

The Energy Efficiency Initiative : Framework for an Effective National Energy Efficiency Policies

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ABSTRACT

All countries have a common obligation regarding environmental issues. Mature market economies still have problems with market imperfections and countries with markets in transition have not yet fully developed the institutions to make use of the market mechanisms. Both market function, institutions and policies must develop to achieve market transformation both in a national and an international context. An initiative from several International Institutions has led to a set of recommendations aimed at designing an effective energy efficiency policy with implications for different kinds of economies and for the trade of goods and services related to energy efficiency.

The paper will present the European context in which this 18-month project took place. It explores the most favorable conditions for an energy efficient economy. The paper then highlights what is believed to be the key steps of a successful energy efficiency policy:

- organise a global open energy market;
- set the energy price at the right level (avoiding any subsidies on energy cost);
- develop a qualified expertise on energy efficiency issues;
- integrate energy efficiency in sectorial policies (housing, transportation, urban planning...)

The product of the Energy Efficiency Initiative is a book¹ designed for policy makers and governments of developing nations. Many developed countries can also benefit from it. The paper concludes with some lessons learned by the experts involved from this intensive effort.

Introduction

The objective of the Energy Efficiency Initiative is to provide a comprehensive and valuable report to the European Environment Ministers that will

- stimulate an more energy efficient economy in countries in transition (namely East European countries)
- map out the potentials in energy efficiency
- seek approval and political commitment of the guidelines at governments' level
- promote integration between energy and environment policies in Europe
- facilitate the implementation of the Energy Charter Treaty Protocol

The Danish government who hosts the European Environment Ministers conference in June 1998 positions the Energy Efficiency Initiative on top of the meeting's Agenda. The Danish government organised a task force to prepare a report. The Danish Energy Agency, The International Energy Agency, The Energy Charter have joined forces during the past year to carry out the analysis. Several workshops have been organised to validate the proposed ideas and scheme.

The main questions to answer were: what is the current situation for energy system in the Eastern European countries? What lessons can be learned from Western experience? What are the basis of a sound energy efficiency policy? The present paper summarizes the main findings of the 18 months project.

1. The Four Key Messages

The whole project can be summarized in four main messages to Environment Ministers:

- Accurate energy pricing is crucial
- Successful energy efficiency policies use an integrated approach
- Energy users systematically under-invest in efficiency
- Government and different actors on the market need to interact

Accurate pricing of energy is crucial since it signals the value of efficiency gains and, as a consequence, can attract investment. This signal is weak if prices are subsidised. The signal is stronger and more accurate if it reflects the impact of external effects on the environment. Price increases to the correct level generally need to be made at pace to allow users to adjust their behaviour, and within a framework that avoids pitfalls such as non-payment.

Successful policy integrates measures to assure that comprehensive actions aim to make use of market transformation and to avoid mixed-signals. Energy efficiency policy needs to be co-ordinated with, and be part of, other policy matters that relate to energy use, e.g. housing, and transport. Policies and programmes must be adapted to actual situations. Unsuccessful policies have been based on short-term and single focus programmes, often using grants.

Energy users under-invest, from a strictly financial standpoint, in energy efficiency improvements as they are primarily interested in the service that can be delivered by the equipment or installation. So even though on-going technical development brings more energy-efficient products to the market, consumers are often slow to try them and opportunities that could save resources are systematically foregone. Customer needs should be better addressed in order to give the purchaser more confidence in the energy efficient alternatives.

Government and actors in the market interacting to improve energy efficiency show numerous examples of success. Governing takes place on many levels and aspects: governments set the rules for markets, yet can also influence demand for efficient goods as they are big buyers of energy using equipment; local governments set performance requirements; business associations set practice and routines. In many of these activities an interaction between the parties in formulating demands and challenges for new markets has shown good results. The linking of environmental goals in formal certification of companies according to EMAS and International Standards Organisation (ISO) 14 000 is an example.

2. Energy Efficiency - A Common Concern

Energy, a key component of economic development, is needed as a means of production and to contribute to quality of life. Energy provides service. It powers pumps to irrigate crops, heats schools, and cools vaccines in clinic refrigerators. These services, among millions of others, are what count. It is the combination of energy input and the equipment/installation that deliver the service. It is not the barrel of oil or the kilowatt itself that are important to most people, rather it is the service that energy provides that matters.

