

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE
Committee on Environmental Policy
Committee on Sustainable Energy

Task Force on Reforming Energy Pricing
19 November 2002, Geneva

REFORMING ENERGY PRICES AND SUBSIDIES

Note by the secretariat

At their annual sessions in 2001, the UNECE Committees on Sustainable Energy and on Environmental Policy established a Task Force on Environment and Energy for the period 2002-2005 with a mandate to develop non-legally binding guidelines for decision-makers on reforming energy prices to support sustainable energy development. The guidelines should help, inter alia, in preventing and reducing waste of energy and energy-related environmental impact.

Energy and environmental experts have been designated by a number of UNECE Governments in response to the secretariat invitation to participate in the Task Force. As a first step, the joint Task Force will focus on parts I and II of the guidelines, namely, on (a) raising energy prices to economic levels in countries in transition, and (b) reforming energy subsidies throughout Europe. Two consultants have been engaged to prepare elements for these guidelines, respectively, using as a basis documents developed by the International Energy Agency, OECD, UNEP, the United Nations Commission on Sustainable Development, UNECE and other forums.

Elements on parts I and II of the guidelines, prepared, respectively, by Mr. Laszlo Molnar and Mr. Trevor Morgan, consultants to the secretariat, are annexed to the present note. The Task Force is expected to use these elements, together with comments received from its members, when preparing draft guidelines at their meeting of 19 November. The results will be reported to the Committee on Sustainable Energy at its twelfth session on 20 November 2002.

Guidelines, to be finalized in the light of these discussions, will be submitted to the Bureaux of both Committees and, thereafter, to the Committee on Environmental Policy in February 2003 for consideration and possible transmission, through the Working Group of Senior Officials, to the Ministerial Conference "Environment for Europe" in Kiev, for endorsement.

The Task Force will continue the preparation of the remaining part of the guidelines, on the internalization of external costs from energy production and use, up to the year 2005. The Czech Republic has agreed to be coordinator on this subject and it has developed, in cooperation with the secretariat, a work plan and time schedule.

ELEMENTS FOR GUIDELINES FOR REFORMING ENERGY PRICES IN COUNTRIES IN TRANSITION

1 Objectives

1.1. General principles of tariff regulation

Energy commodity prices (with the exception of petroleum products) are usually set by some kind of a state body in countries in transition. Two major objectives need to be highlighted in the process of regulated (non-market) rate making (18):

- Customers should receive adequate service at reasonable rates
- The utilities should be provided with a reasonable opportunity to recover all their costs, including the costs of capital (a fair return on investment)

The World Energy Council (WEC) Statement 2000 (13) lists three further objectives: accessibility, availability (security of supply) and acceptability. Other organizations (EBRD) mention affordability.

For countries in transition it is affordability that causes serious problems.

From the perspective of the success and efficiency of the energy sector and the entire economy the most important factor is that prices reflect long-run marginal costs¹.

The existence of certain subsidies, however, may be tolerated temporarily: „any subsidy can be justified if the gain in social welfare or environmental improvement that it brings exceeds the net economic cost” (2).

1.2. Removing price distortions

UNECE, IEA, EUROSTAT, the World Bank and other organizations have all stated that energy prices (particularly household prices) in countries in transition are far below the average EU prices (and what is even more important: they are below the marginal prices as well).

The EBRD study includes an interesting presentation about prices in countries in transition (14) (see Table 2).

The fourth column of Table 2 shows that HH prices are below LRMC, often by 50-70-90% in all countries except Poland. Table 2 also shows that the ratio of industrial and HH prices does not correspond to the ratio usual in developed market economies. Industrial power tariffs are often (relatively) high while HH prices are cheap. (This is an obvious case of cross subsidies/financing.)

The difference between prices and LRMC is covered by subsidies.

¹ Marginal cost is defined as the cost of producing an extra unit of output using the existing capital stock. Long-run marginal cost (LRMC) is marginal operating cost plus the cost of additional capacity required to increase output (14).

According to the IEA-UNEP study (2): An energy subsidy is any government action that lowers the cost of energy production, raises the price received by energy producers or lowers the price paid by energy consumers.

There are different kinds of energy subsidies (as shown by the above definition).

World Bank (1) has put subsidies into 7 categories:

- No disconnection of delinquent residential customers
- Across-the-board household price subsidies
- Life-line tariffs
- Price discounts provided to certain households selected on basis of occupation, medical history, age merit, etc.
- Compensation for the share of utility expenditures that exceeds a notional burden limit set as a given percentage of monthly household income
- Other earmarked cash transfers helping low income households to pay for utility services
- Non-earmarked cash transfers to poor households.

IEA-UNEP lists the following types of energy subsidies, together with their impacts: 1. Direct financial transfer 2. Preferential tax treatment 3. Trade restrictions 4. Energy-related services provided directly by government at less than full cost 5. Regulation of the energy sector (price controls).

Subsidy no. 5, listed in the second line among World Bank categories, is perhaps the most frequent one.

World Bank (1), EBRD (2) and many others deal in detail with the negative economic effects of price subsidies. The evaluation of subsidies shows that all subsidy types without exception have several weaknesses (e.g. the poor are not being reached (targeting), a low share of the subsidy goes to the poor, high share to the more well off etc. and the unintended negative side-effects such as economic efficiency loss, higher consumption and waste, discouraging energy efficiency etc.).

Therefore the regulatory institution must aim for the elimination of subsidy distortions as its basic objective.

Two things, however, need to be emphasized:

- Subsidies must be cancelled with great care and under no circumstances it is allowed that the poor should be the losers of the price reform (establishing the appropriate social support system)
- Certain subsidies may be retained for a longer period (e.g. renewable energies) but sunset clauses should be included.

1.3. Encouraging proper behaviour in consumption

Energy prices of the right level provide the market signal that facilitates (motivates) *consumers* to save energy. For the competitive operation of the industry, transport, tertiary etc. sectors it is necessary that they use energy in a rational manner.

