European best practices in energy efficiency programmes and in supportive policies aimed at increasing economic, social and environmental benefits of energy efficiency on the demand-side

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Abstract

Experience in several European countries show that Electric and Gas distribution or supply (retail) companies can reach their customers through energy efficiency programmes more easily than other actors (energy agency, municipalities, regional or national governments, market regulators).

Without an appropriate supportive framework the distribution and supply companies are unwilling to collaborate to energy efficiency programmes since their profit would decrease and they would incur direct and opportunity costs. This paper presents different national supportive schemes and successful experiences of energy efficiency programmes.

The results of the analysis demonstrate that different successful policies are possible, adapted to the national framework. However only integrated mechanisms that give the appropriate signals to all the market actors can positively induce them to collaborate and to fully exploit the economic, social and environmental benefits of energy efficiency on the demand side. These integrated mechanisms include: dedicated funds, obligation or negotiated agreements to perform energy efficiency activities on the demand-side, ratemaking to remove pressure to increase sales and to promote energy efficiency programmes, legal and technical support.

The analysis presented here constitutes one of the inputs being used in order to draft the proposal of an EU Directive on Energy Services and Programmes to be performed by distribution or supply companies with large involvement of other actors (e.g., Energy Service Companies (ESCOs), authorities, independent organisations).

Introduction

The restructuring of the European Gas and Electricity Markets has not positively affected the market barriers, which exist on the demand side for a more efficient use of energy, e.g. lack of knowledge among end-users and providers of end-use technology, split incentives, high implicit rates of return, lack of funding, etc. (Vine et al. 2002). Therefore, a professional intermediary role is still needed between providers of energy, providers of end-use equipment and services, and customers of energy-efficient end-use solutions to overcome the many barriers to end-use energy efficiency, and to reduce the transaction costs for energy efficiency measures. This professional intermediary role would allow to seize the opportunities increased demand-side energy efficiency presents based on its benefits for the economy, employment, security of supply, and the environment.

However, at the same time, restructuring has widely affected the different national policy schemes to support energy efficiency activities by energy companies and thus the implementation of demand-side energy efficiency programmes in the EU Member States. Without an appropriate supportive framework, the distribution and supply compa-

nies will hardly perform any demand-side energy efficiency activity, if their costs are not borne by the customer or market agent who directly benefits, since their profits would decrease and they would incur direct and opportunity costs. The rationale for the adoption of such a supportive framework lies in the fact that involving energy companies still have a prominent role in implementing energy efficiency, since they can integrate supply-side and demand-side energy efficiency in providing least-cost energy services (cf. Wuppertal Institute 2000b for more arguments why energy companies should be involved). Energy companies, but also other actors like energy service companies or engineering companies, can thus be the professional intermediary needed between the presently existing energy providers, technology providers, and consumers.

In Member States without such a policy, such activities by energy companies have gradually reduced with the introduction of retail competition, and are continued only by a small number of companies that are more innovative, or committed to protection of the environment. Conversely, in those Member States, which have combined the implementation of the EU Internal Markets for electricity and gas with a supportive policy framework, energy efficiency programmes by energy companies are continuing or even expanding in volume and scope.In order to better understand the factors of success, recent experiences of EU countries with and without a supportive policy frameworks have been analysed and a lot of information on good practice in energy efficiency programmes in Europe have been gathered in the course of a number of projects (see Wuppertal et al. 2000). The material for the analysis results from questionnaires answered by national experts, and complemented by interviews to key actors and national workshops. This empirical data has been followed by cross comparative policy analysis. This paper presents the overall results of this research, starting with a description of the existing policy mechanisms and how they can be combined to create a supportive policy framework to energy efficiency by energy companies and other actors at national level. Then, it shows:

- different national frameworks for energy companies in the EU Member States supporting the implementation of energy efficiency programmes, and
- successful experiences of energy efficiency programmes implemented within these supportive frameworks;
- the current trends of energy efficiency programme development in the restructured markets.

Based on these experiences, the paper asks, what the results would be if some of the presented successful energy efficiency schemes were implemented EU-wide. Finally, recommendations are given for supportive national frameworks within a harmonised European framework.

For the purpose of this paper, the expression "energy efficiency programme" means a specific activity (e.g. targeted information, free energy audits, rebates for energy-efficient equipment, direct installation of efficient equipment...) taken by energy companies [or other market actors], and targeted to energy end-users or market agents (e.g., manufacturers or retailers of energy-consuming products). Energy efficiency programmes typically combine information, advice, training of technology providers, and possibly a financial incentive to the customer. In contrast to energy efficiency services, energy efficiency programmes are activities not directly paid for by the customer or market agent who directly benefits. However, the customers will in most cases collectively pay for the bill reductions they get during the following years, through a financing scheme for the energy efficiency programme, e.g., through the energy prices or through (energy) taxes. Compared to energy efficiency services, energy efficiency programmes are generally more suitable for promoting energy-efficient appliances or similar measures usually purchased and used in large multiples of individual units, whereas energy efficiency services are often more appropriate for larger, more complex projects yielding revenues high enough to cover the transaction costs for the services.

It should be noticed, that the paper focuses on energy efficiency programmes, not energy efficiency services. However, it is important to note that in the medium term, a supportive framework for energy efficiency programmes can (and will) also stimulate the market for energy efficiency services. For example, projects with energy (savings) performance contracting can benefit from free energy audits or from rebates for the installed energy-efficient technologies offered within an energy efficiency programme. Furthermore, the market for energy efficiency services will be improved, if energy efficiency programmes increase the customers' awareness of the cost-effective potentials for energy efficiency, and if simultaneously the energy companies build up know-how for the realisation of these potentials.

