country studies summarized in Part I and from general sources.

The flow chart of the methodology is illustrated in Figure 12.1. Table 12.1 shows a list of the input data used in the model. The numeric input data used in the calculations are shown in Table 12.2.

The first (1) or global level comprises calculation of the energy use of the public sector based on its share of the total national energy use. The energy use is split into heat and electricity demand. In addition, the emissions and monetary value of the energy use of the public sector is estimated. The level (1) is estimated for all EU-15 and selected Candidate Countries.

The second level (2) model investigates the public sector energy use in more detail. Three segments namely buildings, non-buildings and office equipment are considered and the energy efficiency opportunities within these. The additional data needed for level (2) is shown in Table 12.1 is bold.

The third level (3) comprises the calculations of the different scenarios and impacts of policy options for public procurement of energy-efficient technologies and services. We evaluate three cases as follows:

(a) The baseline case is defined here as the natural trend in energy use and energy efficiency improvements. The final electricity consumption in commercial and public services (tertiary sector) in EU showed an annual change of +2.7% from 1990 to late 1990's (this figure is the net increase of electricity including both the increase in activity levels and energy efficiency improvements). In case of final heat consumption the corresponding change is +3.4% but it has declined during the last years.

We assume that the activity level of the public sector will remain almost constant or increase slightly in the coming years due to the general trend of public savings and outsourcing. The public sector is likely to grow much less than the remaining society and private sector. We assume that the public sector (incl. public building stock) grows annually by +1% during 2001-2020. If the energy efficiency level remains constant, then the public sector's energy growth would be the same +1%/yr. However, we assume in addition a natural trend of -0.5%/yr in energy use due to energy efficiency from better equipment and necessary house renovations. The net increase in energy of the public sector would thus

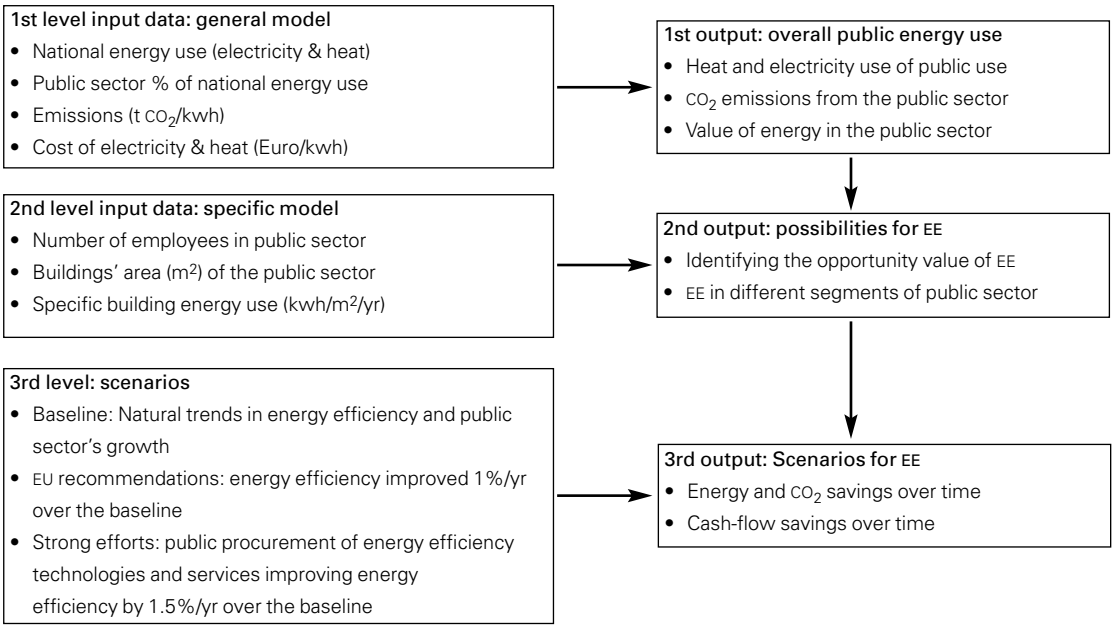


Figure 12.1: Calculation model used in the scenarios.

Table 12.1: Input data

General data (1st level input)
Total electricity use (TWh/yr)
Total heat demand (TWh/yr)
Total population (millions)
Cost of electricity (Euro/MWh)
Cost of heat (Euro/MWh)
Average CO_2 emissions from electricity production (tons CO_2/MWh)
Average CO_2 emissions from heat production (tons CO_2/MWh)
Public sector data (2nd level input)
Public sector's share of total national electricity use (%)
Public sector's share of total national heat use (%)
Number of employees in public sector (millions)
Buildings' area of the public sector (million m^2)
Specific electricity use in public buildings (kWh/m^2,yr)
Specific heat use in public buildings (kWh/m^2,yr)
Trend data (3rd level input)
Increase/decrease of public building stock (%/yr)
Increase/decrease of ITC equipment in the public sector (%/yr)
Natural energy efficiency improvement of public sector (%/yr)

be +0.5%/yr. The present policy outlines in EU (such as the public directive) are adequate to realize this.

In addition, we will also present a case with +2%/yr energy increase as a pure extrapolation from history to future for comparison (denoted as a*). This can also be considered as the worst case of energy use in the public sector.

(b) The first policy scenario is based on the Council decision and EU recommendations to improve the energy efficiency by 1%/yr over the natural trend. This would mean an annual change of -0.5% in the energy use of the public sector.

(c) The second policy scenario assumes stronger efforts through public procurement of energy efficiency technologies and services. This improves energy efficiency by 1.5%/yr over the baseline case, or an annual change of -1% in the energy use of the public sector.

