

Chapter 4

Investment in Support of Energy Efficiency

Ukraine faces specific challenges in attracting energy investment required to reduce its currently high energy intensity, increase its energy production and upgrade its deteriorating energy infrastructure. Energy efficiency efforts and investment have been hampered by distortions in energy price setting and by an energy market structure dominated by state-owned firms. The June 2010 economic reform programme addresses these critical issues and sets objectives for accelerating privatisation in the energy sector and for gradually adjusting energy prices to the market level. Ukraine has developed a basic policy framework in support of environmentally friendly energy resources and technologies, but in the absence of energy price reforms the incentives for such investment have been limited.

Overview¹

Ukraine is an important energy producer with significant reserves of coal and gas. Energy imports nevertheless cover almost half of the country's energy consumption owing mainly to high energy intensity. Ukraine uses around 2.5 times more energy per unit of GDP calculated in purchasing power parity (PPP) terms than the average in OECD countries. Energy efficiency efforts and investments have been hampered by distortions in energy price setting and the energy market structure. Most energy sub-sectors remain state-owned and energy prices are regulated with price levels below production costs and subject to cross-subsidisation within various sub-sectors and among different categories of consumers (Section 1).

Available estimates of future investments required to enhance energy efficiency, increase energy production and upgrade energy infrastructure vary depending on the sources and the underlying energy policy priorities, but all reach considerable amounts. As the state budget will be unable to cover more than 15% of future energy investments, there is an urgent need to find other sources of financing. Whereas some financing might be available from international organisations such as the World Bank and the EBRD, the main source has to be private investment, both domestic and foreign, or in the form of private-public partnership arrangements (Section 2).

To attract investments into the energy sector, Ukraine has to pursue price and market liberalisation in the sector. The June 2010 government economic reform programme addresses most critical issues, setting the objectives to accelerate the privatisation process in the energy sector and adjust gradually energy prices. Ukraine's international commitments and co-operation can help the country to accelerate its energy reform and allow it to mobilise required energy investments, including from external sources (Section 3).

Although for the near future energy efficiency remains the main focus of energy policy, development of renewable energy resources should not be underestimated, in particular when synergies between energy efficiency and environment-friendly energy production/technologies exist for example in the case of heat production based on biomass and wastes. Ukraine has developed the basic policy framework in support of environmentally-friendly energy resources and technologies, but in the absence of energy price reforms the incentive for such investments has been limited. The country's difficult budgetary position means that among available policy instruments green

taxes have to be privileged over costly green subsidies. To promote development of environmentally-friendly energy production and technologies, the government has a key role to play in promoting public awareness and corporate initiatives aimed at improving the measurement and reporting of environment performance which are still less common in Ukraine than in other emerging economies. Foreign investment and international assistance could be a potential source of “greening” effects, both directly through transfers of more energy-efficient and environment-friendly technologies and indirectly by facilitating spillovers to domestic firms through best practices in environment-friendly productions, technologies and management (Section 4).

1. Energy profile of Ukraine

Energy production and consumption

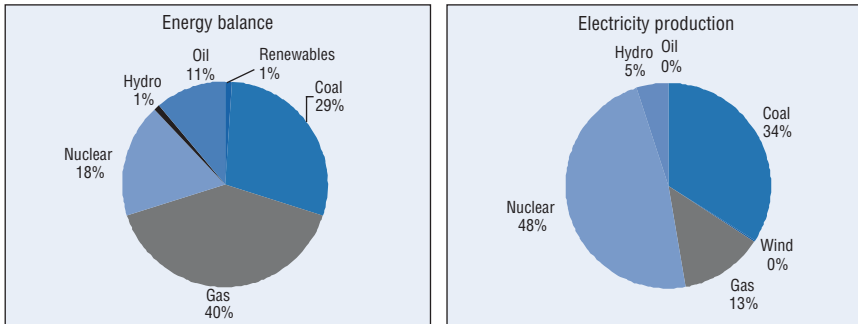
The energy sector represents a significant part of the Ukrainian economy, accounting for some 8% of GDP, 25% of industrial output and some 12% of total investment in fixed assets.² It contributes to a large extent to foreign trade earnings as more than half of export revenues are generated by energy-intensive products, especially ferrous metallurgy and chemicals. These export-oriented sectors have also attracted an important share of FDI (20% of the FDI stock). By ensuring transit of natural gas from Russia to Europe, Ukraine also plays a strategic role in international energy relations.

Ukraine produces significant quantities of coal and natural gas and has substantial reserves of both commodities. Its total primary energy supply (TPES) is dominated by four energy resources: natural gas represents 41%, followed by coal (29%), nuclear energy (18%) and oil (11%). Electricity production comes mainly from nuclear power plants (48%), followed by coal power generation (34%) (Figure 4.1). Heating depends almost exclusively on gas.

Situation in energy sub-sectors

Despite some efforts to exploit further its oil reserves, Ukraine’s annual crude oil production stagnated at some 3 million tonnes and covers currently some 20% of its domestic needs. Following the upward trend in domestic oil consumption, the country’s import dependence on oil deliveries mostly from Russia and Kazakhstan has increased. Oil and gas exploration and production are dominated by the state-owned *Naftogaz*. Prospective fields situated in the Carpathian basin and offshore in the Black Sea-Azov Sea will be more difficult to explore than the existing sites (e.g. in Dnipro-Donetsk) and will require deploying more advanced technologies.

Figure 4.1. **Total Primary Energy Supply (TPES) mix and electricity mix in Ukraine (2008)**



Source : IEA, Statistics by country.

The oil refining sector is dominated by six privately-owned refineries with total annual processing capacity of some 50 million tonnes. The sector needs significant investments to replace outdated equipment to improve its productivity and quality of products, which do not correspond to domestic demand for higher quality oil products currently covered to a large extent (more than 40% in 2010) by imports.

Gas production has been flat since mid-1990s stabilising at around 20 billion cubic meters (bcm), covering some 25% of domestic requirements, almost all produced by the state-owned company *Naftogaz*. With consumption fluctuating at above three times domestic output, the resulting gap has been met by imports from Russia and Turkmenistan. According to the Ukrainian State Agency for Energy Efficiency and Energy Savings (replacing the former National Agency for Ensuring Efficient Use of Energy Resources – NAER), domestic gas production could be increased up to 60% of domestic demand. Ukraine possesses large gas storage capacities.

Ukraine's proven coal reserves (34 billion tonnes) are the sixth largest in the world. After a significant decline in the early 1990s, total coal output has stabilised at around 60 Mt, which covers almost all domestic consumption (65 Mt/year).³ State-owned mines provide 57% of total output, but the most effective mines are private and owned by large vertically-integrated enterprises that have built their production chains starting from coal extraction to electric power generation and distribution. Most of domestic coal production, which is hard to extract and generally of poor quality, is sold at a loss to the steel industry enabling it to be profitable. With a workforce of some 500 000 people, the coal sector remains one of the largest employers in the country. A lack of investment is the main reason for poor safety record of Ukraine's coal mines, confirmed by the highest incidence of fatalities in the world after China.

