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**GUIDELINES ON REFORMING ENERGY PRICING AND
SUBSIDIES**

Addendum

EXPLANATORY NOTES

submitted by

the UNECE Committees on Environmental Policy and on Sustainable Energy
through the Ad Hoc Working Group of Senior Officials



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Addendum

EXPLANATORY NOTES

**I. EXPLANATORY NOTES TO THE GUIDELINES ON REFORMING ENERGY PRICING
IN COUNTRIES IN TRANSITION**

1. Objectives

The primary goal of energy pricing reform should be to create a well-functioning competitive market, aimed at increasing economic efficiency and improving the quality of energy services. It should fully take into account the economic, environmental and social concerns of governments and society, in promoting the sustainable production, transmission and use of energy.

Energy sector reform should be part of a broader process of macroeconomic restructuring. Key elements include:

- Commercializing energy commodities and services.
- Unbundling vertically integrated monopolies.
- Liberalizing the energy sector by introducing wholesale and retail competition.
- Promoting best practices in managing public and private energy companies.
- Improving the environmental performance of the energy sector.

The general public should be informed about the benefits of energy-sector reform and market-based pricing, notably the resulting gains in economic efficiency and GDP growth, the more efficient use of energy consumption and lower emissions of CO₂ and pollutants.

Making the energy sector profitable and attracting domestic and foreign investment should be a primary policy objective.

2. Approach

2.1 *General Principles of Tariff Regulation*

The prices of energy products and services, with the exception of petroleum products, are usually set by some kind of a State body in countries in transition. Two major principles need to be taken into account in regulating energy prices:

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

For the efficiency of the energy sector and the entire economy the most important factor is that prices reflect long-run marginal costs (LRMC).¹ Certain subsidies, however, may be acceptable (see chapter II of this paper): in principle, any subsidy can be justified if the gain in social welfare and environmental improvement that it brings exceeds the net economic cost.

2.2 *Removing Price Distortions*

The prices of network-energy services (electricity, gas and heat) - particularly to households - in countries in transition are often far below average EU prices, and LRMC.

Studies show that household prices are well below LRMC, often by as much as 90%, in almost all economies in transition. Moreover, the ratio of industrial to household prices does not correspond to that observed in developed market economies. Industrial power tariffs are often

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.

relatively high as a result of cross-subsidies. The difference between prices and LRMC is covered by subsidies. The long-term objective should be to bring prices to different customer categories into line with LRMC.

2.3 *Encouraging Efficient Consumption*

The correct energy prices provide market signals that motivate consumers to use energy efficiently. In non-energy-intensive sectors, where energy costs do not exceed 2-5% of total operating costs, it is nonetheless important for companies to exploit opportunities to use energy more efficiently when the rate of return on investments in energy-efficient technologies is acceptable. Generally, such investments require a payback of no more than five years. Rational energy use is even more important in energy-intensive sectors, iron and steel, glass, non-metallic minerals and heavy chemicals, where energy costs can account for as much as 40% of total operating costs.

The importance of efficient residential energy use is increased by the fact that this sector accounts for a large proportion of final consumption. Under-pricing has discouraged energy-efficiency improvements up to now. Raising prices in the residential sector would boost interest in using energy more efficiently. In addition, it is important that technical solutions be made available to help people save energy if they wish to, including:

- Installation of meters and heating controls in individual housing units.
- Individual billing.
- Subsidies for family houses and multi-dwelling houses to finance investments in energy efficiency, such as cheap loans and tax concessions.

2.4 *Attracting Investments into Energy Sector*

The use of energy by energy industry itself in countries in transition represents on average 30% and 40% of total primary energy supply. Because of low energy prices and non-payment of bills, energy producers and distributors often make commercial losses. This means that the necessary maintenance, investment and modernization do not take place.

Price reform would allow the sector to become profitable, which would attract 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, energy companies could make good the lack of investment in the past. Energy price reform and liberalization of the energy industry would help improve the efficiency of energy production and supply.

3. *Price Signals to Consumers*

The population should be informed of plans to reform energy prices in a timely and effective manner. It is a major exercise to communicate to the population and to make it understand why the

reform is necessary and beneficial for society and the economy as a whole. It should be explained that price reform is a key element of moves to promote sustainable development, protect the environment and raise people's standard of living.