Possibilities for policy frameworks supporting the implementation of energy efficiency programmes by energy companies

USEFUL COMBINATIONS OF POLICY MECHANISMS STIMULATING ENERGY EFFICIENCY PROGRAMMES

Experience shows that policy frameworks successfully stimulating the implementation of cost-effective energy efficiency activities by energy companies and other actors consist of a combination of:

- an agreed or mandated, quantified target for energy savings,
- a channel or an allowance for raising funding, and for avoiding net losses, and
- a standardised and mandatory scheme for cost-benefit evaluation of the energy efficiency activities.

Such a framework has been created in Denmark, the Netherlands and the UK as it will be presented below, but also in some States in the USA.

Table 1 presents such useful combinations of policy mechanisms. The overview in Table 1 is divided into mechanisms for creating a quantitative target, which should be combined with mechanisms for raising funding, and which should be completed by further supporting mechanisms useful in every combination of policies and measures. Several combinations of these elements are possible, e.g., mechanisms limited to monopoly segments (i.e., distribu-

Table 1. Useful combinations of policy mechanisms for stimulating energy efficiency activities by energy companies and other actors.

Scenario	Main mechanism for creating a quantitative target	Main mechanism for raising funding
Dedicated Funds	Size of **Dedicated Funds** to finance energy efficiency activities	**Dedicated Funds** to finance energy efficiency activities, from special levy or from taxes, administration by independent body or by energy companies
Targets and funding for energy companies	**Obligations** or **Negotiated Agreements** to implement energy efficiency activities	**Price Regulation**, limited to monopoly segments*, or regulated special levy system to enable energy efficiency programme **cost recovery**; Direct revenues from energy efficiency services

Common components of each combination:
1. Price regulation, limited to monopoly segments*, to **avoid** artificial incentives for increased sales
2. Other **legal and technical support** for energy efficiency services and programmes
3. **Requirement to report** on energy efficiency activity results, using common evaluation methods

* Distribution and transmission networks and supply to non-eligible customers

tion and transmission networks and supply to non-eligible customers) can be combined with mechanisms for the non-regulated parts of the markets.

The individual policy mechanisms to be used in the mentioned combinations are briefly explained in the following. More detail can be found in a recent study (Wuppertal Institute et al. 2000).

SCHEMES WITH DEDICATED FUNDS TO FINANCE ENERGY EFFICIENCY PROGRAMMES BY ENERGY COMPANIES, ENERGY SERVICE COMPANIES AND OTHER BODIES

To finance the implementation of energy efficiency programmes and the development of a market for energy efficiency services, a dedicated fund is raised through a public benefit charge applied on all or certain actors of the electricity and gas system, or through recycling a part of an energy tax. The type and amount of energy efficiency programmes to be funded, and, as a consequence, the amount of funds, will depend on the specific goals to be reached. Furthermore, the administration of the funds, and the definition and monitoring of the energy efficiency activities, can be in different hands (an existing or new, independent or government body, or the energy companies themselves, with independent oversight). In Europe, such a scheme has been introduced, e.g., in Denmark (the Electricity Saving Trust scheme).

OBLIGATIONS TO ACHIEVE A TARGET FOR ENERGY SAVINGS THROUGH ENERGY EFFICIENCY PROGRAMMES AND SERVICES

A quite strict mechanism to stimulate a defined level of energy savings is to set an obligation, i.e. a legally binding target for the energy companies. Obligations can differ by actors (distribution and/or supply companies) and by targets (an amount of energy to be saved expressed in kWh, or a percentage of revenues to invest in energy efficiency).

The British Energy Efficiency Commitment (EEC, and its predecessors Standard of Performance) is the most prominent example of such an obligation in Europe. More recently, Belgium, Denmark and Italy have created energy efficiency obligations for distribution network companies in their energy legislation. Furthermore, Ireland is expected to copy the British EEC scheme.

NEGOTIATED ENERGY EFFICIENCY AGREEMENTS WITH THE ENERGY INDUSTRY

Here, the government or the regulator negotiates the energy efficiency target with the energy industry, and settles the target in an agreement. Such a negotiated agreement can be a substitute for obligations, provided the number of energy companies is not too big (e.g., less than 20), and a good monitoring and enforcement of compliance is in place. In Europe, negotiated energy efficiency agreements or CO_2 reduction agreements including specified energy efficiency targets exist in Belgium, Denmark, Finland, France, Germany, Ireland and the Netherlands. However, they differ much in volume and effectiveness.

PRICE REGULATION MECHANISMS TO MAKE ENERGY COMPANIES PROFIT NEUTRAL BY PERFORMING ENERGY EFFICIENCY PROGRAMMES

When performing an energy efficiency programme, an energy company faces both direct programme costs and usually net lost revenues due to reduced energy sales from the programme, except in specific situations like load management activities postponing investments, with avoided costs exceeding lost revenues. Under certain regulatory regimes, these costs or losses cannot be recovered and hence create extremely strong disincentives to energy efficiency activities.

There are a number of actions, which still are available for the price regulation of monopoly segments (transmission and distribution networks, supply to captive customers) and targeted at removing these disincentives:

1. recovery of strictly direct costs of an energy efficiency programme within tariffs;
2. recovery of net lost revenues because of reduced energy sales from energy efficiency within tariffs;
3. additional energy efficiency incentives within tariffs (bonus, shared savings, mark-up).

Energy efficiency programme cost recovery has been quite common in Europe, they have been introduced in Belgium, Denmark, Spain, England and Italy. However, there is no current example of recovery of net lost revenues, or of additional incentives in the liberalised European energy markets.