Ukraine inherited a large electricity generation capacity from the Soviet period, with installed capacity of around 54 GW. Domestic electricity demand strongly contracted in the 1990s and started to recover only after 2002. The overall output capacity has thus remained sufficient for the needs of the Ukrainian economy and allowed the country to be a net exporter of electricity to neighbouring countries. The country compares relatively well in terms of access to power infrastructure relative to other Eastern European countries.⁴ The excess capacity has nevertheless hindered investments during the past two decades entailing the deterioration of existing facilities and decreasing efficiency in generation, transmission and distribution infrastructures.

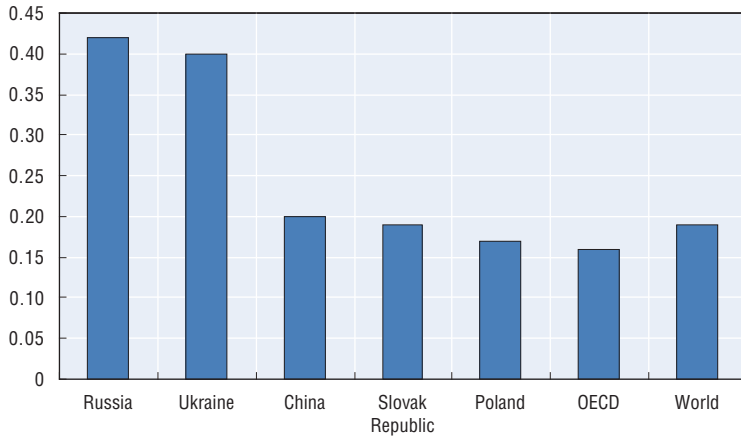
Electricity produced from renewable resources has not played an important role so far. In 2010, installed capacity of renewable power plants (not taking into account large hydropower plants) reached 14.12 MW. By the end of 2010, installed wind power capacity was significantly lower than in neighbouring countries such as Romania, Hungary or Poland (European Wind Energy Association, 2011). The production of biomass has just started to develop. The experience of other countries suggests that after having attaining a certain technological level, wind production capacities may increase rapidly though the intermittence of wind power requires adapting the electricity grid. Several wind power projects are currently under preparation, notably by the largest private vertically integrated energy holding DTEK, part of the financial and industrial group System Capital Management, which plans to invest EUR 1.85 billion in the construction of two wind farms in the Zaporizhia and Donetsk regions. Despite Ukraine's significant potential in producing biomass and biofuel, the exploitation of these sources is only in its initial stage with one of the first bio gas plant with the generating capacity of 2.5 MW being launched in 2010 in the Cherkasy region.

Energy-intensity

Ukraine is one of the most energy-intensive economies in the industrialised world. Its ratio of total primary energy supply to GDP is more than ten times higher than the OECD average and also significantly higher than the average of the former Soviet Union countries.⁵ The gap is less striking when GDP is calculated in purchasing power parity (PPP) terms, but even then Ukraine uses around 2.5 times more energy per unit of GDP than the OECD average (Figure 4.2). As in most other countries, industry and transport are the main energy users but, compared to the OECD economies, Ukraine's industry has a higher share in total final energy consumption (41%), whereas transport accounts only for 15%.⁶

The country's high energy consumption in industry is mainly due to its energy-intensive and export-oriented sectors, especially metallurgy and chemicals, which often use energy-inefficient technologies imposing large

Figure 4.2. **Energy intensity in Ukraine and selected countries in tonnes of oil equivalent per thousand USD of value added (at PPP exchange rate)**



Source : IEA (2010a).

energy losses. For instance, smelting one tonne of steel in outdated open-heart furnaces consumes almost four times more energy in Ukraine than in EU countries or China (National Agency on Efficient Energy Use, 2009). Glassmaking and sugar production require roughly twice as much energy input per unit of final product in Ukraine as the EU average. The country's annual energy consumption is strongly correlated with the fluctuations in domestic and especially external demand for industrial products. In 2009, a 50% contraction in Ukraine's exports of basic metals and chemicals triggered a 9% drop in electricity demand then a strong rebound in the early 2010 following the resumption of exports.

Ukraine's high energy consumption suggests that an energy strategy should prioritise energy savings and improvements in energy efficiency rather than seeking to develop at any costs domestic energy production. There is a large potential for energy efficiency gains in all economic sectors, especially in industry but also in power generation and distribution, household consumption, transport and agriculture. District heating also represents a considerable opportunity for energy savings requiring probably comparatively less significant investments than in other areas.

Role of the state

Following delays in the privatisation process, the state continues to play a key role in most energy sub-sectors (Table 4.1). The predominant state ownership, often associated with vertically-integrated monopolies, means that competitive pressures are very limited in the energy sector, especially in

the gas sector where the state-owned monopoly (*Naftogaz*) is present at all stages of the gas value chain (Box 4.1).

The difficulties of privatisation can be illustrated by the example of the coal sector. In 2008, a Presidential Decree stopped the privatisation of the energy enterprises until the adoption of the energy sector development programme. However, a new draft privatisation programme prepared by the Ministry of Coal Industry⁷ was also rejected. Finally, a list of 99 coal mines to be privatised was approved in April 2009, but so far no privatisation has actually been carried out, partly also because most of state-owned mines are not profitable.

In the electricity sector, the privatisation process has also faced many problems. In early 2008, the government announced the plan to sell 25% of equity in six electricity distribution companies (*oblenergos*). The privatisation programme included a number of obligations for potential investors such as improving power plants' effectiveness, reducing emissions and participating financially in future integration of the Ukrainian power system within the EU network. The first auction of the 25% stake in "*Poltavaoblenergo*" scheduled for April 2008 was cancelled after the minority shareholders blocked the process through a court decision, which stopped the whole privatisation programme. A new plan to sell 25% to 60% of the shares in a number *oblenergos* was announced in August 2009 specifying a series of obligations for investors, notably upgrading production facilities, implementing the EU integration requirements and nominating the representative of the state on the supervisory board of companies with a blocking stake of 25% of shares plus one share. Several sales were realised in 2009 and 2010, notably of *Lvivoblenergo*, *Cernihivoblenergo* and *Poltavaoblenergo*. The 2011 programme proposes for sale shares in four companies, including in *Dniproenergo* (25% minus one share), *Zakhidenergo* (45% minus one share), *Centrenergo* (53.3% minus one share) and *Donbasenergo* (60.8% minus one share). Subsequently, the sale of a further 19 *oblenergos* is foreseen with the shares proposed for sale amounting to up to 75% in some companies.