The population needs to understand that the price of all products, including energy, should reflect production and distribution costs as well as a reasonable profit to cover the cost of capital. The population should be made to accept that energy is a commodity just like any other. It can be particularly difficult for people to accept this principle in some countries of Eastern Europe, the Caucasus and Central Asia where the majority of consumers have become used to not paying their energy bills.

The population should also be persuaded that prices reflect only those costs that are related to the supply of the energy service in question and that the relevant costs are as low as possible. It should also be made clear to people that prices will be raised gradually and that the most vulnerable segments of the population who could lose out from the transition will be protected.

4. Transparency of Pricing

In countries in transition, end-user prices are often subsidized. Producer-side subsidies are also common. Within large, vertically integrated energy utilities, cross-financing between the different functions along the supply chain – production, transport and distribution – is widespread. Where import prices are volatile, prices changes are often passed on to consumers by the regulatory body in an arbitrary manner. This lack of transparency, which hinders efforts to improve the efficiency of energy pricing and remove subsidies, is a pressing issue in many countries in transition.

In vertically integrated network industries, unbundling of the accounts and management of the different parts of the supply chain would reveal cross-subsidies and make it easier to remove them. At the same time the regulatory body responsible for pricing should take care that the logic behind pricing and the frequency and timing of price changes are widely known and understood. Predictability of prices is necessary to make it easier for utilities and consumers to plan ahead.

5. Pricing Methodologies

In almost all countries in transition, the regulatory authorities responsible for pricing network-based energy services do so in an arbitrary manner, based on broader economic considerations, such as protecting activities like mining, maintaining employment and reducing imports, and social considerations, such as supporting the incomes of poor households. The most important initial step in reforming energy pricing is to move away from an approach based on the ability-to-pay philosophy towards one based on the cost of service. The ultimate objective should be to move towards market-based pricing based on competitive services in generation and supply. The pricing of the natural monopoly elements, including transmission and distribution, would, however, normally remain regulated.

Normally there are four main cost elements in the price structure for electricity and gas:

- A one-off payment for connection to the grid.
- A standing or fixed charge (usually monthly), not related to the amount of the commodity consumed. This charge covers costs such as metering, billing and capacity.
- A usage cost related to the amount of energy consumed, to cover the production of the commodity itself and the variable costs of delivering it to the end-user.
- A capacity charge, which is intended to cover the cost of building and maintaining capacity regardless of the extent to which that capacity is issued.

Other charges, such as environmental taxes, excise and value-added taxes, regulatory charges, costs of compliance with economic and energy policy requirements, would be added the above charges in the bill to consumers.

Regulators can use different approaches to setting the average price that utilities are allowed to charge their customers:

- Rate-of-return regulation.
- Price-cap regulation.
- Revenue-cap regulation.
- Performance-based regulation.

With rate-of-return regulation, profits are guaranteed and prices are predictable and transparent, but there are limited incentives to reduce costs. The other types of price control are known as incentive-based regulatory approaches. Producers have incentives to minimize costs. But there is a risk of windfall profits and the quality of service can suffer.

Whatever the chosen approach, prices should normally reflect the LRMC of energy production, transport and distribution, including a fair return on investment. In determining the LRMC, the exact cost of all elements of energy supply needs to be calculated for the various consumer categories taking account of differences in load characteristics. The introduction of cost-based tariffs should be seen as a transitional move. In the long run, the goal should be to move to market-based pricing through the introduction of competition in the wholesale and retail supply. In this way, the free market would determine the price of the energy commodity, with the price being free to rise and fall in response to scarcities and surpluses. Market mechanisms provide a system of price adjustments to signal where resources are required and where they are not. The same mechanisms also promote the deployment of the most economically efficient energy technologies.

6. Methods for Allocating Costs

Utilities' costs, including operation and maintenance, administration, depreciation, tax and interest charges, can be grouped according to the various functions of energy supply; namely, production, storage (in case of gas), transmission, distribution and overheads.

In practice, these costs have to be allocated to different customer categories, to different types of service (for example, firm and interruptible) and to different types of charges, as described in section 5 above.