The baseline scenario (a) is assumed to be realized by itself through present EU policy measures. The energy efficiency scenarios (b) and (c), however, require

stronger EE policies in the public sector. There exist a variety of policy options ranging from regulatory measures such as minimum standards, codes or norms to more market driven actions such as incentives or procurement activities. We will analyze the scenarios from the public procurement point of view and evaluate what these would mean for public procurement of energy efficient services and technologies. Our understanding is that scenarios (b) and (c) could be fulfilled through a strong public procurement based policy options following the policy recommendations presented in Chapter 8 of PROST.

12.3 Energy use in the public sector

12.3.1 Situation in 2001

The total use of heat and electricity in the EU-15 region as calculated in this study was 6617 TWh in 2001. The public sector's share of this was slightly under 10%, or 628 TWh/y. The value of the heat and electricity used by the public sector was about 47 billion euro. Thus, the public sector could represent a major possibility for savings both in terms of energy (and CO_2) and money.

The weight of the public sector varies somewhat from country to country. Based on the country studies done previously in PROST, the public sector (national, regional and local) in most Member States corresponds to about 10% of the total national energy use. In some countries, notably in Germany and Ireland it's clearly less, or closer to 5%. In Austria, the share is 11% of electricity and 14% of heat, respectively. In Sweden, the public sector stands for 30% of the total heat use due to large public housing companies. In the Candidate Countries studied (Slovakia, Estonia, Poland, and Hungary), the estimate for the public sector's share is around 20%, or twice that of EU-15. Hence, energy efficiency strategies for the public sector in the CEEC may have larger impacts than in present EU countries.

12.3.2 EU-15 energy use in public sector 2001-2020 in the different scenarios

The starting point in year 2001 for the total energy use (heat and electricity) in the public sector of EU-15 is 628 TWh . The electricity use was 195 TWh. The share of heat is in average 2-3 times larger than electricity in the Member States. The scenarios (a-baseline), (a*-worst), (b-EU) and (c- PP of EE) are shown in Figure 2 from 2001 up to 2020.

The reference case (a) predicts an 11% increase in energy use by year 2020, or 66 TWh more than in 2001. The electricity use has increased in this case by 20 TWh. The energy efficiency scenario (b) and (c) indicate -9% and -18% changes to the 2001 level, respectively. In terms of energy, this means 60 and 115 TWh energy savings, respectively. Realizing for example the scenario (c) would mean avoiding constructing electric generation capacity of 40 TWh or 5-6 large power plants in 2020. In 2020, the difference in energy use between the unlikely worst case (a*) and most energy efficient policy (c) would be 420 TWh, or 67% of the year 2001 level.

What type of measures could fulfill the amount of energy savings reported here? In case of heat, most of the demand comes from buildings in which 10-20% energy savings are easily achieved through very cost-effective measures (payback time less than 2-3 years) and have been verified e.g. by extensive Finnish auditing activities of public buildings. The life-span of buildings is long but different renovation measures into which energy efficiency measures could be integrated as well fall probably within the 20 years time horizon used in the scenarios. In new buildings, stricter minimum standards or requirements on specific heat demand are easy to incorporate. Better thermal insulation, more efficient windows, heat recovery, and better control are examples of approaches to improve the thermal building efficiency. Technically speaking, the heat demand could be dropped even more than required here, or by 30-50% from average heat demand values of today. This has been demonstrated for example in Helsinki Ekoviikki, where the Helsinki Housing Office has built ecological buildings for social housing purposes demonstrating 50% lower heat demand than in new buildings in Helsinki in average.

The electricity demand in the public sector is composed of building related electricity use (e.g. ventilation, cooling, air-conditioning, and lighting), occupant or employee related use (office equipment, appliances) and other public services (e.g. street and traffic lighting, pumps). The share of each category of electricity use may vary very much from municipality to municipality not to speak about the differences between countries. However, in each of these categories, considerable electricity savings could be achieved through more energy efficient technologies. For example, more efficient

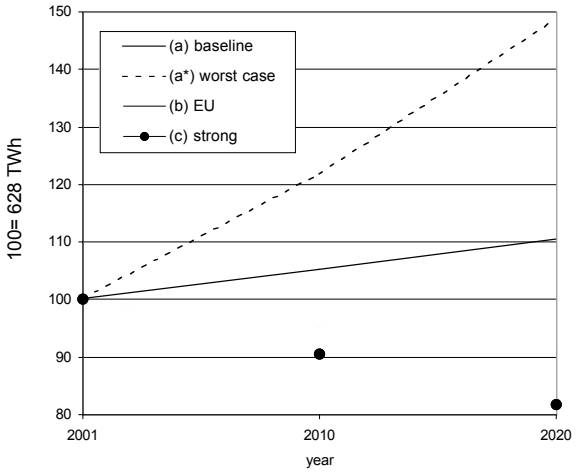


Figure 12.2: The total heat and electricity use of the public sector of EU-15 in the different scenarios. At starting point in 2001, energy use is denoted 100 and corresponds to 628 TWh.