The dominance of public ownership has generated various forms of state support, particularly in the coal sector often depending on the lobbying power of individual enterprises. In January 2009, the Cabinet of Ministers established a list of 27 state-owned mining enterprises which have been granted access to electricity at a price 25% below that paid by other enterprises. In April 2009, in response to the economic crisis that drastically reduced demand for coal from the power generation sector, the Cabinet of Ministers obliged state-owned electricity generation companies and other enterprises affiliated to the central government to buy coal exclusively from the state-owned mines. In December 2009, the Parliament extended until 2013 the ban on bankruptcy procedures of mining companies in which the state ownership amounts to at

Table 4.1. **The role of the state in the energy sector**

Sector	Extent of state-ownership/ control	Remarks
Oil exploration and production	Dominance of a state-owned company	State-owned holding <i>Naftogaz</i> accounted for 92% of production in 2008-2010 (97% in 2005).
Oil transport	Monopoly of a state-owned company	Operated by subsidiary of <i>Naftogaz</i> – no unbundling.
Oil refining and processing	Some state ownership: one refinery, representing 25% of total output	Participation of foreign capital, mainly Russian oil majors: TNK-BP, Lukoil.
Oil distribution and trade	Limited state ownership	Fragmented industry with the 9 largest retailers controlling some 50% of the market; presence of both domestic and foreign firms.
Gas exploration and production	Dominance of a state-owned company	<i>Naftogaz</i> accounted for 91% of production in 2008-2009 (96% in 2005).
Gas transmission	Monopoly of a state-owned company	Operated by subsidiary of <i>Naftogaz</i> – no unbundling. Privatisation prohibited by law.
Gas distribution and trade	Some state ownership	<i>Naftogaz</i> owns controlling or minority stakes in several of 42 distribution companies. Strong presence of private, including foreign (mostly Russian) capital with limited transparency of ownership structures.
Electricity production	Dominance of state-owned companies	Privatisation of nuclear and hydropower stations is prohibited by law. State keeps control in four out of five regional thermal power generation companies (<i>gencos</i>). Remaining shares in <i>gencos</i> are privately owned and listed on the Kyiv Stock Exchange.
Electricity transmission	Monopoly of a state-owned company	Ukrenergo administers the National Dispatch Center. The company owns and operates the high-voltage network.
Electricity distribution	Dominance of state ownership	Public control (majority stakes) in most of 27 regional distribution companies (<i>oblenergots</i>) that operate the low-voltage networks. <i>Oblenergots</i> also own some generation capacity (mostly combined heat and power plants).
Coal	Significant state ownership (above 50% of coal output)	State-owned mining companies are supported by the state, leading to significant market distortions.
Renewable	State ownership of large hydropower stations. Private ownership in small scale renewable.	Only the hydropower sub-sector is significant, the remaining of the sector is currently small.

least 25% of capital. In January 2010, the state-owned mines have been granted further exemptions from mandatory social security and other tax payments.

Energy pricing

The energy pricing system is a key factor determining energy consumption and investment. In Ukraine, the level and the modalities of price regulations vary in different sub-sectors (Table 4.2), but the main problems are common to all energy sub-sectors, notably:

- low average tariff levels, often below production costs;
- non-transparent price setting mechanisms and related uncertainties concerning future price levels;
- a complex and non-transparent system of subsidies across sectors.

Box 4.1. *Naftogaz*

The state holding company *Naftogaz*, created in 1998, is a dominant player in most subsectors of the oil and gas industry, including:

- oil and gas exploration and drilling: due to the company's financial difficulties, its activities in these areas have considerably declined since the mid-2000s;
- hydrocarbon production: whereas gas output has stabilised since the mid-2000s, oil production has declined; in 2010 *Naftogaz* subsidiaries produced 18.3 bcm of gas, i.e. 91% of the total Ukrainian output, and 3.3 Mt of the oil and gas condensate, i.e. 92% of the total;
- oil and gas transport (including transit of Russian natural gas and Russian and Kazakh oil to third countries): *Naftogaz* subsidiaries own and operate the two large pipeline systems; the total volume of gas transported to third countries declined to 99-96 bcm in 2009-2010 from 120 bcm in 2008;
- gas underground storage facilities with working capacity of around 32 bcm;
- processing of the gas and the condensate: *Naftogaz* remains a significant player also in this segment;
- supply of gas, compressed and liquefied gas and oil products to Ukrainian customers: *Naftogaz* subsidiaries, notably Gas of Ukraine, own and operate the system of low-pressure distribution gas pipelines and provide gas to households, district heating companies, public sector consumers and small business; *Naftogaz* also has its own network of petroleum filling stations throughout the country.

In 2010, *Naftogaz* holding companies had 175 000 employees. The company is closely linked to the government. Since 2009, the company's financial problems have intensified after the collapse of the cross-subsidy scheme due to higher gas import prices and the budget crisis. The scheme relied on income from industrial customers and state subsidies to cover the losses resulting from the below-cost tariffs paid by households and the district heating companies. In 2009, *Naftogaz*' deficit was estimated at around 2.5% of Ukraine's GDP. The Ukraine-IMF agreement includes the commitment by the government to reduce the deficit of *Naftogaz* to 1% of GDP in 2010 and to eliminate it thereafter. It was recently reported that the government envisages transforming *Naftogaz* into a publicly traded company by selling some of its shares through an initial public offering (IPO).

Source: IMF – Ukraine Technical Memorandum of Understanding, IMF Country Report No. 09/270, September 2009.

Table 4.2. Price structure in the energy sector

Sector	Scope of price controls and tariffs levels	Remarks
Oil and petroleum products	Market-determined prices.	Competitive retail market in petroleum products and competition in oil refining (including from imports).
Gas	Administratively regulated tariffs. Differentiation between households, industrial consumers, district heating companies and budget-financed organisations. Prices below cost-recovery levels for households and district heating companies.	Additionally, non-payment is an issue. In 2010, only 82% of the gas sold by <i>Naftogaz</i> was paid. District heating companies and households are mainly responsible with non-payment at 34% and 20%, respectively. High cross-subsidies.
Electricity	Mixed price setting (market and administrative elements). A complicated system with differentiated tariffs for various classes of consumers and additional discounts. Very low tariffs for households. significantly higher for industry.	Single buyer model: nuclear and hydro-power sold to state company Energorynok at prices set by the regulator (NERC). Thermal power generation companies (gencos) are to compete to sell to Energorynok but in practice no real competition. Energorynok sells power to regional energy supply companies (oblenergos) and large industrial firms. Prices for transmission and distribution set by NERC. Oblenergos sell to customers at rates based on the wholesale price plus the transmission and distribution tariff. Tariffs for households which remained more or less stable since September 2006 have started to be gradually adjusted in 2011 to the economically justified level.
Coal	Administrative price setting for the majority of the market.	Since 2006, a single state-owned company Coal of Ukraine acts as a market operator setting the prices (based on actual costs, subsidies for loss-making companies and a notional profit margin) and buying coal from mining companies and then selling it further, also at the regulated price that is established in the negotiation process involving four different ministries.
Renewable	Guaranteed feed-in electricity tariffs defined in relation to conventional energy prices.	In place since 2008-2009.

