Energy efficiency policy in restructuring European electricity markets

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1. SYNOPSIS

Policy options for supporting energy efficiency services and programmes in the European Union are proposed and analysed.

2. ABSTRACT

Energy efficiency is a key low-cost strategy for meeting generally accepted energy policy goals for economic efficiency, energy security, and environmental protection. Yet, energy efficiency has usually taken a back seat, if it is even on board, in the electricity market reforms underway in Europe and elsewhere in the world; sharing this back seat position with other social obligations and public benefits traditionally entrusted to monopolistic electric utilities. An extensive review of European electricity markets and demand side management experiences, and an analysis of policy options, was reported to the European Commission in the autumn of 2000. The experience so far in countries which introduced reform early on demonstrates the need for nurturing and supporting the market for energy efficiency. Five important sets of energy efficiency policy mechanisms were identified: (i) financing mechanisms, (ii) changes in ratemaking of the remaining monopoly segments, (iii) obligations to implement energy efficiency, (iv) negotiated agreements, and (v) support mechanisms, such as monitoring/verification schemes and standardisation. A critical assessment of these mechanisms is presented and the prospects for implementing a common European Union policy are discussed. Coherence with competitive market principles and other energy efficiency policies, such as standards, market transformation programmes, etc., is also addressed. It is concluded that policy mechanisms aimed at stimulating energy efficiency services and programmes by energy companies or other actors need not conflict with retail competition, and can be used to enhance the competitive market for energy efficiency services.

3. INTRODUCTION, METHODOLOGY AND DEFINITIONS

Introduction: Monopolistic energy companies in several countries have been regulated or encouraged to promote energy efficiency (EE) and other public benefits through Integrated Resource Planning (IRP), Demand Side Management (DSM), and the like. The prospects for energy company DSM fundamentally change when energy markets are deregulated and specifically when introducing retail competition. To investigate the subject, the European Commission, under the framework of the SAVE programme[1], mandated a group of institutions from eight European countries (Belgium, Denmark, France, Germany, Italy, Portugal, Sweden, and United Kingdom). This study (Wuppertal Institute *et al.* 2000) had two main objectives: (1) to investigate the possibilities of doing DSM and IRP in the restructured Internal European Electricity and Gas Markets; (2) to develop recommendations to stimulate DSM and IRP in the liberalised electricity and gas markets, both at the European and National levels.

European Union (EU) Directives (further on referred to as the IEM/IGM Directives) require the Member States to introduce wholesale competition and a minimum of retail competition (equivalent to approximately 27% and 20% of the total consumption for electricity and gas, respectively) by 1999/2000. The structure, ownership, and regulation of the electricity and gas businesses in the EU show wide variety. Historically, some countries, e.g., France, Italy, and Portugal, have had state-owned, nationwide monopolies; some, like Germany and Sweden, had

a mix of private and public/municipal companies; and some had completely municipal structures, e.g., Denmark and The Netherlands. The level of market restructuring implemented by the Member States also varies widely, for example, in terms of market opening and unbundling (see Table 1). As a consequence, the adoption of a common energy efficiency policy at the EU level, involving the electricity and gas industries, constitutes a challenge. It requires the identification of intersections upon which to build actions, while simultaneously giving attention to subsidiarity issues.[2] It also requires reviewing the role of energy companies in energy efficiency in this new environment.

Table 1. Summary of electricity market structure and restructuring in the eight study countries.

Country	Pre Restructuring/IEM	Status of Restructuring/IEM
Belgium	High level of vertical integration and near monopoly for private company Tractebel-Electrabel.	Reluctance both on government and industry and only minimal unbundling and market opening required by IEM starting 1999.
Denmark	Generation (Elsam and Elkraft) owned jointly by many small municipal energy companies (~70).	Some initial reluctance but starting 1998 implementation goes faster and further than required. Unbundling by separate legal entity
Germany	Diverse and complex market with eight large generators, and 55 regional and 580 municipal distribution supply companies. Ownership of various types.	Rapid deregulation starting 1998/99. Full retail competition without clear rules for the new market. Unbundling only by separate accounting.
France	Vertically integrated monopoly state owned EdF controls the electricity sector.	With reluctance IEM is implemented in 2000 (with delay) respecting the strict minimum required by IEM directive.
England and Wales	Central generation and transmission company (CEGB) and regional distribution and supply monopolies (Area Boards), resulting from post-war nationalisation.	Restructuring starts in 1989/90 and includes privatisation and splitting up CEGB. Phased market opening and now full retail competition.
Italy	High level of vertical integration and state owned monopoly ENEL as result of nationalisation.	Restructuring starts in 1999 going probably somewhat further than IEM requires. Includes breaking up ENEL and privatisation.
Portugal	High level of vertical integration and state owned monopoly EDP as result of nationalisation's during the 1970s.	Restructuring, including privatisation and unbundling by entity, starts in 1991 and has gone faster but not further than required.
Sweden	Generation (50% of total) and transmission in state-owned company. Some private generators and mostly municipal distribution/supply companies (~250) in a relatively diverse market.	Restructuring starts in 1996 going much faster and further than required in IEM. Unbundling monopoly functions by legal entity. Now full retail competition.