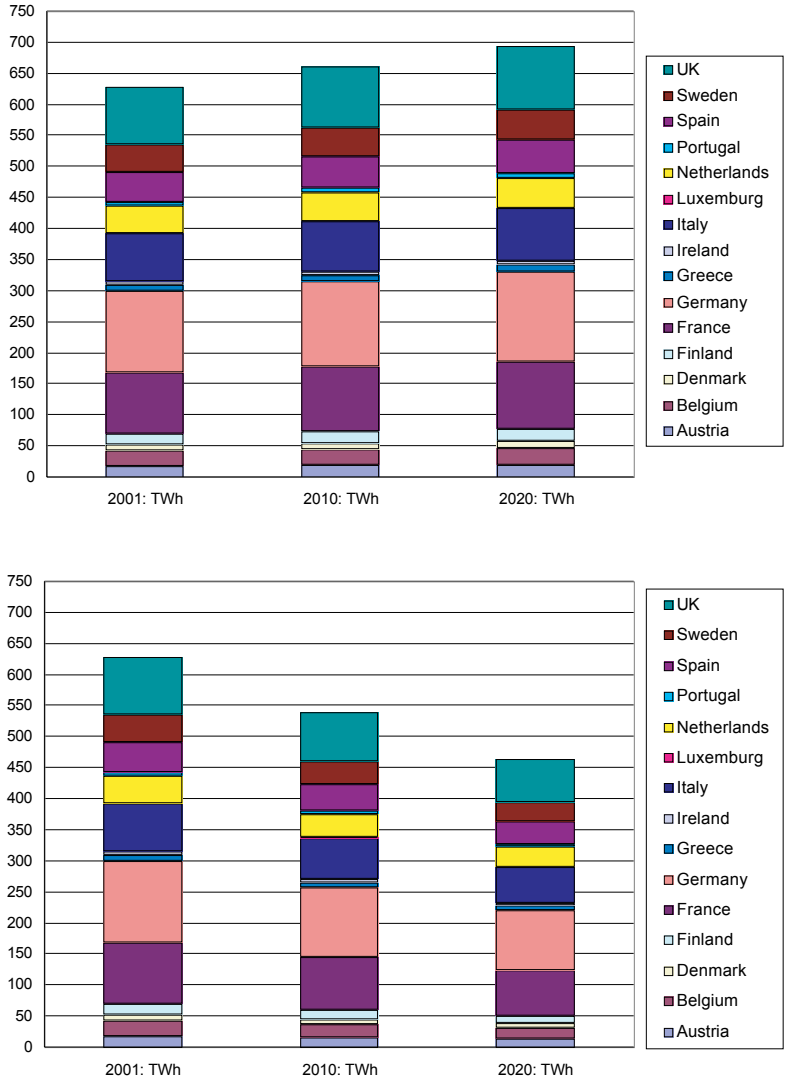


Figure 12.3: The energy use of the public sector by Member State of the EU. Above is the baseline scenario (a) and below is the strong energy efficiency scenario (c). Summarizing the outcomes of the scenarios, the energy use of the public sector in 2020 shows a +10%...-20% change compared to 2001 (excl. the worst case scenario). Related to the total national heat and electricity uses in the Member States, this means in practice a +1.5... -2% change from the reference level 2001.

lighting and better lighting design during building renovation or in new buildings may drop the total building electricity consumption by 5-15%. Office equipment with Energy Star labels, A-labeled appliances and energy efficient pumps could typically save 30-50% in the electricity bill compared to ordinary products. The rotation time of products described above varies from 5 to 25 years which falls within the time horizon of the scenarios. The payback time of the more efficient products is typically 2-5 years but in addition other benefits such as increased productivity or improved comfort could be achieved as well.

The Swedish PROST Country study shows that the annual opportunities for electricity savings are 525 GWh if procuring the most energy efficient available technologies. This corresponds to 5% of the public sector's electricity use in Sweden. The same kind of savings could be achieved throughout the Europe.

Thus we may conclude that both electricity and heat savings of around 20% in 20 years represented by the highest energy efficiency case (c) can be firmly justified and achieved even in large public building stocks or in public practices. It would, however, necessitate clear energy policy measures, for example instructions on how energy efficiency features should be incorporated into call of tenders and public procurement procedures.

The energy use of the public sector in the Member States of the EU is shown in Figure 12.3 for the baseline and energy efficiency case. Germany, France, UK and Italy represent almost 2/3 of the whole public energy

use in Europe. Smaller Member States such as Austria, Belgium, or Finland would each represent a few percent of the total. Germany alone comprises almost a quarter of the total. If creating common European policy guidelines for energy efficiency in the public sector, achieving true impacts may require more consideration of the characteristics of the larger public sectors in Europe, or, alternatively finding country independent or commonly accepted and used policies. European legislation and directives on competition already require the public sector to procure openly services and products over a certain threshold. Thus, authorities on all levels have experience and are used to procurement. Therefore we perceive here public procurement of energy efficiency as a good approach for a common European policy option on energy efficiency in the public sector.

12.3.3 Savings and investments by 2020

The price of energy varies between the Member States quite much. The retail price of electricity is between 90 (Greece, Finland) and 225 Euro/MWh (Denmark), the average being around 140 Euro/MWh. For heat, the price range is between 30 (Belgium) and 70 (Denmark, Italy) Euro/MWh, the average price of heat is about 45 Euro/MWh. Taken the ratio of heat and electricity in the total energy use, the above pricing scheme means that their value for the public sector is about equal.

The total annual spending of the public sector in EU-15 on heat and electricity is estimated at 47.4 billion Euro in 2001. Assuming negligible price changes, the impacts of the different scenarios on the energy costs are of the same magnitude as in energy use. The impacts of the scenarios on the energy bill of the public sector are illustrated in Figure 12.4.

The EE scenarios (b) and (c) would mean in 2020 annual savings of 9 and 13 billion Euro respectively compared to the baseline trend (a). The savings compared to the 2001 level, would be 4 and 8 billion Euro from the two scenarios, respectively. These figures do not account for the investments needed, but using a conservative payback time of 5 years, would result in net savings that are at least 75% of the estimates above.

The effects of the EE scenario case (c) on each Member State are shown in Figure 12.5. The largest single savings are gained in Italy and Germany followed by France and UK. In small Member States, the energy bill of the public sector in 2020 would be around 1 billion Euro.

The differences in the energy prices in the EU mean that the countries with highest energy prices would gain more through the savings than those with low energy prices. In Figure 12.6 we have illustrated the relation between economic and energy gains through energy efficient public policies (case c).