In non-energy intensive sectors energy costs do not exceed 2-5 %. Yet it is important for companies to use this energy saving potential in cases where the rate of return is acceptable

(generally < 3-5 years). Rational energy use is even more important in energy intensive sectors (e.g. iron and steel, glass, non-metallic minerals, heavy chemicals, etc.) where energy costs can go up to 30-40 %.

The importance of residential energy saving is increased by the fact that 30-40 % of final consumption occurs in this area. The undervalued prices have not encouraged saving so far. Following the price reform the residential sector will show a heightened interest in energy saving. It should be promoted by various state tools (credit, consulting, tax concessions etc.).

In case of residential energy saving it is important that technical solutions should be available that help people save energy if they wish to:

- individual metering
- individual billing
- possibilities of energy saving control for the consumer (e.g. heating control)
- subsidies for family houses and multi-dwelling houses to facilitate energy saving (e.g. subsidized loans, tax concessions)

1.4. Attracting investments into energy sector

The use of the energy sector in countries in transition represents 30-40 % of Total Primary Energy Supply. Owing to low energy prices and non-payment of bills energy producers and distributors are often making losses in countries in transition. This means that the necessary maintenance, investment and modernization do not take place.

After the price reform the sector becomes profitable, with the influx of domestic and international capital. To attract foreign funds, countries in transition have to provide a stable investment climate and competitive tax arrangements. Once the right conditions are achieved companies may start catching up with the investments that were missed.

Price reform and the reform of the energy sector with liberalisation enforce energy efficiency.

2. Price signals to population

The population must be informed of the energy price reform in a timely and detailed manner. Making the population understand why the reform is necessary and beneficial for the residential sector and the entire economy is a major communication exercise. It must be explained that the price reform cannot be separated from the perspective of sustainable development and environment protection.

The population needs to understand that the price of all products, including energy, must reflect production and distribution costs and should also include a profit to cover the costs of required developments.

The population must be made to accept that energy is a commodity just like any other (e.g. coffee, cigarettes, food, alcoholic beverages etc.). If the prices of these products must be paid then the price of energy needs to be paid too. (The acceptance of this is particularly difficult in some CIS countries where the majority of consumers „traditionally” do not pay their energy bills.)

The population must also be informed that prices only incorporate the absolutely necessary cost items with the „least cost principle” prevailing.

It should also be stressed that prices shall be raised gradually and the most vulnerable segments of the population, the losers of the transition will be safe guarded.

The prerequisite to this complicated communication task is that the government itself should acknowledge that even though energy pricing is a politically sensitive issue, raising energy prices to the economic level is an economic necessity and in the interest of the public. With appropriate pricing policies all countries in transition are likely to emerge with higher standards of living, more rational use of energy and a cleaner environment.

3. Transparency of pricing

In countries in transition prices on the end-user side are often subsidised. Producer side subsidies are also quite frequent. Main units of large, vertical energy utilities (energy production, transport, distribution) are often cross-financed.

Import prices are volatile and the changes are charged to the energy producers and consumers by the regulatory body in an often arbitrary manner.

Under the described circumstances prices do not reflect costs and companies/consumers cannot correctly estimate revenues and expenses. Energy producers are making losses, while consumers are receiving wrong signals from the market. The price does not provide information about actual costs and consumers are not motivated to improve energy efficiency.

The resulting negative impacts can only be mitigated by price and pricing transparency. Pricing should be related to costs. This is the most pressing issue in many countries in transition.

Other steps of reform should accompany transparency such as unbundling which reveals and removes cross subsidies in vertical monopolies.

At the same time the regulatory body responsible for pricing should take care that the logic behind pricing and the regularity of price changes are widely understood. Predictability of prices is also necessary to make the costs of energy utilities and consumers easy to plan, which is the prerequisite to a stable market operation.

4. Pricing schemes

In almost all countries in transition the regulatory institutions responsible for pricing set the price in an arbitrary manner, based on economic considerations (sustaining certain activities such as mining, considerations about employment, reduction of import dependency etc.) and social considerations (subsidization of households).

The most important steps in reforming energy prices are to move from “ability to pay” philosophy to cost of service, and eventually to market based prices (for competitive services).

Normally there are three elements of cost in the price structure for electricity and gas:

1. a **one-time payment** to be connected to the grid
2. a **standing or fixed charge** (usually monthly), not related to the amount of the commodity consumed, to support costs such as metering, billing and sometimes capacity costs.
3. a **usage cost** related to the amount of commodity consumed, to cover the production of the commodity itself and the variable costs of delivering it to the end-user (13).

Naturally other elements of cost are included in detailed pricing such as capacity charge, environmental levy, excise and VAT taxes, regulatory charges, costs of compliance with economic and energy policy requirements.

There are different types of price control:

1. Return regulation: the returns are guaranteed, it is predictable and transparent. But there is no incentive to cut costs.
2. Price cap regulation: it has led to contradictory outcomes in California.
3. Revenue cap regulation
4. Performance based regulation

The types 2., 3. and 4. of price control are so-called incentive based regulations. Producers are motivated to cut costs. But there is a risk of windfall profits and the quality of service can decline (16).

Prices under all circumstances must reflect the long run marginal costs of energy production, transport and distribution, including a fair return on investment. To define LRMC the exact cost of all elements of energy supply needs to be calculated for the various consumer categories and the different consumer usage patterns in order to achieve a sustainable energy system. The lack of transparency is one of the major hindrances to sustainable development.

The introduction of cost-based tariffs is not the final goal, but instead a compromise. The process to improve the tariffs and the tariff systems is ever continuing. And eventually there must be a way leading to market prices. In this last case, on a liberalised market it is the market that regulates the price. Prices rise and fall to reflect scarcities and surpluses. The market mechanisms provide a system of price adjustments to signal where resources are required and where they are not. The same mechanisms select the best energy technologies.