CHANGE THE PRICE REGULATION OF MONOPOLY SEGMENTS TO REMOVE PRESSURE TO INCREASE SALES

With restructuring, the monopoly sector, and hence price regulation, is reduced to the transmission and distribution networks and, at least for some time, to the supply to non-eligible (captive) customers. Price regulation for these market segments should try to better align the evolution of revenues and profits with the evolution of cost drivers (e.g., for distribution networks, this can be energy sales, number of served customers, grid length). A reduced weight of energy sales, typically 25 to 50%, would better reflect the structure of costs and at the same time reduce or avoid incentives to increase sales. In Europe, such new regulation schemes have been introduced in UK in 1994, and in more recent years in Portugal, Norway, and Italy.

LEGAL AND TECHNICAL SUPPORT AND QUALITY STANDARDS FOR THE DEVELOPMENT OF ENERGY EFFICIENCY PROGRAMMES AND SERVICES

There are a number of policy actions, which are targeted to develop the market for energy efficiency services, but also remove some non-financial barriers to the implementation of energy efficiency programmes. Such policy actions can be:

- standardised monitoring and evaluation procedures;
- guidelines for the tendering procedures in activities of demand-side bidding and competitive sourcing of demand-side efficiency resources;
- technical support for energy efficiency service or programme preparation, implementation, evaluation (e.g. training for the staff on EE technologies, evaluation of savings etc.);
- standardised Energy Performance Contracting schemes;
- guarantee fund for insurance of investments;
- independent certification of energy service companies (ESCOs);
- actions that foster co-operative processes of the relevant actors in the market for energy efficiency programmes and services.

OVERVIEW ON THE DIFFERENT POLICY FRAMEWORKS IN THE EU-15 MEMBER STATES

Table 2 presents an overview on the policy framework for electricity and gas companies regarding energy efficiency activities in the different Member States of the EU-15. It shows in which country which of the above mentioned policy mechanisms has been implemented. No information could be gained in the course of the studies about the situation in Greece and Luxembourg.

The following chapter briefly describes currently adopted schemes in some of the EU-15 Member States. These good practice examples show that these EU Member States have taken action to ensure that energy efficiency programmes, and particularly those implemented by energy companies, can continue after the restructuring and competition enforced by the EU Internal Markets for electricity and gas. These Member States have achieved impressive energy

Table 2. Framework for electricity and gas transmission, distribution and/or supply companies regarding energy efficiency.

Country	Electricity energy efficiency			Gas energy efficiency		
	Energy efficiency funds	Energy efficiency obligations	Others	Energy efficiency funds	Energy efficiency obligations	Others
Austria						
Belgium	X[1]	X[1]	A	X[1]		A
Denmark	X	X	A, R		X	A, R
Finland			A			A
France			A			A
Germany			A			A
Greece	?	?	?	?	?	?
Ireland		X	A			
Italy		X	R		X	R
Luxembourg	?	?	?	?	?	?
Netherlands	X[2]		A	X[2]		A
Portugal			R			
Spain						
Sweden						
UK		X	R		X	R

Source: Wuppertal Institute et al. 2000; Wuppertal Institute 2002a; Wuppertal Institute 2002b.

A - Negotiated agreements and other commitments for energy efficiency activities or savings targets.

R - Reduction of disincentives or setting of incentives in ratemaking of monopoly segments.

? - No information could be gained in the course of the studies, no response to survey.

1 - The current charge for energy efficiency activities on the demand-side of 0.0248 Cent/kWh in the electricity and gas sector is going to be abolished. Instead there will probably be energy saving obligations on the electricity grid and gas companies in the whole of Belgium as they have already been stated in Flanders from 1 January 2002.

2 - energy efficiency activities financed via energy taxes and administered by the utilities.

Table 3. Overview of cost-effectiveness of different measures in the non-domestic sector.

NON-DOMESTIC	Energy Savings TJ	Rebates 1999 in Euro	Cost-effectiveness TJ/Million Euro
Relighting	63.8	464 180	137.4
Variable speed drives	216.5	459 746	471.0
Heat pumps	6.0	18 048	332.0
Solar boilers	1.1	24 334	46.9
Total	287.4	966 308	

Source: Kerssemeeckers, et al. 2001

savings during recent years. More detail can be found in a recent background paper (Wuppertal Institute et al. 2003).

Frameworks and programmes – recent developments in Belgium, Denmark, Italy, the Netherlands and the UK

The good practice examples for energy efficiency programmes and the policy frameworks supporting them presented in the following are:

- Energy efficiency programmes stimulated by legal obligations in Belgium (Flanders), Denmark, Italy and the UK,
- Energy efficiency programmes financed by a dedicated national fund for energy efficiency in Denmark, and
- a pragmatic and efficient way for involving the energy companies into the implementation of a very successful energy rebate scheme in the Netherlands.

BELGIUM

In Belgium, in spring 1996, the Control Committee for Electricity and Gas published a recommendation to spend a part of the surplus revenues of the electricity sector on energy efficiency activities on the demand-side. In 1996, the demand-side energy efficiency fund for the Distribution Sector was budgeted at 10.29 million Euro per year; the following years the Fund was changed to an amount based on 0.0248 Cent/kWh distributed. The gas sector copied the initiative in the electricity sector and came up with its own energy efficiency Fund. From 1996 to 1999, the energy companies spent about 40.2 million Euro on energy efficiency activities for different customer groups, more of half of it for household customers. However, the Funds will come to an end in the coming years, mainly because of the liberalisation of the sector. The regions are preparing or have already implemented legislation to substitute the funds by own initiatives.