The economic gains in relation to the energy efficiency gains are the largest in Denmark and Italy. Portugal, the Netherlands and Spain are over the EU

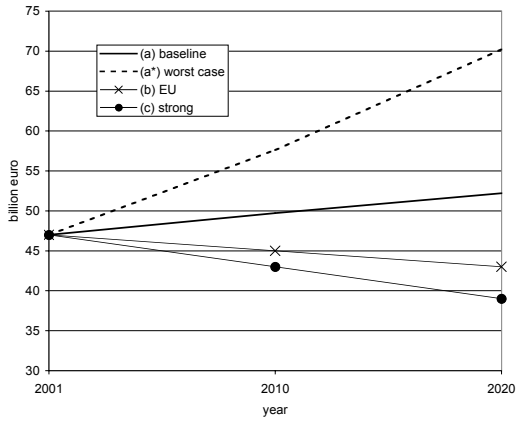


Figure 12.4: The value of the total heat and electricity use of the public sector of EU-15 in the different scenarios.

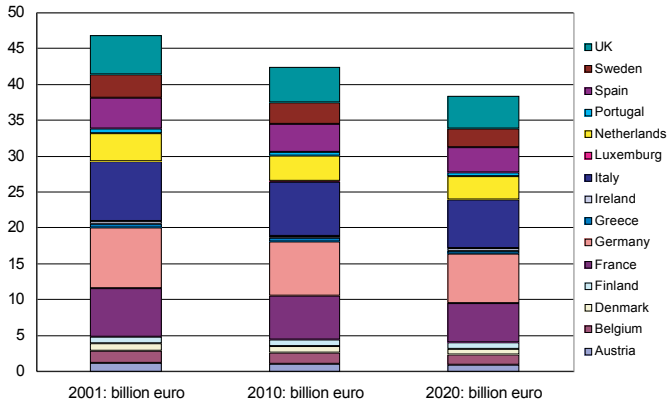


Figure 12.5: Annual energy bill (heat and electricity) of the public sector by Member State in the energy efficiency scenario case (c).

average and hence from an strictly economic point of view the motivation for energy efficiency in the public sector should also be largest in these countries. The difference between the minimum and maximum found in Figure 12.6 is about factor 2.

The additional investments on better EE features needed to reach the largest EE improvements represented by case (c) is estimated to be 1.6 billion Euro, or 80 million Euro if spread evenly over 20 years. For a small Member State this would mean 1.5-2.5 million Euros per year. Adding the investments to the annual energy bill would mean a 0.2% increase in average, but if accounting at the same time for the savings from energy efficiency services and products, an annual net decrease of 0.8% in the energy bill could be achieved.

What would 80 million Euro per year on energy efficiency features mean in the total product sales volume, i.e. how much product sales could energy efficiency trig? As an example of the business potential repre-

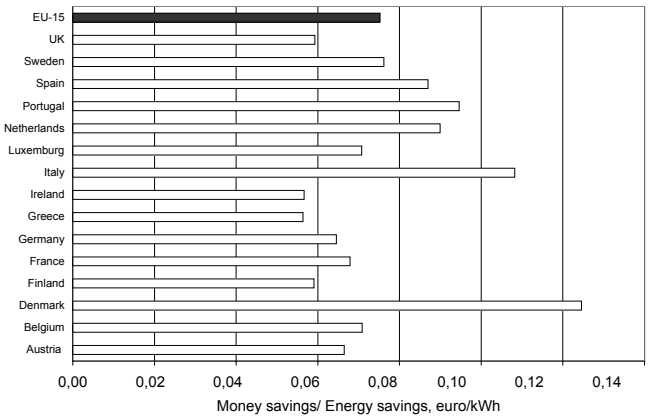


Figure 12.6: Relation of economic to energy gains in case (c) scenario in Member States.

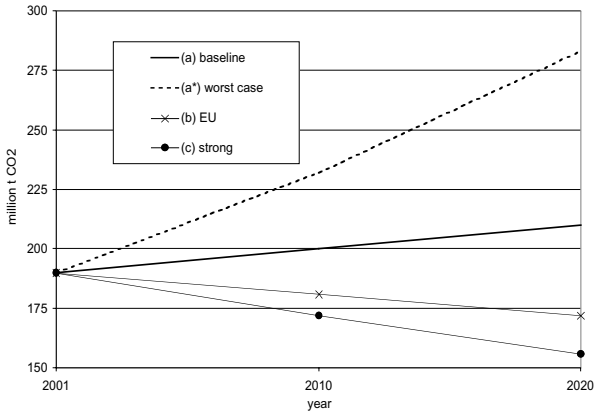


Figure 12.7: The CO_2 emissions from the different scenarios.

sented by the energy efficiency features, we will consider the office equipment. The PROST country studies indicate around 13 % of the electricity savings in the public sector could come from purchase of more energy efficient PC:s and screens alone. This would mean a public purchase of more than 12 million PC:s over 20 years, or 600 000 on an annual basis. Valuing a PC for 1,650 Euro each, the total value would be 1 billion euro per year.

Thus, if the public sector would go for purchasing products and services with more energy efficient features, their purchasing power would be considerable and would for sure create interest among suppliers to satisfy this demand.

Summarizing, the public sector in Europe could save annually something in between 9 and 13 billion Euros in 2020 through easy realizable energy efficiency. Through its purchasing power the public sector could attract adequately interest on energy efficiency among suppliers of products and services.

12.3.4 CO_2 emissions

The total CO_2 emissions caused by the public sector's heat and electricity use were 191 million tons CO_2 in 2001. Scenario (b) and (c) represent 18 and 34 million t CO_2 savings in 2020 compared to the 2001 level, respectively. Compared to the baseline (a) scenario the savings are 38 and 54 million t CO_2, respectively. Figure 12.7 summaries the results.

Figure 12.8 illustrates the CO_2 emissions by Member State. Germany, UK, Italy and Spain represent 71% of the public sector's emissions from heat and electricity in the EU. The Netherlands represents around 9%. The remaining 10 Member States are responsible for 20 % of the emissions.