Methodology: The analysis presented here was carried out in four phases. Phase I laid the theoretical foundations for the work, and developed definitions. Phase II analysed the restructuring of the electricity and gas markets, and the incentives or disincentives for IRP and DSM, which result from the restructuring for different types of energy companies. As a basis for this study, extensive questionnaires were completed for participating and other countries. In Phase III, another detailed questionnaire gathered data on existing or planned policy mechanisms for support to IRP and DSM, and experiences with IRP and DSM. Based on responses, a set of six 'families' of policy mechanisms for support to IRP and DSM, which are compatible with the liberalised markets, were identified and analysed with seven common sets of criteria. In Phase IV, finally, recommendations to stimulate IRP and DSM in the liberalised electricity and gas markets, both at European and national levels, were developed and discussed with practitioners in workshops in all eight study group countries.

Definitions: DSM is defined to include end-use energy efficiency, fuel switching, and load management delivered both as **DSM services** (defined as directly paid by the customer or market agent who directly benefits) and **DSM programmes** (programme cost not directly paid by the customer or market agent who directly benefits). To be called DSM these activities must be implemented with involvement of energy companies, and must reduce the total costs of energy services to customers and society, including external costs (e.g., emissions and nuclear risks). **Energy efficiency services** and **energy efficiency programmes** can also be implemented by

other actors, but we will only call it DSM if an energy company is involved. Policy **mechanisms** to support DSM are instruments, targeted at entities, like energy companies, that are aimed at promoting DSM programmes or services, directed at end-users. Electricity and gas companies can be active in generation, wholesale, transmission network operation, distribution network operation, retail supply, or any combination thereof.

4. IRP AND DSM IN EUROPE

IRP is a business planning approach for energy companies for the purpose of providing least-cost energy services. IRP looks not only to the traditional supply resources (large power plants, and electricity transport infrastructure), but also analyses whether the demand of the customers for energy services can be met at lower costs and lower environmental impact with either innovative (mostly decentralised) generation resources, including independent power production, or DSM programmes and services. IRP can be used as a planning tool which together with other regulatory instruments creates an economic incentive for energy companies to include DSM into their resource portfolio.

Practical experience with IRP is quite limited in Europe. Only Denmark has adopted an effective IRP obligation. The 1994 Electricity Act states that: distribution/supply companies are required to prepare DSM plans; generation and transmission companies and the Independent System Operator make scenarios for generation and transmission. The Ministry gives guidelines and co-ordinates an overall 20 year plan. All utilities implement it. This IRP process has been the framework under which the impressive Danish DSM programmes have been carried out. Very few other experiences with IRP in other EU countries have been reported (Table 2). Portugal is the only other country where such a mechanism was introduced in legislation, and a study has been carried out (EDP and the University of Coimbra, 1995), but with no real framework to make it effective and implement the findings. There have been a few experiences at the local level in Germany. The most comprehensive and successful is the Hanover case study (Stadtwerke Hannover AG, 1995) which was carried out in 1993/1995 for the period 1995/2010. As a result, a range of DSM programmes and services were implemented.

In Denmark, the legislation has changed with the implementation of the IEM. The obligation to perform IRP has been replaced by an obligation to perform DSM. However, the basis for the decision on which type of DSM to implement is the integrated assessment of supply and demand options that has been a fundamental principle of IRP. Which role IRP could play in liberalised electricity markets, is therefore one important question the study had to address.

The historical evolution of the electricity sector in EU Member States has resulted in very different structures. The IEM Directive is a first important step towards harmonising the rules to build an integrated electricity market. Similarly, each country developed its own level and type of DSM, in accordance with its objectives and the characteristics of its system. Table 2 presents the past level of DSM activities in the EU countries analysed and the attention given to DSM in the implementation of the IEM Directive.