Energy costs reflect the volume of consumed energy. Capacity costs can be calculated for each customer category through detailed analysis of system loads, taking into account how certain customers influence such costs. Determining which customers account most for peak load is particularly important.

7. Types and Structure of Rates

Consumers enter into various classes of contracts with utilities for different types of energy service. The main types of regulated tariffs are as follows:

- *Firm customer tariff system.* The majority of customers opt for firm supply. These customers have a long-term relationship with the utility, cannot be switched to alternative fuel and require a continuously available service. They include households and most commercial businesses. They generally pay a fixed charge and an energy charge according to metered consumption. Flat rates are also quite frequently used where the energy charge is independent of actual consumption, usually where the service is un-metered. The amount of capacity charge is a controversial issue in the case of such customers.
- *Lifeline tariffs.* In many countries, lifeline tariffs are used for household consumers. Its objective is to meet the basic energy needs of the poorest customers at an affordable, subsidized price. The price subsidy is restricted to the initial (one or two) block(s) of consumption.
- *Interruptible tariffs.* 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 by switching to an alternative back-up fuel. In return, interruptible customers benefit from a discount on the firm tariff. Some household customers use interruptible service for off-peak water or space heating.
- *Seasonal tariffs.* These are used where consumption varies markedly with the seasons, usually for space heating. A distinction is normally made between peak and off-peak periods for commodity charges to reflect the higher cost of meeting demand at peak.
- *Public lighting tariff.:* In some cases, a separate tariff may be applied for this type of use.
- *Incentive tariffs.* These may be used where the utility wishes to encourage or discourage consumption during certain periods

In many cases, regulated tariffs contain various price subsidies to meet social objectives. In assessing the justification for these subsidies, the following considerations should be taken into account:

- The extent to which the poor benefit from the subsidies (coverage)
- The share of the subsidy that goes to the poor (targeting)
- Market distortions caused by the subsidy
- Administration costs.

Other issues also need to be considered, such as the extent to which revenues are collected in cash, how much consumption is not billed and un-metered consumption. Raising tariffs towards LRMC requires these issues to be resolved.

8. Frequency of Price Adjustments

Regulated energy prices should be adjusted in a timely and predictable manner. The adjustment may occur at certain predetermined periods, e.g. annual review, or may be linked to some other event. Changes in price would normally be based on the changes in several economic indicators, for instance, import prices, the rate of inflation and the exchange rate. The price-adjustment formula may also include a revenue or productivity improvement-related element.

9. Support Mechanisms for the Poor

Reform of energy pricing should be accompanied by measures to compensate households for the loss of income that would normally entail. At present, there is no standard approach to dealing with this issue in the countries in transition. Income-support mechanisms must be developed taking into account local characteristics, including income levels and the extent of the household-price increase brought about by reform. Key issues that policy makers must address include establishing criteria for determining eligibility for support and the mechanism for providing that support.

9.1 Criteria for Eligibility for Support

The poorest consumers would normally be eligible to receive support following the price reform. Identifying those customers is not always easy because of incomplete household statistics on poverty and energy consumption. Human passivity, health conditions, cultural reasons and pride which can discourage poor people from applying for subsidies, can also prevent support from being directed to targeted households.

The group of eligible consumers can be determined based on earlier applications for aid, voluntary application and affordability criteria. Affordability may be defined based on income per capita. Another approach is to use the share of spending on energy in total household income. If this share exceeds a given level, the so-called fuel-poverty level (for example, 15%), the household would be eligible to receive support. In some countries, eligibility is linked to the energy

consumption of the household. In this case, eligibility would be determined by a threshold: in kWh/year for electricity or m³/year for gas.

9.2 *Evaluating Support Mechanisms*

In deciding on the most appropriate support mechanism, policy makers must try to achieve five key objectives:

- The mechanism should cover all eligible poor people.
- It should reach only those consumers who need it and not those who can afford to pay full cost prices.
- It should minimize the cost to the government or utility.
- It should be fair and cost-effective.
- It should minimize distortions.