Finally, we compare the CO_2 savings against the energy savings in Figure 12.9. The largest CO_2 savings through energy efficiency are in Greece, followed by Portugal, Germany and UK. Spain, the Netherlands and Italy are also clearly above the EU average. In France and Sweden, the CO_2 savings through energy efficiency are the smallest in the EU. There is a factor of 10 between Greece and France, i.e. saving a kwh of energy in Greece yields ten times more savings in carbon dioxide emissions than in France. Therefore, in countries like Greece and also those clearly above the EU average, using CO_2 savings as an argument for energy efficiency in the public sector may be highly motivated. However, for a common European policy formulation of EE in the public sector, the above observation may mean that CO_2 quota based or CO_2 savings driven policy approaches would not yield very effective outcomes through Europe. The variance in the cost to energy savings ratio was much smaller, or 2 compared to 10 for CO_2, which means that energy efficiency policies linked to fiscal or economic factors such as energy taxation or public procurement may gain much broader impact in Europe.

12.4 Energy use in the public sector in selected Candidate Countries

In the PROST project, four Candidate Countries to the European Union were included namely Estonia, Hungary, Poland and Slovakia. The public sector's share of the total energy use in these countries is about double as high than in the EU, or 20% of the national heat and electricity use. The energy price is about 1/2 of the EU level and the specific CO_2 emissions are 60-70% higher than in EU.

The four scenarios presented for the EU countries may not all be that relevant for the CEEC countries. Firstly, the public sector in the CEEC:s are relatively large and being part of the EU it could be expected that the size of the public sector will decreased during the period up to year 2020. Secondly, as the specific energy consumption is higher than in the EU, the opportunities for energy efficiency are larger in general in CEEC:s. Thirdly, the infrastructures within the public sector and society need still considerable investments to raise the service level closer to that of EU, for example the electricity consumption per capita in the CEEC:s is 40-80% lower than in the EU. Fourthly, the fiscal situation of the public sector is poor which may not enable large capital investments.

Summarizing, we have factors that favor both an increase and a decrease in the energy use of the public sector of the CEEC countries. With the data and information available in the PROST project, it has been difficult to quantify the net effects of these influencing factors. Our best estimate is that the CEEC countries should come closer to scenario (c) and we use this as the basis for our calculations here.

In 2001, the four selected CEEC countries show 137 TWh energy use in the public sector.

Figure 11.10 shows the outcome of scenario (c) which demonstrates a 25 TWh decrease in the energy use or close to a 20% decrease. This corresponds to 3.5% reduction in the national energy uses. The energy bill in 2010 would be 700 million Euro lower than in 2001. Accounting for the investments for energy efficiency would reduce the savings by 5-15 % as the potential for low cost EE in these countries is high. The CO_2 savings in scenario (c) are 15 million t CO_2.

In Figure 11.11 the relative importance of emission reductions and economic gains obtained through energy efficiency. We observe that the CO_2 emission reductions are clearly higher per unit of saved energy in the CEEC:s than in EU, or about double, but the economic savings are clearly lower, or less than half. Energy efficiency policies EE driven by CO_2 emission reductions would yield larger gains in the CEEC:s than in EU-15.

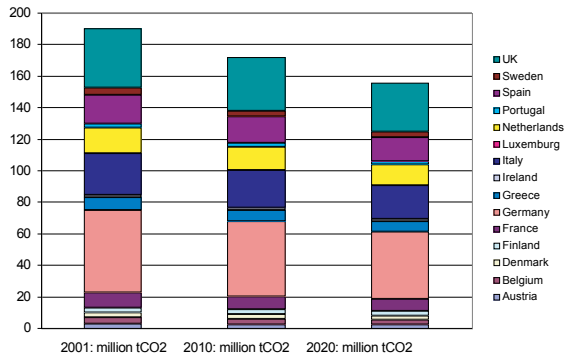


Figure 12.8: The CO_2 emissions for each Member State in scenario (c).

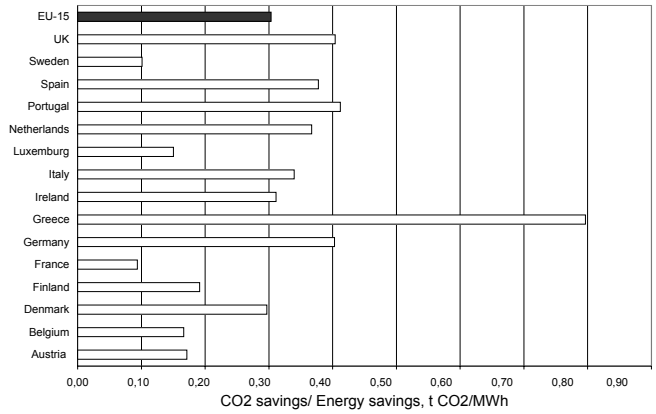


Figure 12.9: Relation of CO_2 to energy gains in case (c) scenario in Member States.