An example of a successful Belgian energy efficiency programme in the non-domestic sector: rebates for variable speed drives (on pumps, fans, and compressors, but not on air conditioning) were granted to industry, commercial sector, agriculture (incl. horticulture), and municipalities, depending on the kVA of the electric motor, with a maximum of the total subsidy of about 3 718 Euro per year. The premium decreased from about 124 Euro/kVA when the motor was of the 1 kVA size to about 37 Euro/kVA when the motor was of the 100 kVA size. A report by Kerssemeeckers et al. (2001), based on data from energy efficiency programmes in Belgium (Flanders), confirms that the installation of variable speed drives, e.g., for ventilation purposes, is very cost-effective in general (cf. Table 3).

Since 1 January 2002, there are several energy efficiency obligations on electricity transmission, distribution and supply companies in Flanders (Vlaamse regering 2001):

- Transmission and distribution grid operators are obliged to save yearly 1% of the energy sold two years earlier in their area. The programme allows fuel switch (but saving electricity weighs 2.5 times more than fuel savings in the balance). The savings are measured ex ante. The network companies can select different measures. To each measure corresponds an estimated saving. Only 'direct' measures are accepted (i.e. indirect measures such as information and sensibilisation get a 0 weight in the addition to the 1%). Payment for the programme is by the customers via the normal billing.
- Transmission and distribution grid operators are obliged to prepare a plan of indirect (through information) and direct (through financial support) energy efficiency programmes yearly. These plans must be accepted by the regional regulator in Flanders (VREG) and must target the 1% savings obligation. By September 2002, only ELIA has submitted a plan to promote energy savings at the large customers (connected to the grid at a voltage >20kV and <75kV, and falling therefore under regional authority). It concerns 60 companies consuming 4.6 TWh (or 5.57% of the Belgian electricity consumption). ELIA, sees a budget for the actions of 3 million Euro and will raise the transport tariff by 8 Cent/MWh.
- Transmission and distribution grid operators are obliged to distribute information brochures provided by the Government of Flanders and to implement individual ENERGY EFFICIENCY activities for low voltage customer groups.
- Supply companies are obliged to disclose the supply mix.

DENMARK

Energy efficiency activities in Denmark date back to 1976. A wide portfolio of initiatives have been developed, and are still in force. These strong effort brought to a substantial decrease in energy consumption in most sectors.

The electricity sector underwent major changes with the passing of the Electricity Supply Act in 1999. After the unbundling of vertically integrated electric companies, non commercial network companies have been created. Since

April 2001, large electricity customers are allowed to switch suppliers, and since January 2003, all electricity consumers are able to do so. Since August 2000, 30% of the natural gas market has been open to competition.

A supportive framework for the development of energy efficiency activities on the demand-side in a competitive market was put into effect through different mechanisms. The most important are the obligation to the electricity network companies and – already before the market restructuring - the establishment of the Electricity Saving Trust in 1996.

Electricity Saving Trust – Fuel switching programmes

The Electricity Saving Trust is funded by a volume-based levy of 0.08 Cent/kWh paid by domestic customers and public institutions and collected by network companies. Private companies, consults and/or electricity companies are invited to tender to design and implement projects. The projects with the highest reduction of CO_2 emissions at the lowest cost are selected. In 2001, the activity of the Trust to promote conversion from electric heating to district heating or natural gas focused in particular on the large cities with coal-based CHP. In 2002, the Fund has initiated local campaigns for changing from electric heating to natural gas at the same time as "come again" campaigns are implemented in the district-heating areas in which the plants conducted conversion campaigns in 1998. During recent years the Trust has been conducting campaigns in co-operation with manufacturers, retailers, the association of the electricity network companies ELFOR and the Danish Energy Agency (DEA; since the new government started in November 2001, DEA has been included in the Ministry of Commerce structure) on low-energy light bulbs (CFLs), white goods and standby consumption in TVs and VCRs. In relation to the public sector, the Electricity Saving Trust is working to spread the A agreements where municipalities, counties and state institutions commit themselves to purchasing only low-electricity-consuming (A label) equipment.

The Electricity Saving Trust has to reach a cumulated electricity saving over 10 years of 750 GWh leading to a reduction of the Danish total CO_2 emission by 1%.

Converting from direct electric heating to gas and district heating is a major programme performed by the Trust. An independent board oversees the operations of the Trust and selects the projects with the highest reduction of CO_2 emissions at the lowest cost.

The fuel switching programme is carried out by the staff of the Danish Electricity Saving Trust in cooperation with all 4 natural gas and 150 district heating companies (nearly all the largest companies out a total of 400 companies). These natural gas and district heating companies are working under conditions approved by the Danish Electricity Saving Trust. Appliance manufacturers and building managers and administrators are also involved in the programme, offering preferential prices following a call for tenders by the Trust.

The monitoring and evaluation is performed by the Trust. In 2001, the savings were 48 GWh, while they were 248 GWh for the period 1998-2001. 17 000 customers (participants) being 34% of the eligible customers (50 000) have converted to gas or district heating.

Energy Efficiency Obligations for the Network Companies - Energy Audits in the Commercial sector

In Denmark, the energy efficiency obligation is placed upon the electricity network companies, who evenly supply energy efficiency activities to all types of customers. The overall target for the energy efficiency activities of the network companies in 2002 is 128.5 MWh additional in the first year of implementation (for "measurable" programmes only; cf. ELFOR 2001). Costs recovery is carried out trough a Public Service Obligation levy (0.08 Cent/kWh) on the network tariffs constituting a no-profit no-losses scheme. The levy is collected by the network companies via the electricity bills. At present the companies spend approximately 14 million Euro annually on energy saving activities (ELFOR 2001). The Electricity utility association ELFOR is taking care of national planning and evaluation/documentation of the energy efficiency activities.