Estimates show efficiency improvements in the range of 20-30% can be attained cost-effectively. The opportunity to redouble efforts to use energy more efficiently is clear. It is also clear that there is a need to push forward on an energy efficient path now because the central and eastern Europe and the Commonwealth of Independent States (CEE/CIS countries) cannot

afford not to, particularly in this time of economic transition, and in the OECD countries for economic reasons and because it is a cost-effective path to meeting environmental goals and international commitments.

The challenge is common for both the east and west. All countries can improve energy efficiency in their systems. A significant amount of energy use is embedded in the existing capital stock. A change of buildings, appliances, machinery and processes constitutes an opportunity to use energy more efficiently. Every decision in purchasing, building or retooling made without taking energy efficiency into account is a lost opportunity. Every policy decision made without due regard to making energy efficiency improvements prolongs a waste of resources. Concerns about international competitiveness, restructuring of industry, the speed of technological development and rapid growth of trade further underline the common challenge. Though countries considered in this report may be in very different economic situations presently, the future is common.

Countries which are in the process of restructuring their economies have a historic opportunity to build a higher degree of energy efficiency into refurbished and new capital stock. This positions them advantageously both in business competitiveness and in environmental performance. There is an urgency for countries in central and eastern Europe and the Commonwealth of Independent States (CEE/CIS) to act now. CEE/CIS countries have the unique opportunity to improve their energy performance during the economic transformation. They can also draw upon the experience of other countries and avoid some of the pitfalls experienced.

Since the oil price shocks, many countries, mainly in the west, have undertaken a variety of policy approaches to improve energy efficiency, as well as security of supply and fuel diversity. Experience emphasises the need for adequate economic signals to trigger energy efficient behaviour and investment. This experience also demonstrates that response to some policies and measures has not been sufficient to realise the full potential of cost-effective energy efficiency. It points out that complementary actions that strengthen consumer and business participation provide better results. Experience shows that an integrated and persistent policy approach is essential: one based on the dynamics of a market economy, which improves access to information, expertise and technology, which focuses on the consumer desire for service - not energy per se - and fosters capacity building. Moreover, there is no one set of policies and measures that is suitable for all countries. Policy-makers must carefully weave a basket of policies and measures that takes full consideration of economic, social and institutional factors in order to achieve energy efficiency improvements and consequent environmental and economic gains.

3. Short Analysis of Energy Demand and Efficiency

3.1 Demand Trends in OECD Countries

Energy demand is driven by a variety of factors, the most important being economic output and structure, energy prices, technological progress, personal income, lifestyles, and the impact of energy and environmental policies. The link among all these factors is complex, and the response in energy demand to changes in one or more of them depends on the type of energy service in question, stage of economic development, existing infrastructure, political system, availability of energy resources, climate and geographic conditions, culture, etc.

Before the first oil price shock, energy demand in OECD countries grew at close to the

same rate as gross domestic product (GDP). After the steep increase in prices following the 1973 and 1979 oil shocks, growth in energy demand flattened out, and even declined in absolute terms in the immediate years after the disruptions. The average annual growth rate between 1973 and 1985 was 0.7%, while GDP grew at a rate of 2.4%. However, after the drop in oil prices in 1985, growth in energy demand picked up again, at an annual average growth rate of 1.6% between 1985 and 1995, even as the economic growth was maintained at the same rate as between 1973 and 1985.

Two key factors have resulted in changing the composition of energy use in the OECD economies. First, growth in the use of electric equipment and appliances and the increased mobility has resulted in a significant shift towards electricity and transport fuels. Equally as important, large reductions in the fuel used per unit of space heated or per unit of manufacturing kept reducing the use of fuels for these services relative to actual outputs. The growth in electricity demand has been close to the GDP growth, though the actual coupling depended critically on the price of electricity and the role of both electric heating and raw materials production in each country's economy. Transport fuels also grew steadily, and as a result transport fuels almost doubled their share of total final consumption between 1971 and 1995. They now account for more than half of total oil demand today. A key issue for the future is the extent to which some of the activities or energy services for which these energy forms are important will become saturated.