5. Methods of allocation of costs

Utility's costs are made up of items such as operational and maintenance costs, administrative, depreciation, tax, billing etc. costs. Such costs can be grouped into the following categories by the various functions of energy supply: costs of production, storage cost (e.g. in case of gas), transmission costs, distribution costs and others.

The allocation of costs, as mentioned in section 4.4, takes place through a different logic: there are customer costs, energy costs and capacity costs.

The costs are charged to customers according to their type (e.g. industrial, residential, small or large consumer, interruptible or firm, alternate fuel capability, etc.).

Energy costs reflect the volume of consumed energy.

Capacity costs can be calculated through the detailed analysis of the system load, taking into account how certain customers influence such costs. Peak loads and their times of occurrence need to be analysed.

6. Types and structure of rates

Consumers enter into various classes of contracts with the utility concerning the energy service. The following section outlines the major regulated tariff types. The structure of tariffs has already been presented in section 4.4.

A. Firm customer tariff system. The majority are **firm customers**. These customers have a long-term relationship with the utility, cannot be switched to alternative fuel and require a continuously available service. Such customers include e.g. households. They generally pay a fixed charge and an energy charge obtained through metering, but flat rates are also quite frequently used where the energy charge is independent of the actual consumption (un-metered service). The handling of capacity charge is a controversial issue in the case of such customers.

B. In several developing countries **lifeline tariffs** with two or three blocks are used for household consumers. Its objective is to meet the basic energy needs of the poorest customers at a favourable price. In this pricing mechanism the price subsidy is restricted to the initial (one or two) block(s) of consumption. (From a market perspective it is imprudent that larger customers receive energy at a more expensive price.)

C. The objective of interruptible energy supply is load management. It is primarily aimed at certain industrial consumers who are inclined to accept this type of service by temporarily interrupting their activity or using an alternate commodity capability (fuel switching). The **tariff of interruptible supply** includes discounts for these consumers. Some of the household customers also use interruptible services such as off-peak storage water or space heating.

D. Seasonal tariffs are used in consumption categories highly dependent on seasonal impacts (e.g. space heating). Peak and off-peak periods are expressed by peak and off-peak tariffs (E.g. electricity is charged per kilowatt hour, with different price tariffs for peak and off-peak usage.)

E. In certain cases a separate **public lighting tariff** is determined.

F. Finally there are **incentive tariffs** with the help of which the utility wishes to encourage consumption or retain the existing consumption. In this case all incremental consumption would receive the discount. This solution, however, raises problems of discrimination. Other incentive pricing encourages companies to reduce energy consumption and operate in a more efficient manner.

Please note: some of the state regulated tariffs contain various price subsidies to meet social objectives. In the evaluation of price subsidies the following considerations should be taken into account: 1. The extent to which the poor are being reached (coverage) 2. The share of the subsidy that goes to the poor (targeting) 3. Side effects due to the subsidy 4. Administration costs. In addition, other issues need to be considered such as range of cash collection, non-billed consumption, un-metered consumption etc. Raising tariffs towards LRMC can only achieve the final objective through the resolution of these issues (i.e. with the reform of the energy sector): the improvement of revenue collection, reduction of losses and the stimulation of investments in the energy sector.

7. Frequency of adjustment

State regulated energy prices should be adjusted in time. The adjustment may occur at certain pre-determined periods e.g. annual review or may be linked to some other event:

- performance based rate-making.
- using a price formula (price indexation).

The new price is usually based on the changes of several economic indicators. For instance, the import price and volume adjustment of a commodity, the rate of inflation, the changing exchange rate vs. the US dollar etc. may provide the basis for price correction. The price formula may include e.g. a revenue or productivity improvement-related element, for instance in the privatisation of the Hungarian energy industry investors were guaranteed an 8 % asset-related rate of return.

8. Supportive mechanisms for the most indigent – compensation measures for low-income population groups

Along with the reform of household energy prices the poor must be supported by subsidies.

As the countries in the countries in transition are fairly different there is no single well-tested method for the selection of those eligible for subsidy and to determine the method of subsidisation. Supportive mechanisms must be developed taking into account the local characteristics, the income level of the population and several other factors.

The large international bodies (1, 14, 22) set down the criteria, which are used to establish a successful support system. The elements of the system are as follows:

A. Criteria for eligibility for support. The most indigent consumers will be eligible to receive subsidies following the price reform. Their selection is not easy mainly because of incomplete household statistics on poverty and energy consumption. Human passivity, health conditions, cultural reasons and pride also can cause problems (poor people often do not apply for subsidies).

The group of eligible consumers can be determined based on earlier applications for aid, voluntary application and affordability. Affordability may be defined using the income/capita of the household e.g. based on (1) \$2,15/capita/day absolute poverty line in 1996 PPP terms. Another starting point is the share of expenses households spend on energy (14). Hence affordability ratio = energy expenditure/income. If this ratio exceeds a given level, the so-called fuel-poverty level (e.g. 15 %) the household receives a subsidy. (E.g. in Bulgaria 19 % of the households was subsidised (3).) In other countries eligibility is linked to the energy consumption of the household (e.g. setting electricity or gas consumption limits in kWh/year or m³/year: consumers below the limit receive support).

B. When evaluating the supportive mechanisms five objectives must be met (14):

- it covers all eligible poor people (i.e. coverage)
- reaching only those consumers who need it (and not those who can afford to pay cost-recovery prices) – (i.e. targeting)
- minimising the scheme's cost for government or utility
- making it fair and cost effective
- minimising distortions arising from the scheme

None of the currently used subsidy systems fully satisfy the above criteria. We cannot recommend an across-the-board subsidy (all residential consumers are subsidised, blanket subsidies in form of low energy prices and poor enforcement of payments discipline) because of bad targeting. Supply-side subsidies should also be avoided because they mean low targeting as well.