To their business customers, the Danish network companies mainly offer a free on-site individual advice service. They monitor whether the customers implement the energy efficiency measures identified. Each year, the companies have to provide such a free energy audit to 10% of the business customers with more than 20 MWh/year consumption or customers with 10% of the total consumption of the customer group. Each year, equipment and operations using about 2.2 TWh/year is screened for energy efficiency. According to the experiences, ca. 5% of this consumption (110 GWh/year) will be saved, which is the biggest part of the total annual savings from the Danish energy efficiency programmes of the network companies.

In the future, also the natural gas companies and the district heating companies will work for energy efficiency in Denmark. The framework of the activities will to a high degree correspond to that of electricity companies (Energistyrelsen 2001). Following a building-up period, these activities are expected to be considerable in scope (Miljø & Energi Ministeriet 2001).

ITALY

Before the implementation of EU Internal Markets Directives, activities carried out by energy companies to promote end-use efficiency at customer's premises have been fragmented and loosely evaluated and documented. Much more impact on energy consumption trends and load shape has been probably produced by tariff structures.

The restructuring of the electricity and gas markets introduced eligible customers, bringing to an end the era of the two state-owned monopolists. In the framework of this complete redesign, electricity and gas distribution companies were identified as the best actors to perform energy efficiency activities on the demand-side. With the two Ministerial Decrees issued on 24 April 2001, they were given the obligation to reach annual national savings targets. For the fulfilment of the target, both programmes or services can be delivered.

The savings are measured in terms of toe ("primary energy savings", "riduzione dei consumi di energia primaria"). At least 50% of the target should address programmes that reduce consumption of the form of energy they distribute (gas for gas distributors, electricity for electricity distribu-

tors). Other primary energy saving programmes are admitted up to 50% of the target.

Two regulation signals have been introduced (in practice or in principle and details are underway) for electric and gas distribution companies to eliminate "artificial incentives to increase sales" and make the companies profits neutral to energy efficiency activities on the demand-side or better:

- firstly total revenues coming from certain customer classes are no more 100% proportional to energy units sold, but only 25% or less, thus reducing the extraprofits connected with increasing energy sales beyond the expected levels used in setting unit prices by the regulator. This action is in line with the principle of harmonisation of the economic interest of energy companies and the objective of efficient use of resources established by Law 481, November 1995 and to the Energy Authority Bill n. 204, December 1999;
- and secondly costs of energy efficiency programmes incurred by gas and electricity distributors will be recovered through a small fraction of the tariff; this is established by law (Law 481, November 1995; Bill 23 may 2000, n. 164 (Decreto Letta); Bills 24 April 2001).

Costs born by the distributors to carry out the programmes to fulfil the obligations can be partially recovered through the tariffs (net of contribution from other sources, i.e. national or regional contributions, costs covered directly by the customers, etc.). Criteria guiding the cost recovery are to be set by the energy authority, taking into account any profit variation resulting from programmes implementation.

On 4 April 2002, the energy authority has issued a proposal for the guidelines for the design, implementation and evaluation of programmes (these guidelines also cover the mechanisms of cost recovery and of the energy efficiency certificates issuing and trading).

The energy authority's proposals regarding costs recovery are:

- the cost to be recovered by distribution companies for each kWh saved is identified as an average value (probably between 3.3-4.4 Cent/kWh saved in the first year), calculated as a percentage of the sum of the average avoided cost of the saved energy and the environmental avoided costs;
- cost recovery are admitted for a maximum of five years following the implementation of the programme (if a programme is implemented in 2003, the distribution company will receive a cost recovery from 2004 to 2008). The authority introduces a reduction coefficient to take account of the persistency of the savings. Some technologies are supposed not to last as others. For example some CFL will be out of order before the end of first year, thus the savings in the second year for some measures will be reduced up to 10%, depending on the technology introduced;
- gas distributors can recover only costs of programmes for the reduction of gas consumption; electricity distributors can recover only costs of programmes for the reduction of electricity consumption;
- some correction factors can be introduced for specific programmes with higher costs;
- since the distribution tariffs are designed following a Multiple Driver Target, the authority will not introduce further specific mechanisms to take into account profit variations;
- the cost will be recovered through an addition to the variable fraction of the tariff, that will finance a national compensation fund.

The energy authority will also be responsible for the evaluation of the programmes carried out. Each distributor should give evidence of the programmes carried out to fulfil its own obligation, obtaining energy efficiency certificates issued by the authority. A fee is due by those who fail their target.

Distributors can act in three ways:

- direct fulfilment of the obligation,
- bilateral contracts with ESCOs or other actors that would act on their name,
- buying energy efficiency certificates on the market.

NETHERLANDS

In the 1990's, the energy distribution companies and the Dutch government had agreements on quantified energy savings targets. This scheme ended in 2000 with the liberalisation of the energy markets in the Netherlands. However, the electricity and gas companies are still involved in the administration of the Energiepremieregeling rebate schemes and campaigns in the context of the Dutch "Regulatory Energy Tax" (ecotax), where they can build on their experiences with rebate schemes in the 1990's.

The "ecotax" on electricity and gas is in principle paid by the consumer to the state; but the energy companies collect it. The customers have the possibility to get a rebate paid out by the energy company for specific energy efficiency measures. The energy companies subtract these energy rebate payments from their ecotax debt. The energy companies are also reimbursed for the costs incurred in the implementation of the programme. The companies have to document the actual implementation, expenses etc. An independent state body monitors this (checks accounts in detail, visits some actual customers who have signed a paper on having received grants, etc).