Table 2. Past level of DSM activities and attention given in the IEM implementation

Countries	Past Level of DSM	Description	Attention to DSM in the IEM implementation
Belgium	Low	DSM was and still is marginal (1st programme in 1996).	Yes, an obligation for distributors to do DSM in Flanders.
Denmark	High	Since 1992 Distribution and supply companies are invited to set up energy conservation. Efforts have increased as result of the agreed expense level. Commercial DSM services should evolve.	Yes, obligation for distributors on DSM programmes, an expense allowance; obligation on suppliers for DSM services.
France	Low	Tariff at marginal costs for 20 years, extensive load management activities, agreement EdF – ADEME.	No.
Germany	Medium, decreasing with IEM	Municipal utilities particularly active in developing DSM programmes in the past. ESCOs and some energy companies develop DSM services (to larger customers).	No.

Countries	Past Level of DSM	Description	Attention to DSM in the IEM implementation
Italy	Low	Municipal utilities are responsible for the few DSM activities to date.	Yes, obligation for distributors on DSM programmes; weak and no practical results yet.
Portugal	Low	In the past, few DSM activities completed (financed by EDP), but, they slowed down with privatisation.	Yes but weak and no practical results yet.
Sweden	Low	Some DSM has been done by utilities but not through systematic IRP or regulatory incentives. DSM services, mainly for larger customers, are developing fast.	No.
England & Wales	Medium-low	Limited to the activities under the Energy Efficiency Standards of Performance (EESoP) for small customers. Some DSM services are developing for larger customers.	Yes, an obligation on suppliers for DSM, an allowed expense level (EESoP).

5. PROSPECTS FOR IRP, DSM AND ENERGY EFFICIENCY SERVICES

IRP: Restructuring, specifically the combination of unbundling and competition in wholesale and retail supply, renders IRP as a method of planning for matching demand forecasts and supply capacities useless for most energy companies. However, a limited form of IRP is still useful for network operators, or for suppliers to captive customers, where these exist. In addition, methods for integrated assessment of the cost-effectiveness of supply-side and demand-side options, which have been developed under the IRP framework, can also be used by energy companies to analyse the most cost-effective options to provide eligible (i.e., contestable) customers the energy services they need at least cost, and with a minimised environmental impact. IRP can also be used as a tool in national energy planning and for setting priorities for policy intervention aimed at supporting new supply options, combined heat and power generation, certain energy efficiency measures, etc.

DSM: The recognition that there are various barriers to energy efficiency and thus least-cost energy services has been a key motivation for regulators to mandate or stimulate utility DSM programmes in the past. Energy market restructuring will not reduce most of the barriers to energy efficiency that exist on the demand side, including, lack of information and knowledge among end-users and providers of end-use technology, split incentives, high implicit rates of return, limited access to financing, etc.

There are many instruments, e.g., financial incentives, standards, labelling, co-operative procurement, and market transformation programmes, that can be used by governments or other actors to stimulate energy efficiency, without involving the energy supply industry. However, there are also a number of reasons, why energy companies should continue to play a role in implementing energy efficiency. To give just three important reasons:

- Energy efficiency services and programmes from energy companies can facilitate the transition to sustainable energy systems. Other market actors can supply such services and programmes as well, but it is easier to promote energy efficiency in co-operation with energy companies that have incentives to do so than against energy suppliers with the perception that they can only lose profits through energy efficiency.
- Energy company DSM can be an instrument for internalising the abatement costs for environmental damages, and other external costs, into the costs of the sector, and reflecting them in the tariffs to the end-user, who would otherwise—through higher energy use—ultimately cause the externalities (‘Polluter pays’ principle).
- Without energy company DSM, a number of important possibilities are missed. In particular, the contact that distribution and/or supply companies have with their customers can help to access the customers for information dissemination, for installation, and for billing in the context of energy services. Participation of energy companies in energy efficiency activities can thus reduce transaction costs.

Are the incentives that energy companies receive from DSM activities in liberalised markets consistent with the benefits to society? Depending on the type of market restructuring, and on which actor in the energy business is concerned, there are a number of situations, in which inherent economic incentives can exist. Such situations include, for example:

- a situation, in which transmission and distribution system capacity upgrade investment costs in certain geographical areas can be postponed or avoided through targeted DSM (assuming that the transmission/distribution company is allowed to do DSM);
- a situation, in which the market makes it attractive for an energy company to do load management (kW, particularly peak clipping and load shifting);
- a situation, in which there is a demand for DSM services 100% paid by the customer or market agent who benefits; i.e., the energy company focuses on commercial strategies for expanding DSM services (e.g., though third-party financing, functional sales, outsourcing contracts etc.);
- a situation favourable for some DSM activities that can help to increase customer loyalty or attract new customers in a competitive retail supply market.

DSM programmes and services can obviously continue to play a potentially important role in market segments with captive customers. However, it is unclear whether these inherent incentives are strong enough to produce a substantial market for DSM services, particularly energy efficiency services, in a retail competition situation.