None of the support mechanisms currently in use in countries in transition fully satisfies the above criteria. Across-the-board subsidies, whereby all residential consumers are subsidized, should always be avoided because of bad targeting. Supply-side subsidies should also be avoided for the same reasons. The following solutions are more acceptable:

- Life line tariffs with two or three fixed or floating blocks with subsidized tariffs. But they can be implemented only when consumption is properly metered.
- Targeted subsidies in the form of grants related to measures of affordability. The metering of the households' energy consumption and reliable information on household incomes are necessary for this approach to work effectively.
- Direct income support.
- Support for energy-saving investments for poor households.
- Combinations of the above systems.

10. Regulatory Framework

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

- Setting prices in areas where a free market does not operate. Regulation should cover wholesale prices, retail prices for captive customers (where there is no supply competition) and the network access charges.
- Licensing of energy production/generation, transmission, storage and distribution.
- Protection of consumers' interests.

- Other activities, such as developing standards for environmental protection and safety, promoting energy efficiency, etc. and monitoring the behaviour of market participants and industry performance.

The authority should be independent of day-to-day political interference and should ensure equal conditions and non-discrimination of all sector participants. It should be given responsibility for encouraging competition and ensuring the financial viability of industry participants.

II. EXPLANATORY NOTES TO THE GUIDELINES ON REFORMING ENERGY SUBSIDIES

1. Definitions and Scope

No consensus definition of energy subsidy exists, complicating any 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 and 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 internalize 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 on 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.

2. 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 counterproductive 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 underpricing or even zero-pricing (in the case of unmetred supplies or non-collection of bills) is a common problem in some economies in transition. 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.

Subsidies to fossil fuels undermine the competitiveness of renewables and investments in energy efficiency.

To the extent that they reduce returns on investment and cash flows, they can undermine private and public investment in the energy sector. As a result, they can impede the expansion of energy services as well as 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 subsidized 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 minimize the harmful effects while maximizing 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 rationalized 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, policy-makers 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 economies in transition. 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

reorganizing 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 reorganizing 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 economies in transition.

Policy makers, 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 minimized. Although it is next to impossible in practice to design policies that fully incorporate environmental externalities, significant environment improvements can be 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 directly at the poor, the unemployed or the disabled 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 subsidize the electricity or heating fuels needed to run them.

There may, however, be a case for subsidizing 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.

3. 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. But, in many cases, removing or reforming energy in combination with other policy measures, such as those aimed at rationalizing the tax system, could bring important net overall economic and environmental benefits. Governments should place priority on removing or at least reducing the size of those subsidies that are clearly harmful to the environment as well as being economically costly. Subsidy removal, in this case, would be a win-win policy reform. Many subsidies that encourage fossil-fuel consumption fall into this category.

There may nonetheless be a good case for retaining subsidies in specific instances, especially where they are aimed at encouraging more sustainable energy use. Examples might include temporary support for new renewable and energy-efficient technologies to overcome market barriers, and measures to improve poor or rural households' access to modern, commercial forms of energy. But the way in which a subsidy is applied is critical to how effective it is in meeting policy objectives and its cost.

There is no single right approach or model to designing or reforming subsidy policies. 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.

3.1 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 subsidizing 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 subsidize 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 subsidized 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 subsidized tariff were applied only to the first, small tranche of consumption, households consuming small amounts of energy would profit most. Alternatively, a subsidized 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 other 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.

3.2 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 subsidized 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 penalize 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 subsidized tariffs for households should be avoided, since they can undermine the international competitiveness of industrial and commercial firms. Ideally, subsidized capacity and commodity tariffs for small consumers should be financed out of public funds. Such an approach minimizes economic distortions and protects the financial performance of service providers.

The issue of whether to subsidize 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 the construction of the most efficient technologies. Moreover, they do not always ensure that the systems, once installed, are run optimally. Fixed, subsidized 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.

3.3 *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 should 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 organizations 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 subsidize at all.

3.4 *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.

3.5 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 policy makers. 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.

3.6 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 policy makers 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.

4. 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 inhabitants, 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 a 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 strong 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 be introduced only 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. In general, politicians tend to be more willing to tackle difficult subsidy issues immediately after elections in the hope that opposition to reform will have diminished by the time new elections come around.

The following approaches can help policy makers 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, but with due regard to the welfare of poor households. It is vital that energy-service providers (public and private) should 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. Service providers should first deploy all possible means for settling accounts by non-paying customers, including financial charges and fines, before resorting to cutting off supplies. 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 organizations in devising and implementing 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.