The following solutions are acceptable from a professional perspective:

- **life-line tariffs** with two or three fixed or floating blocks (restricting the price subsidy to the initial or to the first two blocks). They can be implemented when consumption is perfectly metered.
- **targeted subsidies**. They are related to the affordability ratio or to burden limit. The metering of the households' energy consumption and a reliable household income statistics are necessary for the implementation.
- income support
- support of energy saving investments for poor households
- combinations of the above systems

8. Regulatory framework

Simultaneously with the reform of prices and the energy sector in general a regulatory authority must be established. Key tasks of the authority include the following:

- **Setting prices** on areas where the market does not yet do so. Pricing includes the regulation of wholesale prices, retail prices, standing charges and the network access charge.
- **Licensing and regulating** energy generation, transmission, distribution
- **Protection** of consumers interests
- **Other activities** (e.g. developing standards for environment protection, safety, energy efficiency etc., making analyses etc.)

The authority must be independent of day-to-day political interference and must ensure equal conditions and non-discrimination of all sector participants, encourage competition on all possible areas and ensure financial viability for all participants.

References:

1. *Lovei, L.*: Maintaining utility services for the poor – Policies and practices in Central and Eastern Europe and the former Soviet Union, The World Bank, 2000.
2. *Morgan, T.*: Reforming energy subsidies, OECD/IEA-UNEP, 2002.
3. *Dubash, Navroz K.*: Power politics – Equity and environment in electricity reform, World Resources Institute, 2002.
4. *Miller-Martinot*: The GEF: Financing and regulatory support for clean energy, GEF, 2001.
5. *Martinot, E.*: Power sector restructuring and environment: Trends, policies, and GEF experience, GEF, 2002.
6. *Wang, Y-D.*: Less energy, a better economy and a sustainable South Korea, Bull. of Science, Technology and Society, Vol 22, No. 2, 2002.
7. *MacKerron, G.*: Developments since 1997 in the UK power sector: environmental and social consequences, NERA, 2002.
8. *Molnar, L.*: Social and Environmental Impacts of Power Sector Reform in Hungary, Power Sector Reform Conf., IEA, 2002.
9. *Clark, A.*: Making provision for energy-efficiency investment in changing markets: an international review, Energy for sustainable development, Volume V No. 2, 2001.
10. *Molnar, L.*: Energy efficiency in Hungary, UNECE, Sustainable Energy Committee meeting, 2002.
11. *Wamukonya, N.*: Power sector reform in developing countries: mismatched agendas, UNEP, 2002.

12. World Energy Outlook, 2001. OECD/IEA.
13. Pricing Energy in Developing Countries, WEC Statements, 2001.
14. Transition Report 2001 - Energy in transition, EBRD, 2001.
15. Reforming energy prices for sustainable energy development, UN ECE, Energy/2001/6, 2001.
16. *Dr. Petrov, K.:* Regulatory Control in the Power Sector --- *Gallagher, J. T.:* Tariff & Pricing Issues in ERRA Member Countries, 1st Energy Regulation & Investment Conference, April 2002, Budapest
17. Gas Distribution Rate Design Manual, UN ECE Gas Centre Series No. 2, 1995.
18. Issues in market-based natural gas pricing in economies in transition, UN ECE Gas Centre Series No. 7, 1997.
19. *Reketye, G.:* The price in marketing (in Hungarian), Muszaki Konyvkiado, 1999.
20. Monitoring country progress in Central and Eastern Europe & Eurasia, USAID, 2001.
21. World Economic Outlook, IMF, 2002.
22. *Barnes-Halpern:* Energy and development report 2000 – Energy services for the world’s poor, The World Bank, 2000.

ELEMENTS FOR GUIDELINES ON REFORMING ENERGY SUBSIDIES

Summary of Recommendations

UNECE governments should:

1. Reform energy subsidies as part of a broader process of economic and institutional reform aimed at placing more emphasis on the market, removing trade barriers and improving governance of the energy sector.
2. Ensure that price signals reflect to the maximum possible extent the full costs and benefits of supplying and consuming different forms of energy.
3. Favour regional development, education and training, health and social welfare policies over energy subsidies in addressing social issues.
4. Target subsidies, where they are justified, at clearly defined groups and technologies, and devise mechanisms that ensure that the benefits of those subsidies go only to those targeted categories.
5. Design subsidy schemes so that they do not undermine incentives for producers and suppliers to provide a service efficiently or for consumers to use energy efficiently, and do not harm the financial health of energy-service providers.
6. Carry out a thorough and coherent analysis of all the economic, social and environmental costs and benefits associated with existing or planned subsidy schemes to ensure that the case for them is valid. Where it is not possible to assess properly the full implications of a given subsidy, eliminate it.
7. Prevent the cost of energy-subsidy schemes from becoming a serious burden on the national finances, and abandon any schemes that involve excessive administration costs.
8. Ensure that the financial costs and the channels through which financial transfers are made are fully transparent, and communicate that information to the public.
9. Place a time limit on the duration of energy-subsidy programmes.
10. Remove any subsidies that fail to achieve demonstrable net environmental or social benefits.
11. Implement reforms in a phased manner, where the economic and social consequences are profound, to soften the financial pain of those who stand to lose out and give them time to adapt.
12. Consider introducing compensating measures that support the incomes of households in more direct and effective ways.
13. Communicate clearly to the general public the overall benefits of subsidy reform to the economy and to society as a whole.
14. Permit energy-service providers (public and private) to cut off supplies to non-paying customers, except under exceptional circumstances.

Definitions and Scope

No consensus definition of an energy subsidy exists, complicating objective discussion of issues relating to subsidies and their reform. The narrowest definition is a *direct payment by a government to a producer or consumer*. But this is just one way in which governments can stimulate the production or use of a particular fuel or form of energy. Broader definitions attempt to capture other types of government interventions that affect prices or costs, either directly or indirectly.