DSM or other energy efficiency services: The market for energy efficiency services delivered by energy companies (i.e., DSM services) or other actors is important to consider when developing policy mechanisms. Ideally, the market for energy efficiency services should develop on its own in the competitive energy market and policy intervention should not be needed. The extent to which energy efficiency services will become an important part of the energy business has been subject to debate but there is limited empirical evidence so far. The main conclusion from studies of the market for energy efficiency services in Europe is that there is a significant increase in such services especially to large and eligible customers, but it is difficult to quantify the size of the market or the realised energy savings (Eurelectric 2000, Strid and Bergmasth 1999, Bergmasth *et al*. 2000). The development of the market for value-added services in general is mainly a response to competition and lower profit margins on commodity sales.

A comparative study of Sweden and the UK shows that 83 percent and 63 percent of the suppliers of network energy (electricity, gas, district heating) offer energy efficiency services (Strid and Bergmasth, 1999). Important reasons are, for example, to become more competitive, build customer relations and improve service. Reporting on the results from surveys on the supply and demand for energy efficiency services in Sweden (Bergmasth *et al.* 2000) concludes that the market is still immature and profitability is low. However, low profitability is tolerated for energy efficiency services that are aimed mainly at building customer relations and support energy sales (for example, information, advice and audits). Other services (for example various outsourcing arrangements) are generally profitable on their own and can lead to growth in a new business.

The fact that energy efficiency can be a profitable business with larger customers is illustrated by the entry in recent years of new market actors such as Enron Energy Services (EES) and Siemens-Landis&Staefa. Both offer energy efficiency services as part of a broader package including financing. Enron's energy and facilities outsourcing concept also include energy delivery. Siemens-Landis&Staefa's performance contracting concept focuses mainly on reducing energy costs. A common feature is that they both target relatively large customers; annual energy costs should preferably be above 1.5 million SEK (170,000 EUR) according to Siemens-Landis&Staefas Swedish marketing materials. In contrast, Swedish energy companies are also offering energy efficiency services to much smaller customers, for example, individual grocery stores.

Energy efficiency services to small customers is not an important market. Services offered are aimed mainly at building customer loyalty (Nilsson 1998, Eurelectric 2000). The explanation why is simple; a consumption level of a few thousand kWh per year does not allow any large monetary savings, in absolute terms, from energy efficiency. Transaction costs may also be prohibitive. Offers for small customers typically include, for example, rebates for appliances and home-warranty schemes. Energy efficiency offers typically include energy advice through printed materials, call-centres, or web-sites.

It can be concluded that there is a market for energy efficiency services, but it is not clear how much, in which market segments, or to what effect in terms of energy savings. The market is still immature and policy support should be sensitive to the potential growth of an energy services industry. Clearly, small customers will not be a commercially interesting market segment and policy support involving energy company DSM may be justified, in addition to traditional mechanisms such as standards and labelling. Programmes combining targeted information, co-operation with market partners such as installers or retailers, and offering a financial incentive if needed, are often more appropriate for energy efficiency potentials tied to masses of standardised units (for

example, appliances, variable speed drives, and high frequency ballasts for fluorescent lighting). Conversely, services such as paid energy audits or energy performance contracting are more suitable for larger, more complex projects requiring an individual examination of the energy efficiency potential. However, programmes are not directly paid by the customers or market partners who directly benefit, and hence need other sources of funding. Similarly, a market for energy efficiency services may also need supportive actions to develop.

6. POLICY MECHANISMS

Policy mechanisms are needed not only to support the implementation of energy efficiency DSM programmes, but also for the development of the market for energy efficiency services; both the demand from the customer side and the supply of such services may need stimulation. The objective of the mechanisms is to promote the development of DSM in a manner that is equitable, practical and compatible with restructuring of the electricity sector. The development and implementation of policy depends on the specific market situation. Three basic market types can be identified with respect to market opening and unbundling:

- **Market type 1:** partial competition, i.e. a market which still has captive customers, and hence franchise monopolies for the supply to these customers; in some cases, only the minimum market opening required by the IEM/IGM Directives is implemented. The unbundling of electricity or gas sector functions is of minor importance here. Countries belonging to this market type include Belgium, France, Italy, and Portugal.
- **Market type 2:** full competition, i.e., all customers are eligible customers, but the rules for market access may not be very clear, and the distribution network companies and the retail supply companies are not clearly separated by legal entity or ownership. Countries belonging to this market type include Germany.
- **Market type 3:** full competition, and the rules for market access are clear, and the distribution network companies and the retail supply companies are clearly separated (i.e. at least by entity). Countries belonging to this market type include Denmark (fully open 2003), Sweden, Norway, and the UK.