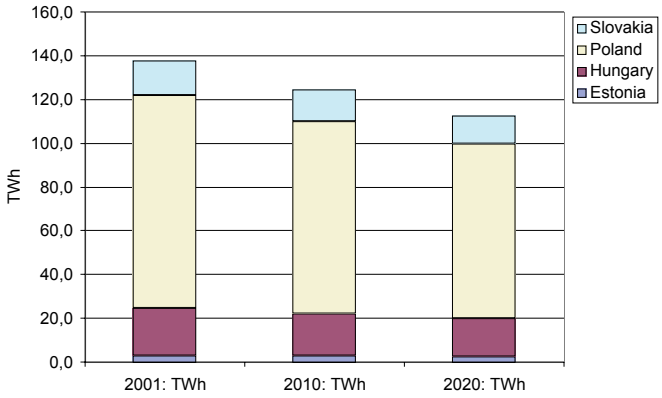


Figure 12.10: Estimated energy use by the public sector of 4 candidate countries (scenario c)

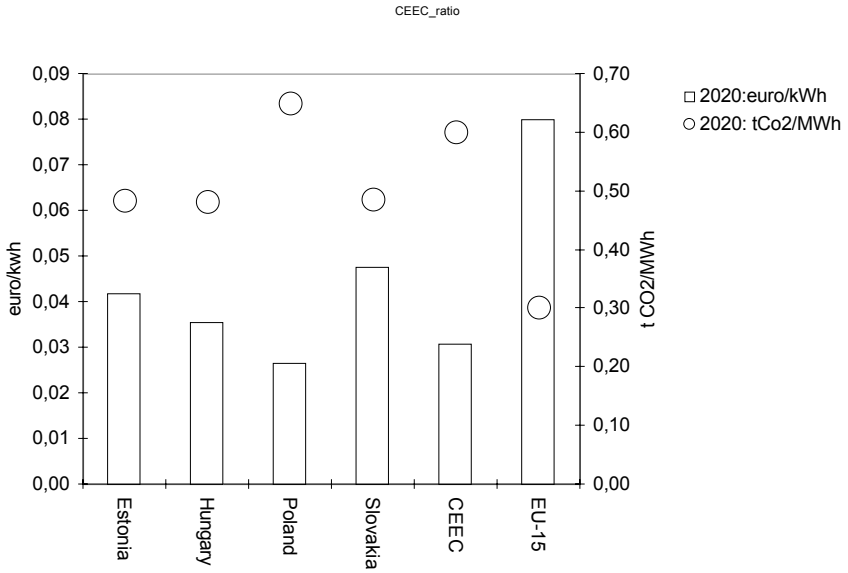


Figure 12.11: Relation of CO_2 and economic gains to energy savings in scenario (c) in CEECs.

12.5 An example of disaggregated energy use

The level of available data from the PROST studies did not make it possible to undertake detailed analysis of the influence of different products or service on the public sector's energy use. However, for a few countries such as Austria we had more data so that some kind of disaggregation was possible. In the next, we show the outcomes from a more detailed analysis on the heat and electricity use of the public sector in Austria.

The Austrian public sector's total electricity use is around 5TWh and heat us is 13TWh per year, respectively. We decompose the electricity use here into the following categories:

(i) Building related electricity use
(ii) Office equipment related electricity use
(iii) Other electricity use (e.g. street lights, pumps, equipment)

In our model, category (i) corresponds to 45%, (ii) to 10% and (iii) to 45%. We take as the natural annual volume increase of category (i) +0.5%, (ii) +3% and (iii) +1.0%, respectively.

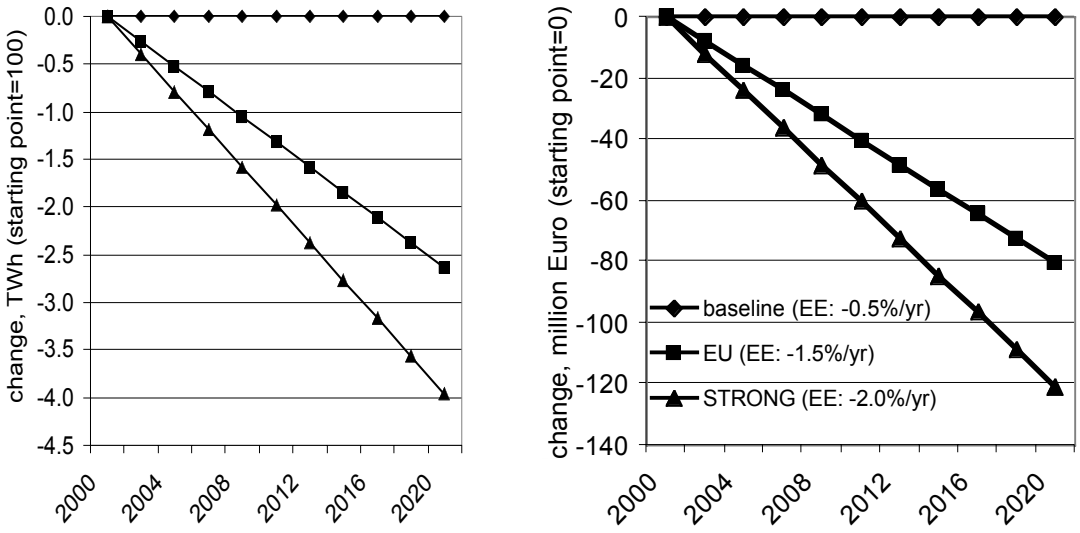


Figure 12.12: Change in heat use (above) and heat bill in the Austrian public sector in the scenarios.

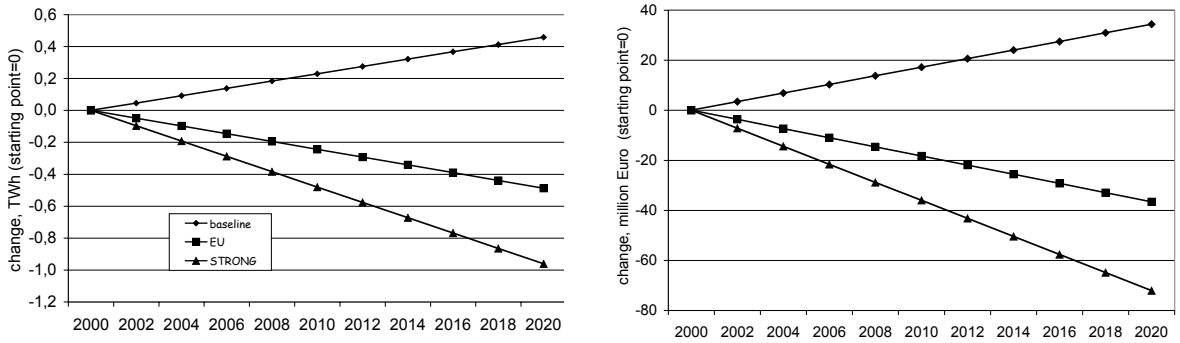


Figure 12.13: Change in electricity use and electricity bill in the Austrian public sector in the scenarios.