The list of the technologies addressed contains for example refrigerators and freezers, dishwashers, washing and drying machines (50 Euro for each appliance with an Energy label class A, 100 Euro for super efficient appliances: Energy+ fridges and freezers and AAA Class Washing Machines, 160 to 205 Euro for tumbler dryers); LCD monitors and TV; floor ground or wall insulation (from 2.5 to 12 Euro per square meter); heat reflecting glass (from 20 to 30 Euro per square meter); high efficiency condensing boilers; low temperature heating systems; lighting systems control. Also a grant for the energy performance analysis is given when at least one of the measures recommended in the audit is carried out. The Energiepremieregeling has been supported by a wide scale information campaign including national campaigns on television and national newspapers, adver-

Table 4. Market share of class A labelled appliances in the Netherlands and the EU 1999-2001.

		1999	2000	2001
Refrigerators	Netherlands	26%	55%	67%
	European Union	12%	19%	27%
Freezers	Netherlands	29%	55%	69%
	European Union	12%	16%	
Washing machines	Netherlands	40%	71%	88%
	European Union	15%	26%	45%
Dishwashers	Netherlands	27%	55%	73%

Source: Belastingdienst (2002), based on GfK data

tisement in shops, actions targeting installers, and websites (such as www.energielabel.nl).

In total, about 15% of the ecotax is used for the energy credit scheme. The amount of funds available to the citizens for 2000 and 2001 were 153 million Euro, of which 97% was actually spent. The information and awareness campaigns and the implementation costs sum up to 20% of the total expenditure.

Within the first two years of the energy rebate scheme, one third of Dutch households applied for the rebates; of these, around two thirds concern domestic appliances. The introduction of the energy rebate scheme has led to an enormous growth of the supply of A-labelled appliances (cf. Table 4). This increase is most likely due to the energy rebate scheme and has led to a situation where retailers very often advice their customers to buy an A-labelled appliance as the best on offer. The increase in sales has also produced a decrease in the prices of A-labelled white goods.

It can be estimated that total annual savings for the energy rebate scheme are around 300 GWh/year for the white goods sector only from the years 2000 and 2001 combined, including the market transformation effects as shown in Table 5. The total savings in the heat sector have been estimated as ca. 500 GWh/year. The total CO_2 emission reduction achieved by the two-year scheme amounts to ca. 0.3 million tonnes additional per year. Other important measurable side effects of the energy rebate scheme were increases in VAT and taxes on profit, and avoided unemployment payments. The latter have been estimated for washing machines only by René Kemna (2002), based on the 9% increase in sales value for the washing machines in the Netherlands due to the energy rebate scheme in 2000/2001 compared to the time before the scheme. This reflects the higher value of energy-efficent machines. Assuming that the number of employees dealing with wholesale and retail of washing machines in the Netherlands is ca. 3 500, and that 50% of the increased sales value contributes to at least securing existing jobs, this leads the authors to an estimate of ca. 150 jobs secured. With an estimated unemployment payment of 15 000 Euro per year, this yields avoided unemployment payments of ca. 2.3 million Euros. It should be noted that elsewhere in the EU, where the machines are manufactured, further jobs have been secured.

UNITED KINGDOM

Before the electricity market reform started in 1989/90 through privatisation, followed by a phased introduction of competition in retail supply in England and Wales, there was little experience of energy efficiency activities on the demand-side in the UK. Energy efficiency programmes have been increasing in scale from round about the time that the reforms started. This is because the energy regulator introduced Standards of Performance for the newly private companies, and these included energy efficiency obligations, in the context of environmental concerns. The Energy Efficiency Standard of Performance (EESoP) are the predecessor of the Energy Efficiency Commitment (EEC), which is today the most important promotion mechanism for energy efficiency activities for households involving the electricity and gas companies.

The EEC is an energy saving target that suppliers with more than 15 000 of electricity or gas customers are obliged to achieve. The companies only have targets for the promotion of improvements in energy efficiency for domestic customers (private households). The obligations are determined by the government (until 2002 by the energy regulator OFGEM) and have been highly cost-effective in previous programme periods since 1994. Benefits to customers and the society on average exceeded the programme costs by more than a factor of 4 (EST 2001). Another important objective of the EEC is the focus on helping lower income consumers, including those in receipt of income and disability benefits.

OFGEM (Office of Gas and Electricity Markets) administers the EEC and is responsible for determining which measures qualify. OFGEM is also responsible for establishing the energy suppliers' individual targets. The EST supports OFGEM in the evaluation of schemes and the development of projects. OFGEM is also responsible for the overall enforcement of the suppliers' obligations. Suppliers are required to submit regular progress reports and annual reports with information for every scheme. Monitoring requirements are set for each scheme, compliance being checked by an independent audit of a sample. Non compliance is subject to a financial penalty.

The mix of energy efficiency measures within the EEC will probably be pretty much as agreed in the consultation proposals (DEFRA 2001, Ofgem 2001, cf. Table 5). Table 6 shows the overall results of the EESoPs and the expected results of the EEC.

It is estimated that the level of EEC proposed for 2002-2005 will raise prices by 1.2% over that period. However, due to the energy savings, the estimated net benefits in reduced energy costs will rise to about 1.6% of bills by 2005

Table 5. Energy efficiency programmes and savings targets under the EEC.