The arguments for supporting DSM in market segments with captive customers in market type 1 are strong and the motivation for such intervention no different from the pre-restructuring situation. Market type 2 is likely to represent a transitional market and will not be discussed in detail here. Consequently the following assessment of policy mechanisms will mainly focus on market type 3. Six categories of policy mechanisms have been identified:

M1 Schemes with dedicated funds to finance EE and DSM programmes by energy companies, ESCOs and other bodies. To finance the EE and DSM activities, a dedicated fund is raised through a public benefit charge applied on all or certain actors of the electricity system, or through recycling a part of an energy tax. The type of DSM services and programmes to be funded, and level of funding, will depend on the specific goals to be reached. The administration of the funds and the definition and monitoring of the DSM 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 schemes have been introduced, for example, in Denmark, Norway, and the UK

M2 Change the ratemaking 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 to the supply to 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 also reduce or avoid unjustified incentives to increase sales. Outside the USA, such new regulation schemes have been introduced in the UK in 1994, and in more recent years in Portugal, Norway, New South Wales (Australia), and Italy. Further, the fixed charge in regulated tariffs can be reduced and the variable charge increased in order to increase the economic incentive to end-users for energy efficiency measures.

M3 Actions in ratemaking of monopoly segments targeted at making Energy Companies neutral or positively affected by performing single EE-DSM programmes. When performing an EE-DSM programme an energy company faces both direct programme costs and net lost revenues due to reduced energy sales from DSM. Under certain regulatory regimes the lost revenues cannot be recovered and hence create strong disincentives to DSM activities. There are a number of actions, which still are available for the ratemaking of monopoly segments (transmission and distribution networks, supply to captive customers) and targeted at removing these disincentives:

- Recovery of strictly direct costs of an EE-DSM programme within tariffs;
- Recovery of net lost revenues because of reduced energy sales from DSM within tariffs;
- EE-DSM additional incentives within tariffs (bonus, shared savings, mark-up).

DSM cost recovery has been quite common in Europe, but the cases of recovery of net lost revenues, or of additional incentives are few.

M4 Obligations to perform a certain level of EE-DSM programmes. One very strict mechanism to stimulate a certain level of DSM is to set an obligation, i.e. a legally binding target for the energy companies. There can be different obligations for different actors (distribution and/or supply companies) and for different targets (as a percentage on revenues, as a saving GWh quota, etc.). There can also be different ways to set the obligation, e.g.:
- By law or by the regulator;
- In the license;
- As an extension of public service obligations;
- Targeted to technologies and customers neglected by the energy efficiency services market.

The UK Energy Efficiency Standards of Performance (Staniaszek 1999, Lopes *et al.* 2000), now changed to the Energy Efficiency Commitment, is the most prominent example of such an obligation in Europe. More recently, Belgium, Denmark and Italy have created DSM obligations for distribution network companies in their energy legislation.

M5 Negotiated agreements for DSM with the energy industry. The government or the regulator negotiates the DSM target with the energy supply industry, and settles them in an agreement. Such a negotiated agreement can be an alternative to obligations (M4), provided the number of energy companies is not too large (for example, less than 20), and a good system for monitoring and enforcement of compliance is in place. This mechanism, combined with an allowance to fund DSM costs via the tariffs, can be very effective as exemplified by resulting savings of 7.4 TWh between 1990 and 1996 in The Netherlands.

M6 Legal and Technical Support and quality standards for the Development of EE-DSM Programmes and Services. There are a number of policy actions which are targeted at developing the market for DSM services, but also to remove some non-financial barriers to the implementation of DSM programmes. Such policy actions include, for example:
- Development of standardised measurement, verification, and evaluation procedures;
- Development of guidelines for the tendering procedures in activities of DSM bidding and competitive sourcing of DSM resources;
- Technical support for EE-DSM preparation, implementation, evaluation (e.g. training for the staff on EE technologies, evaluation of savings etc.);
- Development and testing of standardised energy performance contracting schemes;
- Guarantee fund for insurance of investments;
- Independent certification of ESCOs;
- Fostering co-operative processes of the relevant actors in the market for energy efficiency services through network building, etc.

7. IMPLEMENTING MECHANISMS M1 TO M6 IN RESTRUCTURING MARKETS

The policy mechanisms described were analysed using seven sets of criteria with the purpose of assessing their effectiveness under various circumstances. The seven criteria include:
- C1. Effectiveness at transforming energy companies to providers of least-cost energy services;
- C2. Effectiveness at promoting EE-DSM and development of markets for EE-services;
- C3. Compatibility with IEM legislation at EU and national level, and other rules and constraints;
- C4. Ease of introduction into the legislative and regulatory framework;
- C5. Ease of integration into energy companies' objectives and practice;
- C6. Ease of integration into ESCOs' objectives and practice;
- C7. Ease of evaluation and ensuring compliance.