For the purposes of these guidelines, an energy subsidy is defined as *any government action that concerns primarily the energy sector that lowers the cost of energy production, raises the price received by energy producers or lowers the price paid by energy consumers*. The baseline is assumed to be market prices and costs. This means that any government action that seeks to address a market failure by reducing the price or cost of energy to internalise an external environmental or social benefit (i.e., a positive externality) constitutes a subsidy.

The above definition encompasses a wide range of government interventions in the energy sector, but excludes non-energy government policies and measures that might nonetheless unintentionally lead to lower energy prices in an indirect way. Government actions that primarily concern the transport sector, for example, can significantly affect the cost and price of providing an energy service.

There are many different types of energy subsidies. The following interventions, which may constitute sources of subsidy to producers or consumers, are the most common:

- Direct financial interventions, including:
 - Transfers, grants, preferential loans and liability insurance.
 - Tax instruments, including royalties, duties, levies, tariffs, credits and relief, accelerated depreciation allowances and the possibility of transfer pricing.
- Indirect administrative interventions, such as:
 - Trade instruments, including quotas, technical restrictions and embargoes.
 - Energy-related services provided directly by government at less than full cost. This includes direct spending on energy infrastructure and public agencies performing service functions, and the waiving of bills, which effectively makes the energy service free to the consumer.
 - Regulatory controls, such as price controls, demand guarantees, mandated deployment rates for certain types of energy technology, market-access restrictions, environmental regulations, technical standards, licensing and certification.
 - Publicly funded energy research and development.

The interventions listed above are classified according to whether they impact prices or costs directly or indirectly. Subsidies may be classified in other ways, such as whether the subsidy is on- or off-budget, or whether the subsidy accrues directly to producers or consumers. A producer subsidy – a government intervention that has the effect of lowering the cost of production – would normally lead to a lower price to the final consumer, because it stimulates producers to raise output. A consumer subsidy is a government action that directly reduces the price of a fuel or energy service to consumers. A consumer subsidy may also take the form of a cross-subsidy, where a below-cost price to one category of consumers is offset by an above-cost price to another.

Consideration of subsidies and their reform must take account of taxes, since they offset the effect of subsidies on price. In many cases, energy subsidies are more than offset by special taxes and

duties (other than the standard rate of sales or value-added tax that applies to all goods and services) that raise the final end-use price to above free-market levels. Differential rates of taxation can give a competitive advantage or disadvantage to one fuel or energy form over another in the same way as a subsidy. What matters, in practice, is the overall or net impact of all subsidies and taxes on the absolute level of prices and costs and the competitiveness of each fuel or technology.

Objectives and Approach

A subsidy by its very nature involves a complex set of changes in economic resource allocation through its effect on costs and/or prices. These shifts inevitably have economic, social and environmental implications. But in many instances, subsidies are counter-productive because the costs of the distortions they cause outweigh the benefits. The harmful effects of energy subsidies may be manifested in the following ways:

- Subsidies often lead to higher consumption and waste, exacerbating the harmful effects of energy use on the environment. By lowering the price paid for a fuel or the cost of using it, a subsidy will stimulate use of that fuel, leading to increased air pollution and emissions of greenhouse gases. Inefficient use of energy and outright waste caused by under-pricing or even zero-pricing (in the case of unmetered supplies or non-collection of bills) is a common problem in some economies in transitions. Higher fossil-fuel production can also damage the environment directly, by polluting water supplies and spoiling the landscape. Public funding of fossil-fuel research and development, a form of energy subsidy, may ultimately lead to higher consumption, but may also yield positive environmental effects if it results in the use of more efficient, cleaner-burning technologies in the long term.
- They can place a heavy burden on government finances, worsen the balance of payments and weaken the potential for economies to grow. The financial cost may be significantly raised by the need for heavy administration to allocate subsidies to targeted beneficiaries and prevent abuse.
- They can undermine private and public investment in the energy sector, impeding the expansion of energy services and the development of more environmentally benign energy technologies.
- They do not always end up helping the people that need them most. Subsidies often benefit mainly energy companies, equipment suppliers and better-off households, who consume more of the subsidised fuel and have better access to it. Meanwhile, the entire population, including the poor, shares the cost. Subsidies also encourage cheating and corruption.

The primary goal of subsidy reform, therefore, should be to minimise the harmful effects while maximising the benefits. This will involve changing the subsidy mechanism and/or reducing the overall size of subsidies. Eliminating subsidies completely is justified when they are clearly harmful to the environment or impede economic development and trade while bringing minimal social or local economic benefits in the long term.

Subsidies on any economic activity can in principle be rationalised on the basis of theoretical arguments concerning market failures or imperfections that lead to economically sub-optimal outcomes. A subsidy can be justified if the net gain in social welfare or the environmental improvement that it brings about exceeds the net economic cost. Energy-market failures include external costs, such as pollution, and barriers to market entry that impede the efficient operation of competitive markets. Government intervention, which may involve the use of subsidy, can help to remedy such market failures, either by addressing their causes or by trying to replicate the outcome of a perfect market. For example, support for renewable energy sources or for the deployment of energy-efficient technologies can bring real social, environmental and economic

benefits, depending on circumstances and how that support is provided. But practical considerations can make achieving those goals difficult. In practice, policymakers have to strike an appropriate balance between reliance on the market and intervention to address social and environmental policy goals. They must also devise workable mechanisms that ensure that stated policy goals are met at minimum cost.

Energy-subsidy reform needs to be undertaken as part of a broader process of economic and institutional reform. This is especially important in the transition economies. Economic reform, aimed at restructuring the energy sector and the economy as a whole, should involve placing more emphasis on the market, removing trade barriers, encouraging private and foreign investment and reorganising state enterprises. In the long run, competition can help to reduce energy supply costs and, therefore, prices, which would ultimately help to reduce the need for subsidy. Institutional reform involves reorganising public structures and bodies in order to improve governance of the energy sector. Sustaining financial discipline in the public budget and state enterprises, including enforcement of payments, is a vital component of economic and institutional reform. Non-payment of electricity, gas and district heat bills, an implicit form of subsidy, remains a major problem in some transition economies.