For the heat use, we assume that 70% is building heating related and 30% other use (e.g. hot water, process heat). The annual volume increase of heat is +0.5%.

Three scenarios for annual energy efficiency improvements (energy intensity) are assumed namely -0.5% (baseline, natural trend), -1.0% and -1.5%, respectively.

Figure 12.12 summarizes the results from the scenarios on the heat use. By 2020, annual energy savings ranging from 2.5 to 4 TWh with savings value of 80 and 120 million Euro (incl. investments) could be expected from the stronger energy efficiency measures.

Looking now on the electricity side in Figure 12.13, we observe a basic growing trend of electricity use mainly due to increased demand of electricity requiring equipment and products. This trend is counterbalanced in the two efficiency scenarios so that by 2020, net annual electricity savings of 0.5 and 1 twh could be achieved. The corresponding net economic gain would be almost 40 and 75 million Euro.

Comparing the heat and electricity scenarios, one may find a few interesting aspects. First, we foresee a quite neutral basic trend in heat use in the future whereas for electricity the baseline scenario is an increasing trend. Secondly, even though the savings from the electricity are just a quarter of the heat, the economic value is close to equal. This may be a point to elaborate more as quite often the energy efficiency measures concentrate on the thermal energy use in buildings (e.g. through building codes) whereas the electricity side has received less attention. The electricity side may be interesting for public procurement activities as these are by nature quite often products, equipment or even services in contrary to thermal measures which are mainly building envelope based improvements.

12.6 Summary

The scenarios presented in this chapter indicate a 10-20% energy savings potential in the energy use (heat and electricity) of the public sector in the EU by 2020 which could be realized through public procurement activities. This corresponds to a few percent of the national energy uses but closer to 4% in the CEEC Candidate Countries due to the public sector's higher share of the whole energy use.

The public sector in EU could save a total of 9 to 13 billion Euro in 2020 through the energy efficiency scenarios presented here. The total annual investment needed is only 80 million Euro over the next 20 years. The energy bill of the public sector could thus annually drop by up to 0.8% if going for stronger energy efficiency criteria in purchasing practices.

The largest economic gains in relation to the energy efficiency gains are found in Denmark and Italy – the Netherlands Portugal, Spain are also over the EU average. On the other hand, the largest CO_2 savings through energy efficiency are found in Greece, followed by Portugal, Germany and UK and the Netherlands. Spain and Italy are also above the EU average. These findings may stress using both economic and environmental related criteria in further policy developments for the public sector.

Table 12.2: Input data used in the scenario calculations

Country	AUS	BEL	DEN	FIN	FRA	GER	GRE	IRE	ITA	LUX	NET	POR	SPA	SWE	UK	EST	HUN	POL	SLO
general data (1st level input)																			
total electricity use (TWh/yr)	43	81	35	70	389	498	37	20	267	1	108	38	190	117	334	6	33	77	28
total heat demand (TWh/yr)	94	160	70	100	605	1322	60	101	505	1	328	30	300	112	600	9	75	361	71
cost of electricity (euro/MWh)	100	118	105	100	59	112	63	95	120	60	180	115	88	73	118	57	100	100	68
cost of heat (euro/MWh)	36	35	40	35	75	35	30	50	47	50	70	40	40	54	50	25	15	3	38
CO2 from electricity production (tons CO2/MWh)	0.15	0.10	0.63	0.25	0.08	0.63	1.11	0.77	0.49	0.10	0.57	0.50	0.50	0.15	0.50	0.60	0.66	1.02	0.70
CO2 from heat production (tons CO2/MWh)	0.18	0.20	0.13	0.15	0.10	0.35	0.60	0.22	0.26	0.20	0.30	0.30	0.30	0.09	0.35	0.40	0.40	0.52	0.40
public sector data (2nd level input)																			
public sector's share of total electricity use (%)	11	10	10	10	10	5	10	5	10	10	10	10	10	8	10	20	20	20	16
public sector's share of total heat use (%)	14	10	10	10	10	8	10	5	10	10	10	10	10	30	10	20	20	20	16

13. References and Internet resources

Part 1 of the PROST report is a synthesis based on the findings of the individual Country Studies, which are found in a separate volume. All sources and references for each country study is given in the specific reports, and we have made no attempt at gathering these references here. Only if motivated, we have given separate references in this section. In other parts of the PROST study, the references used are given below with the following exceptions: Where a references is made in the text to specific countries and no other reference is given, the individual country studies are used as the reference. This is also true for Chapter 12, however, additional personal communication has been given from the country teams directly to the authors of Chapter 12. Such personal communication is not found in this reference list.