3.2 Demand Trends in CEE/CIS Countries

Energy demand in CEE/CIS countries before initiating economic reform was characterised by a strong emphasis on heavy industry in the economies, and a lack of accurate energy. Since starting the transition period, energy demand has fallen substantially in the region. In 1996, energy demand in the CEE was about a quarter less than in 1990. In the CIS, it was about one-third below the mark in 1988. These reductions certainly relate to contracted economic output, but at very different rates across sectors. For example, the changes that took place in heating of buildings were not primarily sparked by just economic collapse, but a combination of a surge in prices, real constraints in supply from a lack of hard currency or cut-offs from exporting countries.

There are signs that energy demand in CEE/CIS countries is on the rise in most sectors again as economic activity picks up. It is most notable for electricity for services and households, and transport fuels for private trucking and, above all, private automobiles. Real wage increases in some transition countries have spurred considerable growth in private car ownership and their use. Not surprisingly, the demand for oil for transport fuel has surged. Between 1990 and 1995, gasoline consumption in the Czech Republic, Hungary, Poland, Slovakia and Slovenia grew by more than 30%, while heavy fuel oil for industrial use and power generation fell by 25%. In these countries, gasoline prices declined in real terms, which together with real income growth, provided incentives to increase car ownership and mobility.

Still from very low levels, the sale of new cars in the CEE and CIS has now developed into the fastest growing market world-wide. In 1996, car sales in the CEE countries increased by 35% and in the CIS by 13% compared with 5% in western Europe.

Growth in transport demand will continue to have an important impact, as levels of automobile ownership are only a quarter to half of what they are in western Europe, trucking is only now becoming common as the state railways are reorganized and economies move to higher value and less bulky goods. The transport sector, however, has not yet received the

attention of policy-makers to make a convincing case that CEE/CIS countries will find more effective solutions than those applied elsewhere in the world. Growing demand for mobility and freight transport requires new infrastructure for which public funding may be inadequate. This could lead to road congestion and deterioration of the urban environment if no appropriate measures are taken. It will increase local pollution if unleaded gasoline and catalytic converters are not introduced promptly. Finally, the short-term crippling of national and local finances in turn has put pressure on collective transport systems to reduce activities, which in turn could further stimulate an irreversible development towards car use at the expense of the public systems.

As well as demand growth for transport and electricity, there have been notable changes in the fuel mix patterns in the CEE/CIS as a consequence of economic decline and industrial restructuring. Demand for coal has declined substantially, largely in electricity generation, heat supply and industry. As the use of coal without cleaning devices is a main contributor to extremely high regional emissions, e.g. SO₂ and particulates, falling energy demand has reduced the environmental burden during the downturn.

3. 3 Energy Efficiency in OECD Countries

Overall energy use per GDP is neither a good measure of efficiency, nor a gauge for how efficiency develops over time. Energy efficiency is related to how much energy is needed to satisfy demand for a given energy service, e.g. fuel needed to heat a building. So when looking at efficiency, energy use should be disaggregated among different end-uses to more closely reflect the energy service. It also illustrates that energy use changes by the relative amounts of services demand, i.e., the structure of energy use. Different branches of the economy grow and evolve at different rates, causing the structure of an economy to change over time. Since each branch or activity has a different energy intensity, or energy use/output, these changes alone can change the overall ratio of energy use to GDP. These developments occur for different reasons and in response to various stimuli, for example, sensitivities to energy prices. Policy-makers need to see the impact of measures and technology on the parts of energy use affected by those policies or technology, thus, disaggregation becomes even more essential.

This report suggests more precise tools than the aggregate energy to GDP ratio to give a better understanding of which determinants shape energy use and consequent emission trends. Increased insight of the contribution of different elements in energy and emission profiles can, in turn, point to areas where policies to improve energy efficiency and reduce emissions can be most effective.