One of the consequences of the current pricing scheme has been chronic under-investment in building, maintenance, and upgrades of all energy infrastructure, including pipelines and the electricity grid. For the same reason, both energy producers and energy consumers have no incentive to invest in energy efficiency improvements. The current price system makes most energy sub-sectors economically unviable without massive public subsidies and other administrative support, for instance to prevent bankruptcy.

Artificially low coal prices provide indirect subsidies to industry, coal-fired power plants, heating utilities and households. Since 2006, a state-owned company *Coal of Ukraine* acts as a market operator and sets the level of coal prices, based on actual costs, subsidies for loss-making companies and a

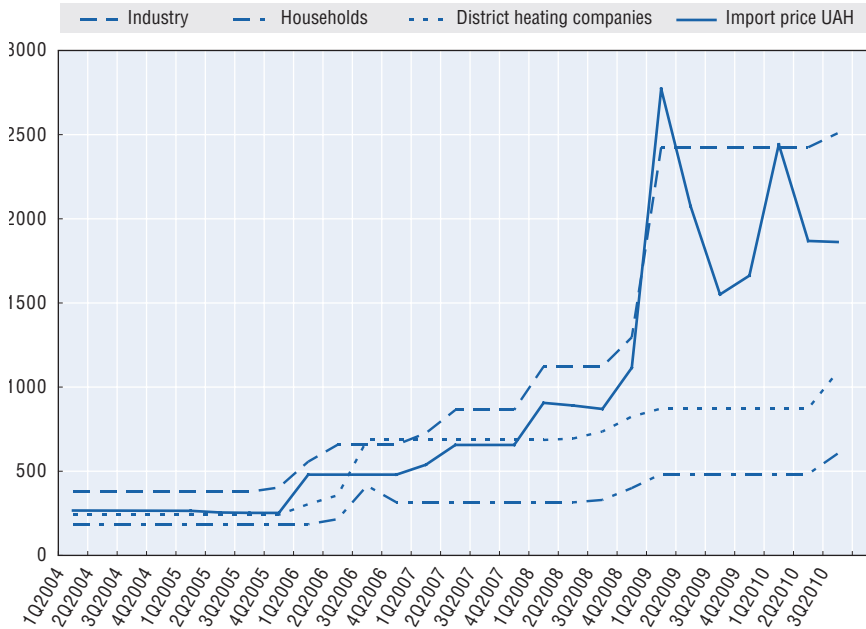
notional profit margin. It buys coal from mining companies and then sells it at the regulated price negotiated with four different ministries. The price levels set in this negotiating process have been typically below the average production costs of state-owned companies and, as a result, most companies have been confronted with a serious deterioration of their financial condition leading to payment arrears and recurrent demands for ever higher subsidies. In 2008, some attempts to liberalise the price policy in the coal sector were undertaken, notably based on auctions for coking coal. In a number of transactions the resulting prices were higher than the regulated ones. However, in the aftermath of the economic crisis and the related decline in coal demand and prices, the auction modalities were no longer adapted to the new situation and the auction system effectively ceased operating in August 2009.

Average coal production costs remain below the price of most other energy sources, including imported coal, oil or natural gas. Special permits for coal exploration and extraction granted in compliance with the Subsoil Code are currently sold at open auctions organised by the Ministry for Environmental Protection and the procedures for obtaining them take around six months. There has been some discussion about lowering the price for licences and simplifying the procedures for coking coal exploration activities.

Despite, or perhaps because of, its key economic role, the gas sector is the least reformed among the energy sectors with serious consequences for the country's production and consumption. Due to the political sensitivities, gas tariffs for households have been kept low, corresponding in the first half of 2010 to 20-25% of the gas price as imported from Russia. District heating companies paid less than half of the import price but non-payments by these companies and by individual consumers have nevertheless been widespread. In contrast, the tariffs for industrial consumers have been increased more or less in line with gas import prices and are therefore close to levels observed in most western European countries (Figure 4.3).

The gas price reform features prominently in the Ukraine-IMF programme approved in July 2010. The programme outlines a comprehensive consolidation strategy to safeguard fiscal sustainability and restore the financial viability of *Naftogaz*. In line with the objective of the IMF programme, gas prices for households and utility companies were increased by 50% with effect from August 2010. A further 50% increase was planned for April 2011 with semi-annual increases thereafter until import parity is reached.⁸ As regards industrial consumers, in addition to the commitment to set gas prices in line with import parity, the authorities have also abolished price subsidies for the sugar, fertiliser, and metallurgy industries. Payment discipline by the district heating companies should be strengthened through the creation of an independent regulator responsible for setting the heating tariffs, and implementing an automated system for collecting payments.

Figure 4.3. **Gas import prices and tariffs for various consumers, 2004-2010**
(UAH per thousand cubic meters)



Source : Based on published tariffs and using official exchange rate.

2. The government's energy strategy and future energy investment requirements

The government's energy sector strategy

Since the mid-1990s, successive Ukrainian governments have issued a number of documents outlining an energy policy strategy and specific plans for different energy sub-sectors.⁹ In general, the main underlying priorities have been energy security and reducing energy import dependency. The key text presenting long-term energy policy orientations is Ukraine's Energy Strategy until 2030 was adopted in 2006 (Box 4.2).

Given the critical importance of the energy sector for the country's future economic development, the Economic Reform Programme for 2010-2014 published in June 2010 gives a prominent role to energy policy issues. It provides a very critical assessment of the current situation in the major energy subsectors and identifies their underlying weaknesses. The Programme establishes a precise timetable for required reforms, including for the adoption of proposed laws and regulations. The reform strategy is divided in three phases: 2010, 2011-2012, and until end-2014 and specifies the objectives for different energy sub-sectors (Box 4.3). The declared target of the

Box 4.2. Ukraine's energy strategy until 2030

The Strategy focuses on the energy supply side and defines the following main policy objectives:

- establish a favourable environment for the safe, reliable and sustainable operation of the energy sector and its most efficient development;
- improve national energy security;
- limit a negative environmental impact of the energy sector;
- implement energy saving technologies and policies to limit the growth of energy demand;
- integrate the United Power System of Ukraine into the European power system, with the objective of increasing Ukrainian electricity exports and strengthening the role of the country in the international transit of oil and gas.