The evaluation of policy mechanisms against these criteria concluded that combinations of mechanisms can be very effective. Schemes with dedicated funds (M1) is an attractive policy mechanism, not least in markets with retail competition, although it may not by itself be very effective for transforming energy companies. The policies to change ratemaking (M2 and M3) are relevant mainly in markets with captive customers although changes in transmission and distribution tariffs can be an effective way of increasing the economic incentives for end-use energy efficiency for eligible customers as well. Obligations and negotiated agreements (M4 and M5) may be difficult to integrate with the objectives and practice of energy companies and ESCOs if not properly designed and without combining them with other mechanisms, notably funding mechanisms. The various legal and technical support mechanisms (M6), mainly intended to reduce transaction costs in the market for energy efficiency services, are easy to implement but also may not be particularly effective on their own.

Assuming a market type 3 situation, with retail competition and clear unbundling, only transmission and distribution companies would be subject to policies to change ratemaking (M2 and M3). In theory, these companies would not be attempting to sell more transmission and distribution (the target of M2). In practice, they will in most cases be part of an integrated company or a holding company that also has generation and/or retail supply business, and thus is interested in selling more electricity. Supporting DSM by monopoly distribution companies (M3) should focus on EE-DSM programmes rather than EE-DSM services and be restricted to certain activities and customer segments. Properly designed, such DSM programmes would not have any detrimental effects on competitors in the market for EE-services, and could even stimulate the market for EE-services.

Switching from fixed to variable charges in distribution tariffs could effectively increase the profitability of energy efficiency measures as exemplified in table 3. Such a change in tariffs would involve essentially no costs for administration, monitoring, etc., which are typically associated with many other policies. The main argument raised against such a scheme is that it would violate the principle that the structure of the tariff should reflect the cost structure of the network, which from an economic theoretical viewpoint is the optimal. Variable charges need not conflict with incentives to load-shifting through time-of-day tariffs and penalties for exceeding maximum contracted load. However, changes in tariffs should be analysed further in order to detail the effects under various circumstances.

Table 3. Total Variable Electricity Cost for a Hypothetical Medium-Sized Manufacturing Industry in Sweden with Typical *Present* Share of Fixed Charges and if Charges Were Made Variable *Only* (source: Bergmasth *et al.* 2000)

Network cost segment[a]	Fixed network cost (EUR/yr)	Fixed network cost per kWh[b] (¢/kWh)	Variable network cost (¢/kWh)	Electricity cost (¢/kWh)	Total variable cost[c] (¢/kWh)	
					present	*only*
High	52,000	1.04	0.57	1.65	2.22	3.26
Medium	38,700	0.77	0.47	1.65	2.12	2.89
Low	38,000	0.76	0.27	1.65	1.92	2.68

a) Network tariffs were divided into three price segments and a representative tariff from each segment was selected here. An exchange rate of 9 SEK/EUR was assumed.

b) The assumed customer has an annual consumption of 5 GWh and a maximum load of 1.25 MW. The fixed price has been recalculated to variable by dividing the fixed prices by the total electricity consumption 5 GWh.

c) The column "present" displays the sum of electricity and variable grid price. The column "only" also include fixed grid price/kWh.

A potential difficulty with obligations and voluntary agreements (M4 and M5) is that it may be difficult to define what an energy company is and monitor compliance in a restructuring market with new entrants (and exits), and increased bundling of energy with other services such as broadband access, intelligent house controls, burglary alarms, etc. Retail supply of electricity could in principle be linked to an obligation to do DSM but it may not be practical unless small retail suppliers and new market entrants have an opportunity to buy themselves free from the obligation rather than demonstrating realised savings. It may also become a market entry barrier for other suppliers of energy efficiency services.

A dedicated fund based on public benefit charges (M1) is likely to be a more flexible and practical approach. It can also be fully compatible with free market principles if the funds are used in a way that does not discriminate against any of the market actors. Public benefit charges have been implemented in a number of European countries already, and in 18 of the states in the USA (Kushler, 2000). The public benefit charges in California

and Massachusetts alone amount to 380 million EUR, which is well above the 260 million EUR reported for the European Union, excluding Spain, Greece, Ireland and Luxembourg (Wuppertal Institute *et al.,* 2000). The most notable example in Europe is Denmark with its Electricity Savings Trust. Dedicated funds raised through public benefit charges was recommended as a key policy mechanism in the other study countries with full retail competition (i.e., Germany and Sweden). Furthermore, the Norwegian parliament is likely to pass a proposition during spring 2001 to implement a new public benefit charge funded agency responsible for energy efficiency.