Policymakers, however, should seek to incorporate the external costs of energy production, supply and use in the prices of energy services where possible, using market-based instruments such as taxes or regulations such as limits on airborne emissions. Getting market signals right so that prices better reflect the true costs of producing and consuming energy, taking account of the environmental and social consequences, should always be a key guiding principle. In this way, the economic costs of meeting sustainable development goals will be minimised. Although it is next to impossible in practice to design policies that fully incorporate environmental externalities, significant environment improvements can still be achieved with measures that fall short of this ideal.

The removal or reduction of energy subsidies does not mean subjugating social welfare goals. Regional development, education and training, health and social welfare policies rather than subsidies should be the primary vehicles for addressing social issues, since the economic efficiency losses and environmental effects are less marked. For example, a social security system aimed at directly at the poor, the unemployed or the handicapped is a more efficient way of improving their living standards than keeping energy prices low. Similarly, it is usually better for a government to contribute directly to the cost of building or running a school or hospital than to subsidise the electricity or heating fuels needed to run them.

There may, however, be a case for subsidising *access* to energy services, where the initial costs of connecting to an energy network (electricity, gas or heat) or purchasing energy-related equipment are beyond the means of the poorest households. Subsidies for maintaining service to poor households may also be justified on practical and humanitarian grounds. This may be the case where the climate is extremely cold, where energy represents a very large share of household spending and where welfare-support schemes fail to provide adequate protection for all poor people.

Recommendations

UNECE governments should:

- *Reform energy subsidies as part of a broader process of economic and institutional reform aimed at placing more emphasis on the market, removing trade barriers and improving governance of the energy sector.*
- *Ensure that price signals reflect to the maximum possible extent the full costs and benefits of supplying and consuming different forms of energy.*

- *Favour regional development, education and training, health and social welfare policies over energy subsidies in addressing social issues.*

1. General Principles of Subsidy Reform

In most instances, governments are faced with awkward trade-offs, both between the economic, social and environmental effects of reforming subsidies and between those consumers or producers who stand to lose out and those that stand to gain. Eliminating or modifying a subsidy is clearly justified where the net effect is positive, but assessing the implications of that reform is highly judgmental and political.

How governments go about subsidising different forms of energy is all-important, regardless of their objectives. A good energy subsidy is one that enhances access to modern energy or has a positive impact on the environment, while sustaining incentives for efficient delivery and consumption. There is no single right approach or model. Every country needs to take account of national and local circumstances. These include the country's own policy objectives and priorities, its stage of economic development, market and economic conditions, the state of public finances and the institutional framework. But there are a number of basic principles that countries need to apply in designing subsidies and implementing reforms to existing programmes.

Experience shows that subsidy programmes and their reform should meet the following key criteria:

- ***Well-targeted:*** Subsidies should go only to those who are meant and deserve to receive them.
- ***Efficient:*** Subsidies should not undermine incentives for suppliers or consumers to provide or use a service efficiently.
- ***Soundly based:*** Subsidies should be justified by a thorough analysis of the associated costs and benefits.
- ***Practical:*** The amount of subsidy should be affordable and it must be possible to administer the subsidy in a low-cost way.
- ***Transparent:*** The public should be able to see how much a subsidy programme costs and who benefits from it.
- ***Limited in time:*** Subsidy programmes should have limited duration, preferably set at the outset, so that consumers and producers do not get “hooked” on the subsidies and the cost of the programme does not spiral out of control.

Each of these principles and how they should be applied in practice are considered below.

Targeting

Targeting subsidies effectively so their benefits are limited to a clearly defined targeted group should be the first consideration in reforming or designing a subsidy programme. The targeted group would normally be a certain type of producer or category of consumer; for example, the operator of a wind turbine or poor households. Subsidies that are enjoyed by all types of producers or all consumers regardless of their income or the form of energy cause major economic distortions and costs, and should, therefore, be avoided. Such subsidies would include, for example, a special low rate of sales tax applied to heating fuels, which benefits all consumers — the largest consumers most in absolute terms. Generally, it is easier to target consumer subsidies than producer subsidies, since the former is applied at the point of sale.

Targeting is, therefore, primarily an issue for consumer subsidies, which should be restricted to the poorest households and to the environmentally cleanest energy sources. The definition of poor households should not be so wide that it captures more than a small proportion of the population. And the mechanism for subsidising a particular fuel should not allow richer households to benefit from the subsidy. Where it is not practical to limit the subsidy solely to poor households, it is preferable to eliminate the subsidy and address the problem of poverty directly through social welfare policies.

Any subsidies intended to alleviate poverty should normally be limited to electricity, natural gas and district heat delivered via fixed networks. It is impractical in most cases to limit subsidies on other non-network forms of energy, such as oil products, to poor people. This is because those fuels can be freely traded. Voucher systems, for example, are expensive to administer and open to abuse, since poor people can sell them to richer consumers.

The method used to subsidise network-energy services for the poor is critical to effective targeting. Lifeline rates — special low rates aimed at small users — can be an effective way of reducing the cost of service for poor households, who spend proportionately more of their income on energy than do rich households. In general, energy consumption is strongly correlated to income level. There are various ways of applying such rates, which affect how well-targeted the subsidy is:

- A subsidy can be applied to the standing charge covering the fixed monthly cost of maintaining a connection to the network – a *capacity* subsidy. If this rate were applied only to households subscribing to the lowest capacity, for example 3 kW for electricity service, this subsidy would be largely limited to the poor. Richer households, which consume more energy, would normally subscribe to higher capacity, for which subsidised rates would not be available. There is, nonetheless, a danger of abuse, since richer households may try to obtain more than one subscription for the same address, especially if the potential savings are large.
- A subsidy can be applied to the tariff for each kWh of energy consumed – a *commodity* subsidy. If the subsidised tariff were applied only to the first, small tranche of consumption, households consuming small amounts of energy would profit most. Alternatively, a subsidised tariff can be applied to households subscribing to the lowest capacity.