The “baseline scenario” sets up the following targets:

- Doubling of electricity production between 2005 and 2030 allowing for a substantial increase in electricity exports.
- Increasing generation of thermal power plants with a major shift away from gas-fired units towards units fuelled by domestically produced coal.
- Increasing nuclear power generation.

The 2006 Energy Strategy also refers to a low carbon development (LCD) scenario containing several specific measures in the energy sector:

- Rehabilitating fossil fuel power plants and increasing their energy efficiency.
- Accelerating the construction of new nuclear power plants.
- Building a new combined cycle and combined heat-power plants.
- Increasing electricity production from hydro-power plants.
- Renovating the gas transmission network, in particular replacing inefficient compressor units.
- Improving energy efficiency in the industrial sector.
- Improving the efficiency of the housing and communal sector, *e.g.* by replacing low-capacity and low efficiency boilers, refurbishing heat distribution networks and improving the thermal insulation of buildings.

Programme is to change radically the market structure of the energy sector and to achieve its liberalisation, notably by abolishing the price subsidy schemes and other market distortions, opening large parts of the sector to privatisation and establishing an independent market regulator with important prerogatives.

Box 4.3. The 2010 Economic Reform Programme: Objectives for the main energy sub-sectors

In the **power industry**:

- Gradual phasing out of all tariff subsidies;
- End of the moratorium on privatisations in the sector in 2010 – complete privatisation of electricity generation by end-2014 with a view of ensuring investment resources for modernisation;
- Ensuring independence of the regulator by end-2012.

In the **oil and gas** sector:

- Gradual phasing out of all tariff subsidies (by end-2012);
- Improvements in the system of permits for oil and gas field development and other investment-friendly measures related to oil and gas production;
- Restructuring of *Naftogaz*.

In the **coal** sector:

- Coal market liberalisation;
- Privatisation of viable coal mines and restructuring (including closures) of mines with no outlook for profitability.

Source: The full text of the Reform Programme is available at www.president.gov.ua/content/ker-program.html.

Energy efficiency issues were explicitly addressed in the 1997 Comprehensive State Program of Energy Saving of Ukraine, but it is difficult to verify its fulfilment as the objectives were expressed in terms of total energy consumption and not as energy efficiency indicators. A new Energy Efficiency Program 2010-2015 initially approved in early 2010 was revised in July 2010 (Energy Efficiency Program, 2010). Its main objectives include a 20% decline in the energy intensity of the Ukrainian economy compared to the 2008 level (not necessarily an ambitious target in light of historical trends), a change in the energy mix by lowering the share of imported energy commodities, especially natural gas, and their replacement by alternative energy resources. The programme sets up a range of targets with the list of measures required for their achievement, such as designing energy efficiency standards and adopting specific investment measures to modernise energy infrastructure and launching information campaigns on energy efficiency. The State Agency for Energy Efficiency and Energy Savings (former National Agency for Ensuring Efficient Use of Energy Resources – NAER) is the main agency responsible for implementing this programme (Box 4.4).

Box 4.4. The State Agency for Energy Efficiency and Energy Savings: Status, responsibilities and recent activities

As a part of a large administrative overhaul in December 2010, the National Agency for Ensuring Effective Use of Energy Resources (NAER) created in 2006 as a successor of the State Committee for Energy Conservation was reorganised and became the State Agency for Energy Efficiency and Energy Savings, supposedly maintaining the responsibilities of the former NAER, notably:

- designing and implementing state policy on efficient energy use and conservation;
- increasing the share of non-traditional and renewable energies;
- establishing a system to monitor energy production, consumption, exports/imports;
- improving the registration and control system of energy consumption; and
- ensuring the functioning of the system of industrial energy consumption norms.

In 2010, the Agency was granted funds to support energy-saving projects foreseen by the 2010 Energy Efficiency Programme and has to participate in financing projects, including those involving the private sector.

Source: The interview the Head of the NAER, *Business Review*, 16 August 2010, <http://naer.gov.ua/archives/2863>

Future energy investment requirements

Limited investments in the energy sector in the past two decades have resulted in the gradual deterioration of the existing energy infrastructure, growing inefficiencies and technical losses, low productivity and a rising environmental burden. The large electricity generation capacity inherited from the Soviet period has made it possible to postpone investment projects, but the situation is no longer sustainable and substantial investment efforts are necessary to cope with the increase in domestic and international energy prices. There is a broad consensus on two points:

- energy investment needs are considerable and to attract such investment a supportive policy environment is required;
- delaying required investments would have adverse consequences on the country's economic and social development and possibly its political stability given current high energy import dependence on a sole supplier.

Estimates of Ukraine's future investment needs vary according to different sources depending on their assumptions and factors taken into

account. World Bank estimates suggest a figure of USD 3.5 billion or 3% of GDP annually (World Bank, 2010). The baseline scenario of Ukraine's 2006 Energy Strategy assumed combined investment outlays of some USD 200 billion at 2005 prices over the 2006-2030 period, i.e. approximately USD 8 billion annually. In the electricity sector, major investment needs have been identified for constructing new nuclear power units, rehabilitating existing thermal power plants and modernising power network connections. In the oil and gas sectors, the main investment needs have been identified in exploration and production as well as the reconstruction of the gas transmission system.

As the exclusive owner of nuclear power plants, the State bears the main responsibility for investment needs of this sector, which covers almost half of the country's total electricity consumption and is therefore critical for the country's energy security. Ukraine has ambitious plans to build several new reactors over the next decade. The contract agreement on the two most advanced projects – *Khmelnytski 3 & 4* – was signed in February 2011 with *Atomstroyexport*, a Russian nuclear power equipment and service export monopoly. An earlier intergovernmental agreement envisages financing through a Russian loan of around EUR 5-6 billion.

The state has controlling stakes in four out of five regional thermal power generation companies (*gencos*). Their economic viability and investment attractiveness is determined by the prices of fuels (coal and natural gas) and electricity tariffs, which both depend mainly on politically sensitive tariff decisions. Investments in this sector thus remain a risky undertaking, despite the significant business potential for electricity exports to neighbouring countries, notably Belarus, Poland and Slovakia.

Large hydropower plants fully controlled by the state have attracted some financing from international financial institutions (World Bank), essentially for their maintenance and upgrades. New generation capacity has also been developed: the first unit of the Dnister pumped-storage hydroelectric power plant started operating by the end of 2009 and with additional units planned in coming years this plant might become one of the largest of its type in Europe. Other segments of the renewable sub-sector remain for the moment dominated by small-scale units, mostly privately-owned.