Using this methodology to investigate some 32 energy intensities for different end-uses and sectors shows that many OECD countries achieved more than 30% savings totally between 1973 and 1995, principally before 1988. The pace after that time was markedly slower, both because of the recession in the early 1990s and lower energy prices. In the same period, 1973-1995, the energy intensity of home heating plummeted by 20 to 50%, and the ratio of fuel use to manufacturing output plunged by 20 to 50%, a significant drop though the same ratio for electricity held constant. In North America, 30% less fuel was used to move a car one kilometre by 1993 from 1973 levels, and for the IEA countries as a whole, 40-60% less fuel was required for each passenger-kilometre of air travel over the same period.

These trends, however, did not always result in lower energy demand. As income rose, drivers, e.g. size of residences, comfort levels, mobility, pushed electricity and fuel use up more than savings of the efficiency improvements.

3.4 Energy Efficiency in CIS/CEE Countries

Compared to the levels in western Europe, energy use per economic activity is higher in the CEE, and even more so in the CIS. Though the comparison at an aggregated level is prone to misinterpretation, other available data also support the conclusion that economies in the CEE/CIS region use energy less efficiently than western European countries. The main reasons are an old and inefficient standing stock in industry, as well as its structure, high losses in energy production, transmission and distribution and inefficient energy use in buildings. In practical terms, space heating intensity in the cold CIS and east European countries were as much as twice as high as those in the Nordic countries before 1990. Industrial processes appeared to use 1.5 to 2 times more energy per tonne of product than in western Europe. Automobiles used less energy per kilometre, but more energy relative to their power and weight. Trucking was particularly wasteful because of both a low share of diesel trucks and poor utilization of routes. Clearly there is room for change.

Energy price shocks, however, provoked little immediate change. Part of the reason was the low capacity utilization of industries that survived the first real shrinking of economic activity. Another reason was that some industries simply did not pay or households could not properly cut back their consumption of heat. A third reason was that the economic decline meant little real new building or retrofitting of factories and buildings, though the very rich did begin to establish a relatively energy-intensive mobility and housing style. And to some extent, the modest freeing up of trade and personal freedom did lead to greater housing comfort for some, and a rapid escalation in the import of used cars from the west, many older, larger and more fuel intensive than the ones previously common in CEE/CIS countries.

Indeed, real efficiency improvements will take longer. Without macro-economic stability, adequate price and subsidy reform, open markets and an inflow of investments, efforts to enhance energy efficiency in the CEE/CIS countries may be disappointing. One reason is that these mechanisms are essential to proper investments in better factories, housing, new vehicles, and technological progress in general, the most important mechanisms for saving energy. Those countries which have succeeded in stabilising their economies and accelerating energy sector reform, have progressed in attracting (private) investment to enhance efficiency in energy production and use.

Energy prices in most CEE/CIS countries, particularly for electricity, natural gas and district heating for household supplies still remain too low to give proper economic signals. The negative impact of subsidised energy supply and below cost energy prices is substantial and goes beyond the issue of insufficient demand-side investment. Low energy prices not only reduce the incentive for energy efficiency, they also induce demand that would not occur if prices followed market principles. As a consequence, energy suppliers need to invest in capacity that could otherwise be avoided.

This price induced shift is amplified by the fact that governments are generally more willing to provide budgetary support for capacity expansions than implementing measures to enhance efficiency. This is also reflective of a lack of project management capacity for small-scale energy efficiency projects. Expertise is still concentrated in utilities and government offices which have in the past focused on large supply-side projects. Also contributing is the

apparent preference of government and industry alike for large scale investments for which financing can be obtained from international financial institutions, and lowers transaction costs.

An important example of further integration and growing concern about energy efficiency is the Energy Charter Treaty and its energy efficiency protocol. Due to come into force in April 1998, the treaty calls on parties to promote and protect investments, to facilitate and secure transit, to liberalise trade and improve energy efficiency. The energy efficiency protocol requires parties formulate policy objectives and strategies to improve energy efficiency and reduce environmental impact. To this end, countries are to develop, implement and regularly update energy efficiency programmes suited to their circumstances. International co-operation is seen as a major supporting tool.