However, targeting of the subsidy at the poor is far from perfect with either of these approaches. Consumption is not solely a function of income: large, poor families may consume more energy than small, rich families. Secondary residences, usually owned by the richest households, would also enjoy the subsidy.

In general, capacity subsidies are more effective at targeting poor households, but only when abuses can be kept to a minimum. Moreover, they are less likely to encourage waste. Both types of subsidies require good metering to be effective.

Producer subsidies should generally be limited to renewable energy sources that bring environmental benefits and that are already close to being competitive with conventional fuels and technologies. However, public support for research and development — a form of subsidy — may be justified for non-renewable energy sources if it can be shown that such support will promote more efficient and, therefore, less polluting energy use. Research into fossil-fuel or nuclear energy technologies aimed at enhancing a country's domestic production capacity and energy-supply security might also make sense. But research and development efforts should always be focused on those fuels and technologies that are most compatible with public policy goals and that are considered to have the best chance of becoming commercially viable within a reasonable period of time.

Efficiency

Energy-subsidy programmes should always be designed in a way that does not undermine incentives for consumers to use energy efficiently or for producers and suppliers to provide a service efficiently.

In the case of consumer subsidies, both the size and the subsidy mechanism affect how efficiently energy is used. The larger the subsidy on electricity, for example, the less incentive consumers will have to conserve electricity and to use it efficiently. They will be less inclined to buy efficient appliances and to take advantage of time-of-day tariff differences that reflect the higher cost to the utility of providing supply at times of peak demand. The way in which an energy service is subsidised will also affect its marginal cost to the consumer and, therefore, the incentive to use the service efficiently. In general, commodity subsidies are more likely to discourage the efficient use of energy than capacity subsidies.

Consumer subsidies in the form of government controls that keep prices below the full cost of supply or allow consumers to avoid paying their energy bills should not be allowed to penalise financially the energy-service provider. Such subsidies, if they cause the company to lose money, will undermine its ability to maintain a reliable service and upgrade and expand the network to meet demand. They will also discourage new investors from entering the industry. Cross-subsidies that involve above-cost tariffs for some larger consumers to compensate for subsidised tariffs for households should be avoided, since they can undermine the international competitiveness of industrial and commercial firms. Ideally, subsidised capacity and commodity tariffs for small consumers should be financed out of public funds. Such an approach minimises economic distortions and protects the financial performance of service providers.

The issue of whether to subsidise capacity or output also applies to producer subsidies aimed at encouraging output of a particular fuel. The right approach will depend on the type of fuel or technology. For certain types of renewable energy sources, such as wind power and solar photovoltaics, subsidies on the installation of capacity may provide a stronger incentive to investors than subsidies on each unit of energy produced, because of the high initial cost of capital. But capacity subsidies may not encourage construction of the most efficient technologies. Moreover, they do not always ensure that the systems, once installed, are run optimally. Fixed, subsidised commodity tariffs for renewables-based power give a stronger incentive to invest in the most efficient technologies, since the amount of subsidy a producer receives depends on output. In practice, some combination of capacity and commodity subsidies may be the best approach.

Rationale

Because subsidies can result in serious market distortions and adverse environmental, social and economic effects, it is essential that any decision to introduce or retain a subsidy be soundly based. Too often, a subsidy is introduced to support a specific social or environmental goal, without serious analysis of all the consequences. It is incumbent on the authorities to present a convincing case for the subsidy based on a thorough and coherent analysis of *all* the associated economic, social and environmental costs and benefits. The burden of proof should be on demonstrating the net benefits of both new and existing subsidies. Since market conditions and policy objectives change over time, this type of exercise must be carried out on a regular basis to ensure that the case for maintaining a subsidy remains valid.

Carrying out this type of analysis requires reliable data, including market assessments and customer surveys, and effective analytical capacity. Where that capacity is lacking, governments must develop training and education programmes and make use of external expertise, either from

international organisations or consultants. As a rule, where it is not possible to assess properly the full implications of a subsidy because of a lack of data or expertise, it is best not to subsidise at all.

Practicality

Even when there are strong theoretical arguments for an energy subsidy, practical considerations related to the financial costs of providing the subsidy may undermine the case for it. These costs comprise two elements:

- The cost of the subsidy itself. This might involve:
 - a direct financial transfer to energy producers or consumers in the form of grants;
 - the loss of income to a state-owned utility;
 - the loss of tax revenue to the national treasury, where a fuel enjoys a lower rate of tax; or
 - the cost of a publicly funded research programme.
- The cost of administering the subsidy scheme, including the cost of preventing and dealing with cheating and abuse. Subsidy programmes involving cash payments to producers or consumers are notoriously expensive to administer, since the authorities need to verify that each recipient is entitled to the money. Cheating can be commonplace and difficult to prevent.

The overall cost of a subsidy scheme should never be allowed to become a serious burden on the national finances. One way of avoiding this is to place financial limits on on-budget subsidy schemes. If the cost of administering a subsidy scheme accounts for a large share of the scheme's total cost, then the subsidy is unlikely to bring any net benefit. In that case, it should be eliminated.

Transparency

Transparency in both energy-subsidy policies and the way subsidy programmes work is essential to good governance. The goals of a particular subsidy policy, how they are targeted, the associated financial costs, the channels through which financial transfers are made and assessments of their economic, environmental and equity implications should always be made fully transparent. Reporting this information to parliament and publishing it on a regular basis would help to prevent abuse. They would also enable the authorities and the public to monitor the cost of the programme. Making all these elements more transparent also increases the political costs of irresponsible policies and rewards responsible action by policymakers. Hidden subsidies are the hardest to reform.