Experience with nuclear safety gained after the Chernobyl accident and the vital interest of foreign partners in nuclear security in Ukraine have created favourable conditions for investments in security improvements and have allowed the country easier access to foreign financing. Nuclear safety is probably the most successful field of Ukraine's co-operation with the EU which provides and supports the country's access to grants and loans. Future investment needs in this sphere continue to be substantial: a recent nuclear

safety improvement programme developed by *Energoatom*, the power plant operator, estimates additional expenses in next few years at some EUR 1 billion.

The gas transmission system requires large investments to improve its operation security and reduce its current losses. However, several factors which are essentially outside of the Ukrainian authorities' control, such as the building of alternative pipelines in Europe and the development of new technologies, might put into question the planned upgrading of existing facilities or their extension. For example, a combination of political and economic factors has prompted Gazprom, the Russian gas monopoly, to diversify its gas export routes, which circumvent Ukraine's territory. Moreover, since future trends in gas supply and demand are increasingly uncertain, the demand for gas transit services on Ukrainian territory may become less favourable in the horizon of 5 to 10 years. The list of national projects includes the construction of the sea terminal for liquefied natural gas on the Black Sea coast.

Until recently, the development of renewable energy resources has not featured prominently in investment programmes, but the "Natural Energy" project is listed among the eleven national projects foreseen for next few years, envisaging the construction of small scale hydro, wind and solar power stations and production of solid alternative fuel.

The 2010 Energy Efficiency Programme for 2010-2015 sets an ambitious investment target of EUR 28 billion for the five year period, of which some EUR 3 billion are to be covered from the central state budget and EUR 1.5 billion from the budgets of other levels of government, while the remaining 85% of the total cost is expected to come from other sources. The contribution of other sources of financing, including private domestic and foreign investment as well as various international sources, should gradually increase from EUR 1.2 billion in 2010 to some EUR 6.5 billion in 2015. However, based on past experience, energy saving investment could be difficult to mobilise. The Comprehensive State Programme of Energy Saving 1997-2010 envisaged the investment for energy savings from all sources at UAH 30 billion, but only UAH 10 billion were actually made available, of which only some 5% came from the state budget.

3. Main reform challenges

To mobilise the considerable investment required to increase production in traditional and renewable sources of energy, upgrade energy infrastructure and enhance energy efficiency, Ukraine has to create a favourable investment climate able to compete with the conditions offered by other countries also seeking to attract energy investments. Although certain progress has been

achieved for example in eliminating barter transactions in gas transit operations (IMF, 2009b), Ukraine's reform agenda in the energy sector remains vast. The combination of state control and differentiated energy pricing schemes has constrained investment and also added up to a significant energy subsidy bill which represents a considerable drain on public finances.

The IEA estimates that in 2009 the level of energy subsidies in Ukraine was equivalent to some 4.7% of the country's GDP, i.e. around twice the levels observed in Russia and Kazakhstan (IEA, 2010b). But interventions in the currently distorted price structure remain a highly sensitive political issue both as regards energy prices paid by households and the tariffs applied in industry, especially for export-oriented sectors whose competitiveness depends to a large extent on their energy bill.

Ukraine's energy reform process has been facilitated by the country's international commitments and co-operation, especially with the EU and the IMF. The recent IMF agreement has prompted progress in energy price reforms and the energy policy dialogue with the EU aiming at gradual convergence of Ukraine's energy sector with the EU internal market has been instrumental in efforts to liberalise Ukraine's internal gas market and modernise its regulatory framework. These reforms are indispensable for putting in place and implementing energy-related projects co-financed by international agencies. Access to international know-how on financing options and technologies is important, especially in the sphere of energy efficiency and renewable energy investments.

International co-operation and agreements

The Ukraine-EU dialogue on energy based on the Memorandum of Understanding of December 2005 established as the main objective the "gradual convergence of Ukraine's energy sector with the EU's internal market, aiming at its integration". Ukraine received observer status in the European Energy Community in November 2006 and expressed its interest in full membership. The Ministerial Council made membership conditional on concrete legislative amendments, notably in the gas sector in compliance with the European Commission's Directive 2003/55/EC. The law promulgated in July 2010 responds to this requirement by introducing the principle of free choice of distributor and supplier for customers, free access of gas companies to the pipeline system guaranteed by the obligation for operators to make infrastructure available to all interested parties under the same conditions (Centre for Eastern Studies, 2010). Following these recent legislative changes, the Protocol on the Accession of Ukraine to the European Energy Community was signed in September 2010 and Ukraine became a full member of this organisation on 1 February 2011.

Ukraine's membership in the European Energy Community also requires the revision of the role of its energy regulatory agencies, in particular strengthening of the prerogatives and independence of the National Electricity Regulatory Commission (NERC) in line with EU rules. The NERC, which was established in 1994, saw its mandate extended to other energy sub-sectors with a large range of responsibilities. In particular, the NERC issues licences for all activities in the electricity sector, including power generation, distribution and supply to end-users, as well as for oil and oil products transport, gas transport, storage, distribution and supply. The NERC sets wholesale electricity prices and establishes retail electricity tariffs, sets the caps on gas prices, and fees for delivering, transporting and storing gas, oil and oil products. Its independence has nevertheless been constrained due notably to the modalities by which the chairmen and commissioners are appointed. The June 2010 Economic Reform Program envisages achieving the independence of the NERC by the end of 2012.

The new law on gas approved in July 2010 foresees the creation of an independent regulatory agency, which will set tariffs for gas transport, storage and distribution. However, to become operational in practice and allow for real competition in the internal gas market, the law should be followed by some additional steps, in particular further restructuring and unbundling of *Naftogaz* and its daughter company *Ukrtransgaz*, which currently dominate the market. It also requires that an independent regulator sets tariffs for access to pipelines according to the EU guidelines. The 2010 Law "On the National Residential Services Regulatory Commission" also established a new regulatory agency, which will be responsible for regulating the prices of heating and other communal services starting 2011. Other ongoing and planned reforms in the electricity sector have been designed in accordance with EU legislation and requirements, in particular the Action Plan which has to be carried out in four stages until 2015 when a competitive electricity market should be in place. Another Action Plan approved in October 2010 sets up a timetable for adapting Ukraine's legislation to EU requirements, notably in the area of construction of power generation plants.

The Energy Charter Treaty to which Ukraine is a party has several implications for the country's energy policy, in particular as regards investment protection. The Charter covers energy transit, and includes a specific mechanism for the resolution of energy transit disputes. The Charter thus provides a basic framework underpinning the rights of investors in the energy sector though its practical application has so far been limited. The Charter's Investor-State Dispute Settlement mechanism was used once in the case of Ukraine (Energy Charter, 2009) and the Charter's energy transit provisions were not very instrumental in resolving Ukraine-Russia natural gas transit disputes in 2006 and 2009.