4. Impediments and Incentives to Energy Efficiency Improvements

4.1 Paying Energy at the Right Price

Energy prices play an important role in determining the potential for energy efficiency improvements. Obviously, an energy price that reflects full costs, makes the efficient model more attractive and improves the potential for efficiency gains. Non-payment of energy delivered to industry and households is a major barrier to energy efficiency of relevance to all market participants (consumers, energy industries and investors). Low collection ratios need to be addressed as they reduce the incentive for private business to provide energy services and limit the financial viability of energy industries. Further economic development may alleviate the non-payment problem.

There is concern that price increases, particularly in the residential sector, could undermine the fragile political consensus necessary to complete the transition process. It is, therefore, not surprising that many governments are reluctant to increase prices to economic levels, or even to levels that compensate inflationary erosion. Prices have also been kept below economic levels by governments in pursuit of broader policy objectives such as macro-economic stabilisation and social policy. Changes to energy prices should be made transparent, and possibly introduced step-by-step which allows consumers and investors to rationalise their investment decisions, appropriately taking account of long-term price expectations. Such an approach can enhance market confidence.

4.2 Beyond Prices

Experience shows that many energy efficiency options are not taken even when the cost of energy saved is much less than the cost of producing the same amount of energy and a consistent price structure is in place. Some of the obstacles to tapping into the large potential to reduce direct energy costs and environmental impact include:

- Lack of knowledge or information about opportunities to save energy, technology and how they effect costs. This is the case for an average consumer, but it often also holds for business leaders, policy-makers, and local authority planners.
- Limited capital which leads to lowest initial cost investment decisions without due consideration for operating costs, or life cycle costs.
- Access to capital for energy producers is easier and often at better rates and terms than for energy consumers.

- Separation of expenditure and benefits such as a landlord making the investment in a building and its energy delivery mechanisms while the tenant pays the energy bills.
- Lack of consumer confidence in new technology;
- Slow rates of infrastructure and capital stock turn-over;
- Legal and administrative obstacles, e.g. discriminatory tax regimes, accounting systems which do not accrue energy saving where they were achieved.

5. Policies and Measures

In principle, markets respond quicker and more effectively to economic signals than government policy and regulation are able to do. Market forces alone, however, may not always be adequate to integrate the long lead times involved in energy supply and demand options with the complexity of *inter alia* energy security, economic development and environmental objectives. Public policy measures may help to overcome some of the barriers. Indeed, many governments have programmes which focus on end-users or on equipment manufacturers to address these obstacles.

Government involvement in energy markets extends to regulation of monopoly enterprises as well as parts of restructured grid-based energy services, e.g. competition law, safety, and environmental protection. In the case of electricity and natural gas service, market forces and other factors that determine end-use efficiency can be modified by the regulatory framework set out by the government and by a range of environmental, fiscal and other policies that affect the allocation of economic resources. In designing policies to effectively encourage greater end-use efficiency, a number of governments have employed strategies along the following lines, depending upon economic and political circumstances:

- ensure that correct price signals are given to consumers;
- ensure that consumers have access to adequate information and advice to improve the effectiveness of market forces;
- offset financial barriers to energy-efficient investments through selected financial inducements which need to be transparent and temporary;
- carefully design efficiency standards;
- foster voluntary actions in business and industry that lead to cost-effective efficiency advances.

The principal policy measures reviewed include:

- information dissemination and technical assistance;
- regulation and standards;
- pricing and fiscal policies;
- other economic incentive measures;
- demand-side management;
- voluntary agreements, and
- research, development and demonstration.

The main challenge for CEE/CIS countries is to create conditions to ensure that energy efficiency investments become more attractive to private capital, both domestic and foreign.

Consequently they need to:

- create market conditions for energy efficiency by eliminating distorted energy prices and phasing out direct and indirect subsidies;
- enhance the availability of financial sources by increasing the collection ratios and providing better access to long-term finance;
- enhance the business environment by improving the legal and regulatory framework and project management capacity.

One finding is the heavy dependence on the programmes of the European Union (EU). Only a few countries appear to have programmes that are truly independent of the support available from the EU. While such support has value, bilateral support has tended to be less comprehensive and less committed to long-term continuity which is important for effective results. Notably those countries in the pre-accession phase of EU membership are developing plans to meet EU obligations including appliance labelling, boiler efficiency and minimum appliance efficiency standards.