The main function of the various legal and technical support mechanisms (M6) is to facilitate implementation of energy efficiency and reduce transaction costs. Irrespective of market type they are relatively easy to introduce and do not interfere with competition for energy commodity or efficiency services. This policy mechanism was viewed as valuable and important in all study countries.

Irrespective of market type, there are several ways of stimulating energy efficiency programmes and services, as shown above. Some of the policy mechanisms are applicable, and needed, mainly in the type 1 markets (i.e., with captive customers). However, the approaches that are clearly applicable to type 3 markets (including M1, M6, and for network companies also M2, M3 and M4) are also applicable to type 1 markets. It appears reasonable to focus EU-wide efforts on such market oriented policies, given that there is full retail competition in some EU-countries and under the expectation that market opening will continue in others. It also appears reasonable to implement mechanisms tailored to captive market segments (i.e., variants of M2/M3 and M4/M5) in market type 1 situations.

8. LINKING MECHANISMS M1 TO M6 WITH OTHER POLICY INSTRUMENTS

Policy mechanisms to support DSM and energy efficiency services is no panacea for energy efficiency. There will continue to be a need for other policy mechanisms and instruments aimed at removing barriers to energy efficiency. Barriers to energy efficiency can broadly be categorised as:

- Price-induced and supply-side barriers: These include direct and indirect supply subsidies, external costs, tariff/ratemaking principles and rate structures, over-capacity, etc.
- Demand-side barriers: Energy costs is a relatively low priority to many users resulting in lack of knowledge and interest. Other barriers include split incentives, high transaction costs, lack of information, high perceived risk, difficulties of financing, etc., which in part explain the unduly high discount rates (implicit and explicit) typically applied when evaluating energy efficiency investments.

A number of policy instruments, in addition to those based on mechanisms discussed above, can be used to promote energy efficiency. Some of these instruments, e.g., appliance labelling/standards or government funded RD&D, can have synergies with energy efficiency services and programmes (e.g., if the DSM increases the market share of A-rated appliances). Some instruments may have either negative or positive effects on the market for energy efficiency services, depending on the design. For example, free in-depth energy audits through public agencies may compete with paid in-depth audits from independent consultants, but they may also pave the way for realisation of the energy efficiency measures identified in the audits through energy performance contracting by independent ESCOs.

Most instruments will, however, serve to strengthen the policy mechanisms discussed above and thus the market for energy efficiency services. Price-related instruments to remove subsidies and internalise external costs will increase energy prices and make energy efficiency investments more profitable. Voluntary agreements with industry to reduce energy use or energy intensity will increase demand for energy efficiency. Various economic incentives, labelling, public procurement policies, information and education, etc., will also increase the demand for energy efficiency, in industry as well as other sectors. A case in point is the U.S. Federal Energy Management Program, setting goals for energy efficiency in Federal buildings and relying largely on private sector financing to reach the goals through energy savings performance contracts.

A coherent approach to energy efficiency should be sensitive to synergies between policy instruments to stimulate mostly EE-DSM programmes, and the role of energy efficiency services. For example, a system with public benefit charges and dedicated funds can be designed so that it is neutral to competition. The funds can be used to stimulate energy efficiency services and programs delivered by energy companies or other actors. Thus, the market for energy services can be stimulated, but also used as a channel for diffusing new technologies or practices in market transformation programmes.

9. RECOMMENDATIONS FOR EU POLICY

The EU IEM/IGM Directives aim at improving competitiveness and harmonising markets across the EU. Similarly, it would be beneficial if the goals and rules for energy efficiency were harmonised, while simultaneously paying attention to subsidiarity issues. A proposal for amending the IEM/IGM Directives, requiring further market opening, was communicated by the Commission to the Council and Parliament in the spring of 2001. One approach, not in the current proposal, would be to complement the IEM/IGM Directives with paragraphs conducive to DSM and the establishment of a common market for energy efficiency services and not only commodity energy. In a European Parliament resolution (A5-0054/2001), in response to the Commission Communication on an Action Plan to Improve Energy Efficiency in the European Community (COM(2000) 247), this issue is raised among many other options to promote energy efficiency. The resolution was adopted by the Parliament on March 1 and goes further than the Action Plan on many points.