The realisation of a number of energy-related projects co-financed by international agencies depends to a large extent on Ukraine's thorough implementation of its energy policy commitments, in particular the alignment of the Ukrainian gas market regulations with the EU *acquis*. One of the most ambitious programmes has been the upgrading of the Ukrainian gas transit system, decided at the International Investment Conference in March 2009 jointly by the Ukrainian government, the European Commission and the international financial institutions, notably EIB and EBRD. Required investment was estimated at USD 3 billion over a seven year period (EU-Ukraine Gas Conference, 2009).

International experience with energy efficiency reforms

Limiting state interference in the energy sector and eliminating current distortions in the energy price structure are necessary but not sufficient conditions for Ukraine to generate significant energy efficiency gains. The experience of OECD and non-OECD countries shows that energy efficiency programmes often fail to deliver fully the expected gains in the absence of an effective system of energy efficiency governance defined as the combination of an enabling legal and institutional framework, funding and co-ordination mechanisms and accountability arrangements, including evaluation and oversight. There is no single model of energy efficiency governance and countries have to adapt their approach to local conditions. Many different measures and mechanisms have proven their efficiency in other countries (IEA, 2010c).

From an investment policy perspective, several recommendations based on international experience are relevant for Ukraine. First, energy efficiency strategies should be integrated into a broader policy framework of economic development and foresee a reliable source of financing for energy efficiency investment. Energy and environment taxes represent a powerful fiscal instrument yielding a double dividend: by increasing the costs associated with high energy consumption or emissions, they discourage these practices and, at the same time, generate revenues, which could be earmarked for supporting public energy efficiency activities.

Successful energy efficiency initiatives in many countries have taken the form of private-public partnerships (PPPs), which involves the private sector in developing and implementing energy efficiency policy and projects. This approach has been particularly important in developing and transition economies as it allows mobilising private sector resources, including its technical, managerial and financial capacities, to deliver public services. Similarly, private energy service companies can also be instrumental to help overcome frequent barriers in energy efficiency projects by facilitating access to financing and mitigating aversion risks often associated with this kind of

project. Public authorities should also seek the active involvement of the private sector in developing technical standards and conformity assessments. To prevent the risk of capture by private and sectoral interests, however, the government has to ensure the oversight and accountability of energy efficiency initiatives involving the private sector.

4. From energy efficiency towards the development of environment-friendly energy resources

The magnitude of energy inefficiency in the Ukrainian economy means that energy savings must remain the immediate goal of Ukraine's current energy policy and investment. But the country also has to gradually develop favourable conditions for enhancing environmental protection and developing environment-friendly energy resources and technologies. The first step could be to exploit more systematically potential synergies between energy efficiency projects and the development of environmentally sound production and technologies.¹⁰ Further development in this area requires collaborative efforts involving the authorities, the business community and the public at large. International technical assistance and financial support also play an important role in supporting the development of renewable energies and environmentally-friendly technologies.

Exploiting investment synergies between energy efficiency and environment-friendly energy resources

Energy-saving investment projects often address directly or indirectly a number of environmentally-relevant objectives since cutting energy costs is expected not only to decrease the dependence on energy imports and improve international competitiveness but also to have a positive impact on energy-related pollution. Easy access to cheap energy has so far made such investment unattractive in Ukraine. Moreover, awareness among many companies in Ukraine of the potential for energy-saving and of available options to finance energy saving investments has generally been limited (Box 4.5).

Despite potential synergies between energy efficiency and renewable energy projects, there are some important differences in the required size, purpose, expected outcome and financial benefits between the two categories of investment (Table 4.3). They should be taken into account in designing and undertaking corresponding investment projects.

Public initiatives encouraging the development of projects presenting synergies between energy-savings and renewable energies can have a significant demonstration effect and serve as an example for the private sector. Possible opportunities include modernising heating in public buildings

Box 4.5. Ukrainian company views on energy efficiency

According to an IFC survey carried in mid-2008 among some 100 industrial companies in Ukraine:

- More than 80% of surveyed firms acknowledged the importance of energy efficiency but underestimated the possibilities to achieve energy savings.
- Most companies have not yet put in place appropriate energy management practices: only 15% of surveyed firms have deployed automated energy metering systems and less than half of them have developed a plan to increase energy efficiency.
- Half of the surveyed companies mentioned a lack of funds as the main reason for not implementing energy efficiency measures; only 15% of respondents applied to banks or international institutions to finance their energy saving investments.

Source: IFC, *Energy Efficiency: A New Resource for Sustainable Growth*, Researching Energy Efficiency practices among Ukrainian companies, undated report available at www.ifc.org/ifcext/ueep.nsf/Content/ProgramMaterials.

Table 4.3. Possible differences between investment in energy efficiency and renewable energy

Parameters	Energy efficiency	Renewable energy
Purpose of investment project in relation to firm's main activity	Auxiliary	Core
Size of investment projects	Small to medium	Small to large
Motivation, skills and awareness of potential benefits of investment project's proponents	Can be low	High
Financial benefits from the project	Cost reduction due to energy savings	Revenues from power/heat sales or cost reduction on power/heat (if captive use)
Non-technical risks	Output of the main activity	Adverse changes in regulatory framework (<i>e.g.</i> feed-in-tariff relative to wholesale power price); reliability of partners purchasing electricity, maintaining the grid, etc.

Source: Based on Table 1.2 in UN Economic Commission for Europe, "Financing Global Climate Change Mitigation", *ECE Energy Series* No. 37, March 2010.

involving a switch from natural gas to viable renewable energy options or in the municipal sector, which can generate both long-term savings for local budgets and stable revenues for investors. To promote such projects, which have for the moment been limited due to insufficient institutional capacities and a lack of information on such undertakings, the authorities might develop training and information exchange to enhance awareness of energy saving benefits and their positive environmental impact.

Renewable energy

Except large scale hydropower installations, energy from renewable resources has long remained a largely untested concept in Ukraine, but in the last 2-3 years, investors' assessment of Ukraine's potential in this area has improved. By the end of 2009, 90% of surveyed multinational enterprises considered such investment attractive, compared to just above 30% in 2007 (SEOLA, 2009). Ukraine's potential for renewable energy resources is substantial, especially in biomass and wind and possibly solar energy (NAER, 2009). In the short to medium term, heating based on biomass, biofuels and wind electricity generation are generally seen as the most promising areas.