Findings of the survey related to CEE/CIS countries include:

- Good awareness of the need for an energy efficiency strategy and action plan. There are cases, however, where the overall strategy has been defined and adopted but the action plan has not been comprehensively implemented. Other countries have not yet adopted energy legislation needed to develop energy efficiency strategies.
- Energy price reforms have not been completed. In some cases where prices have been increased without taking into account purchasing power parities, the non-payment issue has increased.
- Labelling of appliances is of growing interest.
- There are few financial incentives though most countries have identified a need for them.
- Most countries have building codes but there is a lack of enforcement.
- Few regulations or standards directly related to energy efficiency.
- Lack of capital.
- Few, if any, voluntary agreements.
- Some general awareness programmes of good driving practices and the benefits of public transportation. Few measures to expand or improve public transport systems.
- Few examples of information programmes such as audits, mass media campaigns or training.
- District heating is a key area for improvement and the scale of needed investment is large but only a small amount has been provided to date.

Potentially, the greatest increases in efficiency will come not from direct efforts to reduce energy consumption but from pursuing other economic goals like improved product quality, lower capital and operating costs, or specialised product markets. Many projects undertaken for non-energy reasons yield energy efficiency gains as a secondary consequence. For example, glass producers adopted the energy-saving float process primarily for the production flexibility that it offered. Steel makers have installed continuous casters more for the improved product yield than the energy savings. Metal stamping plants have implemented new techniques for cushioning presses not for the 10 percent energy savings, but for the more

consistent products and lower maintenance costs.

Conclusions

The agreements made in Kyoto and the provisions of the Energy Charter Treat, with its protocol on energy efficiency, have made it extremely important to elaborate the concept of energy efficiency and to especially to distinguish the factors of successful policies. The recommendations made in the Energy Efficiency Initiative report pull forward the elements of such policies in terms of economic conditions to attract the necessary investments, and in setting the scene for actors, technologies and institutions to develop and to do so with a consistent long-term view. The present paper gives a summary of the analysis performed and highlights what the study group found as more relevant. The Energy Efficiency Initiative report has been used to draw set of guideline and a declaration that European Environment Ministers are inviting to sign and support.

There is evidence that energy could be more efficiently used in all economies but also that there is a need for more stringent policy actions to release the potential. Large scale improvements are not easily or quickly obtained. Enduring and consistent work lies ahead. For energy efficiency to be widely spread all the millions of everyday decisions made to buy and operate energy-using equipment have to be made with energy efficiency as the preferred choice when it is the least expensive alternative.

- The **dynamics of the market** economy must be enhanced and fully used
- Even when market conditions are sufficient the actors on the market might find themselves unable to use the information correctly. Demand-side opportunities have to **focus customer needs**.
- Also in economies where decentralised decisions are the general rule, many energy efficient and cost efficient opportunities are foregone every day. Promising technologies are known, but do not find their way to the market since purchasing capacity is not identified and signalled to the suppliers of the new equipment. Good technology needs better dissemination to the market and even the best available technology can be improved. There is a need to **improve access to technology** by aggregation of purchasing power and improved communication between lead users and first movers among manufacturers.
- Even when good technology is available its properties are not known well enough to the buyers and users. **Institutions¹ must be developed** to make sure that the everyday choices are made with full information. The best technology should get a bigger market share and the inferior gradually is weeded out.
- Even when all market actors are working with the best intentions they might find that leadership on different levels and sectors of the society is changing and inconsistent. There is a need to **establish policy co-ordination and consistency** in all respects from governments to business associations giving a clear message over the long term.

¹ In everyday language institutions are not distinguished from organisations but more generally speaking institutions are a "sets of habits, routines, established practices or rules which regulate the relations between individuals and groups.

The report's recommendations do not explicitly distinguish between countries in the east or the west. The obligation is common and the policy components are the same.

References

The Energy Efficiency Initiative. "Energy Policy Analysis and Recommendations". Draft report. February 1998.