13.1 References

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Improving policy coherence and integration for sustainable development, OECD (2002a). Paris, www.oecd.org

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The Blue Angel Ecolabel

www.energystar.gov
Energy Star from the US Environmental Protection Agency

http://searchwin2000.techtarget.com/sDefinition/0,,sid1_gci213657,00.html
ACPI (Advanced Configuration and Power Interface), an industry specification for the efficient handling of power consumption in desktop and mobile computers

http://europa.eu.int/ecolabel
European Ecolabel

http://www.energy-plus.org
Energy-plus SAVE Program for super-efficient refrigerators

http://www.eceee.org/library_links
see page with procurement information

AUSTRIA

http://www.municipia.at/fallstudien/f0000124.html
The environmental Program Graz "Oekostadt 2000" developed from 1990 to 1993, equivalent to a local Agenda 21.

http://www.eva.wsr.ac.at/projekte/uni.htm
Project "Energy Efficient Universities"

http://www.nachhaltigwirtschaften.at/publikationen/index.html
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http://www.Energieinstitut.at/
Energy Institute Vorarlberg . “e5-Landesprogrammem” (Program of the province) for energy-conscious municipalities, a best practice competition for municipalities comparable to the Swiss label “energy city”

http://www.eva.wsr.ac.at/(de)/projekte/tpf-rat.htm
Energy Performance Contracting for Small and Medium-Sized Municipalities: Guidelines for Success

www.oekoeinkauf.at
Green Purchasing Criteria

FINLAND

http://www.hymonet.com
Hymonet

FRANCE

http://www.ecocampus.net/
Ecocampus

http://www.finances.gouv.fr/
Ministry of Finance, Economy and Industry

GERMANY

www.wegweiser.de

www.cosinex.com

www.beschaffen.de/clearingcenter/home/home.php

http://www.difu.de/stadtoekologie/praxis/
Database with best practise examples

www.destatis.de/zeitreih
Statistics

www.indikatoren-nrw.de
The project "Indicators North Rhine-Westphalia" by the Ministry of Construction and Housing, Culture and Sports for North Rhine-Westphalia

www.communal-labels.org
The "Action Program 2000plus" by the Ministry of Economics and Small Businesses, Technology and Transport for North Rhine-Westphalia will be implemented by the energy agency of North Rhine-Westphalia, too. One part of the Program is the project "Communal Labels"

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www.stadtentwicklung.berlin.de/umwelt/klimaschutz/berlin_spart_energie/
www.nds-energie-agentur.de/main/m_kem.htm

IRELAND

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All Ireland Directory of Public Sector Procurement

http://www.odci.gov/cia/publications/factbook/geos/ei.html
CIA, The world factbook – Ireland

www.environ.ie
Comhar – The National Sustainable Development Partnership, Work Program 1999-2002,
http://erg.ucd.ie/
Energy Research Group at University College, Dublin

http://www.irlgov.ie/
Ireland – Information on the Irish State

www.irish-energy.ie
Sustainable Energy Ireland

http://www.environ.ie/localindex.html
Local Government in Ireland

ITALY

www.istat.it
Istituto Nazionale di Statistica (National Statistic Office)

www.acquisti.tesoro.it
Public Administration central purchasing (CONSIP Spa)

http://www.n2d.it/isb/
La scuola intelligente (Energy Efficiency in Schools) Provincia di Milano

http://www.grtn.it/
Gestore della Rete di Trasmissione Nazionale (National Greed Manager)

http://www.provincia.torino.it/ambiente/energia/strategi.htm
Provincia di Torino – Piano Energetico Provinciale (Energy Plan)

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JAPAN

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www.gpn.jp
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Green Purchasing Network

www.stat.go.jp
Japan Statistical Yearbook

http://www.unescap.org/enrd/energy/finance/part3_sato.html
Promotion of Energy Efficiency Investments in Japan

http://www.env.go.jp/en/pol/g2o/index.html
Action Plan for Greening Government Operations

THE NETHERLANDS

http://www2.minvrom.nl
The Netherlands Ministry of Housing, Spatial Planning and the Environment

http://www.inkopers.net
Program Sustainable Procurement
Website providing a toolbox with environmental specifications

www.novem.nl/epn
Computing Program 'EP Variants for Commercial and Industrial buildings' to check the compliance of buildings with EPC (Energy Performance Coefficient) requirements

http://www.milieukeur.nl

http://www.rijksgebouwendienst.nl

http://nic-plaza.nl

http://www.egadvies.nl

http://www.dubo-centrum.nl/

PORTUGAL

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AKF Institute for Local Government Studies – Denmark Report about Portugal

http://www.dge.pt
Ministry of Economy General Directorate for Energy

http://www.ine.pt/index_eng.htm
Instituto Nacional de Estatistica (National Statistic Office)

http://www.spes.pt/
Sociedade Portuguesa de Energia Solar (Portoguese Agency for Solar Energy)

SWEDEN

http://www.eku.nu/
Guideline for Ecologically Sustainable Procurement

http://www.sou.gov.se/eku/
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http://www.avropa.nu/index.htm
Co-ordination of government procurement

http://www.boverket.se/
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TCO label of the Swedish Confederation of professional Employees

www.industrilitteratur.se
Information on LCC

http://www.klokainvesteringar.nu/
Lists of recommended energy-efficient products (City of Stockholm)

SWITZERLAND

http://www.admin.ch/ch/e/schweiz/ political.html
The Federal Authorities of the Swiss Confederation

www.admin.ch/beschaffung
Types of goods purchased by the Federal government

http://cities21.com/egpis/egpc-156.html
Saving money and resources with ecological office materials
Integration of environmental criteria in municipal procurement

www.klimabuendnis.org
Alliance of the European Cities with the Peoples of the Rainforest for Protection of the Global Climate

www.statistik.admin.ch
Statistik Schweiz

www.minergie.ch
Quality label for new and refurbished buildings

www.kbob.admin.ch
KBOB Co-ordination of the federal services concerning building organisations, construction and property services

www.eco-bau.ch
Several surveyor's offices which are members of the KÖB are offering handbooks, recommendations and instruction leaflets to the private sector and/or to public administrations. On this site there is a list of documents available

www.igoeb.ch
The Interest group for ecological purchasing (Interessengemeinschaft Ökologische Beschaffung, IGÖB)

www.buwal.ch
Analysis of financial and budgetary questions in connection with life-cycle approaches

www.energiestadt.ch
Label "Energy Town"

www.kdmz.zh.ch
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UK

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