Any subsidies that are retained should generally be kept on-budget, to make them more visible and easier to monitor. On-budget costs should be properly accounted for and the results made available for public scrutiny.

Duration

All subsidy programmes should be subject to regular review. In most cases, it is preferable to establish a time limit or a "sunset clause" for ending the programme, especially in the case of a new subsidy. This ensures that producers and consumers do not get permanently "hooked" on the

subsidy and forces policymakers to actively question the need to continue a programme after a certain time. Many subsidy programmes continue long after the rationale for them has disappeared because of political inertia and vested interests. It can also prevent the financial cost of the programme from spiralling out of control. Ideally, temporary subsidies should be linked to clearly defined targets, such as the penetration of a particular fuel or cost reductions. Such subsidies would normally be phased out in a gradual way to ease the adjustment of the market.

A sunset clause is particularly appropriate where the purpose of the subsidy is to address a specific market-entry barrier, such as the high initial cost of a new technology. Once a technology or a distribution network is established and economic, the subsidy would normally no longer be needed.

Recommendations

UNECE governments should:

- *Target subsidies, where they are justified, at clearly defined groups and technologies, and devise mechanisms that ensure that the benefits of those subsidies go only to those targeted categories.*
- *Design subsidy schemes so that they do not undermine incentives for producers and suppliers to provide a service efficiently or for consumers to use energy efficiently, and do not harm the financial health of energy-service providers.*
- *Carry out a thorough and coherent analysis of all the economic, social and environmental costs and benefits associated with existing or planned subsidy schemes to ensure that the case for them is valid. Where it is not possible to assess properly the full implications of a given subsidy, eliminate it.*
- *Prevent the cost of energy-subsidy schemes from becoming a serious burden on the national finances, and abandon any schemes that involve excessive administration costs.*
- *Ensure that the financial costs and the channels through which financial transfers are made are fully transparent, and communicate that information to the public.*
- *Place a time limit on the duration of energy-subsidy programmes.*
- *Remove any subsidies that fail to achieve demonstrable net environmental or social benefits.*

2. Implementation of Reform

Reforming energy subsidies must take account of practical barriers to reform. The biggest barrier is usually resistance from those groups that benefit from the subsidy and politicians who champion their cause. By its very nature, the costs of an energy subsidy are usually spread throughout the economy, while its benefits are usually enjoyed by only a small segment of the population — not necessarily the targeted group. Those beneficiaries will always have an interest in defending that subsidy when their gains exceed their share of the economic or environmental costs. Subsidies are as popular in practice as they are unpopular in theory.

The majority of the population, who bear the net cost of the subsidy, are typically less inclined to support political action to remove the subsidy, since the cost is likely to be much smaller in per capita terms than the benefit to the recipients. Furthermore, it can be difficult to demonstrate the economic cost of subsidy in terms that the public can understand. Those that want to keep a

subsidy often find it much easier to provide concrete examples of their social benefits, such as the number of jobs supported or the financial savings to poor people. Benefits that involve primarily indirect gains in economic efficiency are abstract and difficult to demonstrate to the public. Where the environmental benefits are global, such as reduced greenhouse-gas emissions, the public may not care much, especially where poverty is widespread.

For these reasons, it can be very hard for policy makers to remove subsidies once they have been introduced. Resistance to reform tends to be particularly acute in the economies in transition. In these countries, the general public often still considers energy to be a basic social good, like food and housing, the pricing of which should not be left solely to market forces.

Resistance to reform makes it especially important for policy makers to be extremely cautious in devising new subsidies. As a rule, a new subsidy should only be introduced if the immediate net benefits are demonstratively large and likely to persist for a long time.

Reforming existing energy subsidies requires strong political will to take tough decisions that benefit society as a whole. The following approaches can help policymakers to overcome resistance:

- Reforms may need to be implemented in a phased manner to soften the financial pain of those who stand to lose out and give them time to adapt. This is likely to be the case where removing a subsidy has major economic and social consequences. Phased reform could start with local experiments, which can be rolled out nationally as lessons are learned. Phasing in reforms can help build public support and momentum for carrying reforms forward. The pace of reform, however, should not be so slow that delaying its full implementation involves excessive costs.
- If reforming an energy subsidy reduces the purchasing power of a specific social group, the authorities can introduce compensating measures that support their real incomes in more direct and effective ways. That goal may be considered socially desirable. It may also be the price that has to be paid to achieve public and political support for removing or reducing the subsidy.
- Politicians need to communicate clearly to the general public the overall benefits of subsidy reform to the economy and to society as a whole to counter political inertia and opposition. In most UNECE countries, the public is becoming familiar with the environmental advantages of renewables and natural gas over coal, making it harder for politicians to maintain support to ailing coal industries.

The problem of non-payment of energy bills must be dealt with vigorously. It is vital that energy-service providers (public and private) be permitted to cut off service to non-paying customers — except under exceptional circumstances. Customers should, nonetheless, be given sufficient time and flexibility in making good their debts. The ultimate threat of the energy service being withdrawn is essential to give customers an incentive to pay their bills on time.

UNECE governments can seek support from multilateral lending institutions and other international organisations in devising and implementing addressing energy-subsidy reforms. Countries trying to cut subsidies may find it politically safer to have their hands tied by an external commitment, such as an international trade agreement or a formal condition for obtaining a loan. Governments may also gain access to advice and expertise on subsidy reform and broader aspects of energy-policy making.

Recommendations

UNECE governments should:

- *Implement reforms in a phased manner, especially where the economic and social consequences are profound, to soften the financial pain of those who stand to lose out and give them time to adapt.*
- *Consider introducing compensating measures that support the incomes of households in more direct and effective ways.*
- *Communicate clearly to the general public the overall benefits of subsidy reform to the economy and to society as a whole.*
- *Permit energy-service providers (public and private) to cut off service to non-paying customers, except under exceptional circumstances.*