A draft proposal for the contents of an EU DSM Directive was developed in the final phase of the project. The Directive should set a substantial, harmonised quantitative target for DSM for the Member States, but leave up to them which policy mechanisms (for supporting the network-associated Energy Supply Industry (ESI)) the Member States adopt to achieve this target. In this way, the subsidiarity principle is strengthened, allowing an implementation of DSM services and programmes adapted to the national electricity markets and regulatory frameworks. Based on these considerations, on the comments and conclusions from the national workshops held in the eight participating countries during autumn 1999, and on intensive discussions within the group, the following proposal was put forward:

The Directive should address **support by the Member States for DSM** activities by electricity and natural gas transmission network, distribution network, and supply companies; and by independent ESCOs.
The Directive should have as its main feature:

- **A mandatory, quantified target for each Member State** to ensure a certain level of **DSM programmes**. This should be defined as a **harmonised** target for both:
  (i) a certain minimum level of **energy efficiency improvement**; the minimum level for each Member State which is recommended by the study group, based on international experiences, is an annual saving of 1 %, respectively and separately for electricity and natural gas, of the consumption in that Member State in the year before the Directive comes into force, expressed in TWh to be saved per year per Member State; and
  (ii) a certain minimum level of **investment** for DSM programmes; the minimum level for each Member State which is recommended by the study group, based on international experiences, is 2 %, respectively and separately for electricity and natural gas, of the total net revenue in that Member State from sales to final customers, i.e. net of taxes or levies; the sum of the investments should be cost-effective; this DSM programme investment must be additional to other energy efficiency activities financed from the state budget.

Furthermore, the DSM Directive should specify that:

- The Member States shall dedicate to an appropriate **authority** the task to approve, and to monitor the energy savings and the cost-effectiveness of the DSM programmes which are implemented to fulfil a Member State's target. **Standardised methods** shall be used for the assessment of the energy savings and the cost-effectiveness of the DSM programmes before and after their implementation. The European Commission shall, in co-operation with the Member States, organise the development of such standardised methods.
- **In addition** to this, the Member States shall support the development of a market for **DSM services**. The Member States may achieve half of the savings target through encouraging DSM services, if they can prove - through the standardised evaluation methods - that these services really achieve the savings. The investment target would then be reduced proportional to the share of the savings target achieved by DSM services.
- The Directive should **leave up to the Member States how** they achieve the quantified target (i.e., using which specific mix of DSM support mechanisms), but give a **non-exclusive list** of some important DSM support mechanisms (e.g., those analysed here);
- The Directive should include an **obligation for Member States**, where price regulation of the remaining monopoly segments exists, to **align the development of revenues** over time more closely to the development of the relevant cost drivers in the price regulation.

- The Directive should include an **obligation for Member States to report**, on an annual basis, to the European Commission on the amount of energy saved, and the cost-effectiveness of the DSM implemented. The Member States should be obliged to also use the standardised evaluation methods for their reporting to the European Commission.

The final report and the Directive proposal was presented and discussed at DG-TREN in Brussels, 29 November 2000, in a group of about 25 stakeholders from government, industry and NGO's. Several participants confirmed that energy efficiency services are limited to large energy users. It was a widely shared view that energy efficiency and DSM should be treated in a separate directive, similar to the Renewable Energy Directive, but in the context of IEM, supply security, Kyoto commitments, etc. Problems associated with complicated definitions, measuring, monitoring and compliance was a major concern with the proposed Directive. It was also stated that the Directive must be clear and simple, and not distort the growing multinational market for energy efficiency services. These concerns should be taken into account in an effort to develop a proposal for a new Directive.

10. CONCLUSIONS

European Union energy market reforms aim at improving competitiveness and harmonising markets. However, market reforms are also fundamentally changing the prospects for energy company DSM activities. There is some evidence of a growing market for energy efficiency services to larger customers whereas smaller customers are essentially left unattended. Policy mechanisms aimed at stimulating energy efficiency services and programmes by energy companies or other actors are justified. They need not conflict with retail competition, and can be used to enhance the competitive market for energy efficiency services. It would be beneficial if energy efficiency policy goals and means, and markets for energy efficiency services, were harmonised across the European Union. Due consideration should be given to subsidiarity issues in such an effort. Policy mechanisms suitable in markets with full retail competition are applicable also in markets with limited market opening and should be given priority at the European level.

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12. END NOTES

[1] The SAVE programme is part of the EC's Energy Framework Programme and a main programme for supporting various activities, including studies, aimed at implementing EU energy policy objectives. It is administrated by the Directorate General for Energy and Transport.

[2] The subsidiarity principle is intended to ensure that decisions are taken as closely as possible to the citizen and that constant checks are made as to whether action at Community level is justified in the light of the possibilities available at national, regional or local level. Specifically, it is the principle whereby the Union does not take action (except in the areas which fall within its exclusive competence) unless it is more effective than action taken at national, regional or local level.