Illustrative mix of possible EEC measures	Lifetime of measure	Ongoing annual energy benefit to h/holds by end of EEC period	... of which electricity	... of which gas	... of which oil and coal	Ongoing annual energy cost savings by end of EEC period	Annual Carbon Savings by 2005
	Years	**GWh/year**	**GWh/y**	**GWh/y**	**GWh/y**	Total benefits **MEuro/year**	**MtC/y**
Cavity wall insulation	40	4 858	628	3 374	855	126	0.15
A and B-rated boilers	15	1 063	0	1 063	0	24	0.04
Loft insulation – professional	30	1 286	166	893	226	34	0.01
Loft insulation – Do it yourself	30	1 337	173	929	235	35	0.03
Fridgesavers-type schemes	15	70	70	0	0	5	0.01
A-rated appliances	15	201	201	0	0	15	0.02
Heating controls with boiler replacement	15	107	0	107	0	2	0.00
Heating controls – extra	15	180	23	125	32	6	0.01
Compact fluorescent lamps	11	1 154	1 154	0	0	123	0.09
Tank insulation	20	1 096	139	768	189	24	0.03
Draught proofing	10	141	18	98	25	3	0.01
Total EEC		**11 492**	**2 573**	**7 358**	**1 536**	**397**	**0.41**

Source: DEFRA 2001

Notes: 0.41 MtC/y is equivalent to **1.50 Mt CO_2/year**. The calculation of energy savings here is fuel-standardised and not discounted to take account of energy efficiency measures which would have gone ahead in any event, without the stimulus of the EEC programme, nor enhanced to take account of positive spill-over or market transformation effects.

Table 6. Overall results of the EESOPs and the EEC.

	Energy Savings*					**Supplier Cost**					**Lifetime Benefit (Excluding Comfort)**		
	Elec.	**Gas**	**Oil**	**Coal**	**Total**	**Elec.**	**Gas**	**Oil**	**Coal**	**Total**	**Elec.**	**Gas**	**Total**
	GWh	GWh	GWh	GWh	GWh	MEuro	MEuro	MEuro	MEuro	MEuro	MEuro	MEuro	MEuro
EESoP 1	8 787				8 787	60				60	306		306
EESoP 2	3 138				3 138	28				28	124		124
EESoP 3	4 563	2 700			7 263	56	33			89	208	67	275
EEC **	18 949	34 879	4 498	3 374	61 700	90	166	21	16	294			1 438

* Energy Savings are based on measure lifetimes used by EEC, and are discounted by 6% over those lifetimes.
SoP 1, 2 and 3 savings are also fuel standardised, using EEC factor of 0.8 for electricity and 0.35 for gas.
** Expected results

and last for the lifetime of the relevant measures (8-40 years) (PIU 2002). This shows how an increase in prices is only a necessary vehicle to fund reductions in the bill. All electricity and gas suppliers are able to achieve their EEC targets through consumers' savings of electricity, gas, coal, oil or liquid petroleum gas, i.e. not only with their own customers, and with the energy source(s) they supply (DEFRA 2001).

A further interesting feature of the EEC is that the government and the regulator encourage the companies to achieve their targets by energy efficiency services, packaging energy supply and at least two energy efficiency measures, instead of the standard programmes mentioned in Table 5. The companies receive an incentive through a 50% bonus when counting the energy savings evaluated for such services towards their EEC targets.

Present trends of energy efficiency programme development

In the EU Member States, in which a supportive framework for energy efficiency programmes already exists, present trends and new initiatives of energy efficiency programme development are characterised by:

- better planning, e.g., through standard programme designs co-ordinated throughout the whole energy supply sector within a country;
- increased professionalism in running the activities, including co-operation with market actors;
- increased attention to the business economics perspective, e.g., reward for energy companies which deliver energy efficiency programmes more efficiently than others;
- incentives for delivery through energy services;

- better monitoring, including standardised measurement and verification of energy savings in the non-domestic sectors;
- use of sound methodologies for the evaluation of energy efficiency programmes;
- improved co-ordination of all the energy-efficiency activities which address a specific target group but are run by different actors;
- connection to/preparing the integration into the implementation of Kyoto mechanisms (emissions trading schemes).

Energy efficiency programmes, which can be judged "representative", based on the analyses of already implemented, energy efficiency programmes in the past, can be classified by the following types of technical measures: insulation/building fabric, domestic lighting, non-domestic lighting, refrigeration, washing machines/dishwashers/dryers, boilers/heating systems, variable speed drives, electric motors, others/multiple technologies.

However, the fact that a technology has been targeted by programmes in the past in several countries does not necessarily imply that it is still appropriate to target it today in a specific country with a specific framework and a specific level of energy efficiency measures already implemented. Examples for emerging energy-efficient technologies, or technologies addressing increasing "leaks" (e.g., consumptions in stand-by mode in electronic devices), that could be in the focus of future energy efficiency programmes in at least some countries are:

- Small-scale circulation pumps powered by permanent magnet motors, and with integrated VSDs can save 60 to 80% of electricity, i.e. a new pump of 5 to 20 W power replaces an old technology pump of 40 to 80 W. This is why we call these pumps the "Factor 4 pumps". Their prices are still high due to small series, but they have the potential to become almost as cheap as conventional pumps if mass-produced, so they are a perfect target for a market transformation programme, involving both building owners and installers, and maybe even boiler manufacturers as target groups and market partners.
- Lighting using Light Emitting Diodes (LED), in traffic lights, security lighting, and other applications.
- Appliances with low stand-by power, both in the homes (TV, Video, audio, PCs etc) and in office equipment should at least be the target of information and motivation campaigns. Transparency on the power consumption of these appliances is low, a labelling and/or appliance databases is therefore needed.
- High savings at no or low costs can be achieved by optimising the energy consumption of new buildings during the planning phase already, through an integrated design of building envelope and installations. A major part of the energy particularly in service sector buildings and institutions is consumed by the building envelope itself, and by installed systems, like heating (including circulation pumps), ventilation, air conditioning, and lighting. 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, where the different engineers and planners co-operate from the beginning. 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.

Projection on extending successful energy efficiency programmes to the whole EU

If the successful energy efficiency programme schemes already implemented in some EU countries were implemented throughout the whole EU-15 over a period of ten years, the EU-15's annual electricity and gas consumption could be reduced by around 8% compared to the baseline (which is expected to grow by almost 20% during that period); i.e. 0.5 to 1% savings per year compared to the market trend appear feasible, with annual investments by the energy companies of ca. 1 to 2% of the revenues from the electricity business.

This estimate is based on the results or targets mentioned in this paper and excluding overlap in target groups and technologies (cf. Wuppertal Institute et al. 2003). It is also supported by many other examples collected during several studies. However, without a supportive policy framework from the national level, most of these programmes would not exist, and it would be highly unlikely that they would spread to the whole EU-15 and the Candidate Countries due to the barriers existing.

Projections on extending specific programmes described in this paper to the whole EU lead to the following results:

- If the EEC's three year energy saving targets were valid for the whole EU-15, this would mean an annual saving of 16 TWh/year of electricity, and 46 TWh/year of gas, of which 32 TWh/y would be achieved through thermal insulation of buildings, and 7 TWh/y through compact fluorescent lamps. Extending the effort from three to 10 years would bring 54 TWh/year of electricity and 155 TWh/year of gas savings.
- Extending the activities of the Danish network companies to the whole EU-15 would yield electricity savings of around 8 TWh/year for business customers, and 12 TWh/year in total. Over 10 years, electricity savings of around 80 TWh/year for business customers, and 120 TWh/year in total could be achieved in the EU-15.
- The overall target of the Danish Electricity Saving Trust is to reduce electricity consumption during 10 years of work by 750 GWh/year until 2008 compared to the baseline. By 2001, about half of this had already been achieved. Transferring this target to the EU-15 would mean an electricity saving of around 56 TWh/year after a ten-year period. The budget needed would be around 900 million Euro/year, based on the 12 million Euro/year the Danish Electricity Saving Trust has available. The energy cost savings to society would be at least twice as high as the costs. The fuel-switching programme alone

would be able to save 46 TWh/year if extended to the EU-15 over ten years.

- A two-year energy rebate programme like the Dutch one implemented at a EU-15 level would yield ca. 7 TWh/year of electricity savings, 11 TWh/year of heat savings, and 4 million tonnes additional savings of CO_2 emissions per year. Extended to 10 years duration, and considering that the market transformation effect for appliances cannot be repeated but stabilised, savings of 17 TWh/year of electricity, 57 TWh/year of heat, and of 26 million tonnes of CO_2 emissions per year would be reached at the end of an EU-wide programme.

Conclusions and recommendations

The good practice examples of energy efficiency programmes and the policy frameworks supporting them show that the restructuring (liberalisation) process does not have to be the end of energy efficiency programmes. In contrary, some EU Member States have taken action to ensure that energy efficiency programmes, and particularly those implemented by energy companies, can continue and can even be extended within a competitive environment.

As it had been mentioned before, the EU-15's annual electricity and gas consumption could be reduced by around 8% compared to the baseline, if such successful energy efficiency programme schemes were implemented throughout the whole EU-15 over a period of ten years. Taking into account that additional energy efficiency services can save on average 20% per service customer, and that customer demand for energy efficiency services is increasing only slowly, it can be estimated, that in total, it will be possible to achieve additional savings of 10% of the EU's annual electricity and gas consumption by energy efficiency programmes and services compared to the forecast within 10 years. This would be equivalent to a net economic gain of around 10 billion Euro per year. It would also achieve two thirds of the additional CO_2 reduction required for the EU to meet its Kyoto target. And it would reduce EU dependence on imports of energy resources considerably.

Without a supportive policy framework, most of the energy efficiency programmes would not exist and demand for energy efficiency services would increase even more slowly. Supportive national policy mechanisms are needed, which stimulate both energy efficiency services and programmes of energy companies and other market actors. In particular, energy policy needs to create mechanisms setting quantified targets for energy savings by energy companies and other actors, enabling energy companies to finance energy efficiency programmes in a way not harming their competitive position in the liberalised electricity and gas markets, which will give the companies a fair share of the net economic gain to society they are creating with the programmes, and developing a standardised and mandatory scheme for cost-benefit evaluation of the energy efficiency activities. This will also support the development of energy efficiency services directly paid by those who directly benefit.

An EU Initiative is needed to ensure the Union-wide implementation of comprehensive and successful energy efficiency services and programmes. The many good examples developed in pilot projects under the SAVE programme are also waiting for replication with the support of this Initiative. It does make a difference whether 1% or 20% of the business customers in the EU can be won as customers of energy efficiency services, and whether an energy efficiency programme is implemented in Denmark with its 5 million inhabitants, or in the EU-15 with 375 million.

Such an EU Initiative will complement other EU action and legislation on energy efficiency and ensure that the EU can harvest the full net benefits for the economy, environment, security of supply, and employment from energy efficiency. Such an EU Initiative and Directive is conforming to the principle: "Harmonisation in targets, but subsidiarity in methods" and would contribute to create a level playing field regarding the efforts allocated to energy efficiency throughout the European Union. The overall objective would be to create lasting energy savings of ca. 10% over the next decade and additional savings thereafter, compared to the baseline trend of energy demand. In order to achieve this objective each Member State would be required to:

- create a supportive policy framework, which enables energy companies and other market actors to successfully implement and finance energy efficiency programmes. The Member States should be free how to achieve this, for instance, using the policy mechanisms presented at the beginning of this paper;
- promote further the supply of and demand for energy efficiency services.

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