The economic viability of specific technologies will depend to a large extent on the regulatory framework and technical development. Due to current cost differences between traditional and renewable sources of energy, progress in renewable energy will depend on the availability of state support schemes based on transparent and predictable regulations. Among different support schemes for electricity produced from renewable resources, feed-in tariffs are commonly perceived as the most effective approach that has been deployed in several European countries. The mechanism consists of guarantees of (priority) grid access for providers' of renewable energy and the purchase at a fixed price of their deliveries that varies depending on production technologies (e.g. wind, solar, biomass, etc.). Prices are set in such a way that they guarantee the economic viability of the renewable business compensating for higher production costs of renewable energy using current technologies. Importantly, the price formula is usually guaranteed over a long time horizon, e.g. 20 years.

Ukraine first introduced the "green" feed-in tariffs in 2008 and then made some important modifications in April 2009.¹¹ The green tariff law fixes the tariff path until 2029 at a level that is linked to conventional energy prices with an additional guarantee against exchange rate movements (the formula contains a floor for prices expressed in EUR). The rates differ depending on the technology and the size of the operation. The entity paying for energy deliveries is the Wholesale Energy Market which simplifies matters for the producers as they do not need to negotiate with local distribution companies (*oblenergos*) to whose networks they are physically connected. In addition to the feed-tariffs, the Tax Code sets up a range of tax benefits in favour of renewable energy production, including the reduction of taxes on land used for the construction of renewable energy facilities and the exemption from corporate tax on sales of power generated by renewable sources (available until January 2021). Imports of equipment and components used for energy savings are exempted from import duties and VAT if they are not produced in Ukraine. The 2011 budget foresees the allocation of public funds and support for cheaper loans to finance energy savings projects.

The business community has raised some issues related to the application of feed-in tariff regulations, notably the costs of connecting renewable energy facilities to the grid and the lack of clarity of certain provisions in the green tariff law. It considers in particular that the investment risk of renewable projects could be mitigated if access to green tariffs would be guaranteed already at the stage of issuing relevant building permits and not only after the plants start producing electricity (International Chamber of Commerce-Ukraine, 2010). However, such modifications would probably increase considerably the risks for the state and the grid operators given frequent delays in the finalisation of renewable energy projects.

Ukraine's level of feed-in-tariffs can be considered fairly generous and allowing for the development of renewable electricity production from the currently negligible level. The financial viability of projects can be further enhanced by the application of Kyoto's Joint Implementation mechanisms (see below). At the same time, it is important that existing provisions are transparent to prevent politically connected insiders from grasping most of the available benefits. At present, most of the sector can only operate thanks to large public subsidies, which will be difficult to expand under current tough budget constraints. Available analyses of the situation in other countries, such as Russia or Poland, suggest that energy saving measures could be a more immediate and cost-effective way to reduce emissions than electricity generation from renewable resources (McKinsey, 2009).

Public strategy and policies for environment protection

The basic principles of environmental protection are enshrined in the Constitution of Ukraine which defines the State's obligation to ensure environmental safety, the right of citizens to a healthy and safe environment, and the right of free access to information regarding the environment. The 1991 Law on the Protection of the Environment, which represents the key legal reference in this area, sets the main environmental standards and introduces the basic instruments to achieve them. It stipulates the modalities for granting permits for the emission of pollutants into the air, waste water emissions and deposits of waste, based on standards established for emission limits by particular pollutants, and sets up respective payment schedules. Some other important issues such as soil contamination, noise, odour, vibration, electromagnetic radiation, and other environmental aspects are not yet fully addressed in Ukraine's current legislation.

Ukraine has to deal with the specific environmental challenge related to the long-term effects of the Chernobyl nuclear power plant disaster and more generally with nuclear power safety problems stemming from its strong nuclear industry inherited from the Soviet period, notably fifteen nuclear reactors, three uranium mines and large nuclear fuel storage facilities. With

the planned expansion of the nuclear sector, the need for the integrated oversight of the nuclear power system will increase and make it necessary to strengthen the regulatory and supervisory role of the State Nuclear Regulatory Committee of Ukraine.

Environmentally-friendly behaviour is generally promoted by an appropriate combination of positive and negative incentives. Ukraine has put in place various administrative enforcement tools such as the monitoring of allowed pollution/emission limits and charging penalties for breaches of these limits. Compliance assistance and promotion have been so far less developed (UNECE, 2007).

Ukraine has adopted the “polluter pays” principle, applying pollution taxes and charges for emissions. As of 2010, there are three types of environmental charges respectively on:¹²

- special use of natural resources;
- environmental pollution;
- deterioration of the quality of natural resources.

At present, such payments are too low to provide strong incentives for energy saving or pollution reduction as indirectly indicated by the low level of fiscal revenues generated by these taxes. According to available data, environment-related taxes represented in 2007 0.26% of GDP in Ukraine compared to more than 2% in OECD countries.¹³ Another illustration is the level of fines paid by firms for energy consumption exceeding established norms. The IFC survey from mid-2008 reveals that 37% of Ukrainian surveyed companies paid such fees but their average amount represented only 0.2% of the average energy bill per company, i.e. a level unlikely to encourage companies to reduce their excessive energy consumption.

The Environmental Protection Law contains a comprehensive list of advantages which could be granted to enterprises adopting the environmentally-friendly measures, including:

- tax benefits for physical and legal entities introducing measures related to the rational use of natural resources; environmental protection; cleaning and decontamination installations, metering devices to control the emission of pollutants;
- access to preferential loans;
- access to grants from “environmental funds” for the entities limiting their pollution levels or developing environmentally-friendly technologies.

In practice access to such advantages remains limited. Preferential loans and grants are to be provided through the system of environmental funds of Ukraine: the State Environmental Fund and the Republican Environmental Fund of Autonomous Republic Crimea, 27 regional and several thousand local

funds. The total resources distributed through this system have declined and became negligible in 2009-2010.¹⁴ There have also been some concerns regarding transparency of the process in awarding preferences. For example, in 2007-2009, the Ministry of Environmental Protection of Ukraine organised a competition to select the entities with environmentally-friendly projects that could receive interest rate subsidies but the results of these competitions do not appear to be publicly available.¹⁵

Ukraine has introduced a VAT exemption on imports of materials, parts and final products that either use alternative or renewable energy or are used for production of alternative fuels or are in some other way related to energy efficiency improvements. These VAT exemptions apply only to products which are not available or produced in Ukraine. The list of eligible items is defined by the Cabinet of Ministers.¹⁶

Corporate initiatives in support of environmentally friendly energy and technologies

It is not yet common practice for businesses in Ukraine to report regularly on the environmental impact of their activities and their actions in favour of energy efficiency improvements and environmental protection. In 2010, only a few among the major Ukrainian energy companies included special sections dedicated to environmental issues on their websites, but the situation in this area has been rapidly evolving, partly under the influence of foreign firms that introduce their home country's corporate practices in Ukraine.

Some corporate initiatives have been launched through international assistance programmes such as the *Go-Green Declaration*, signed in 2008 by 23 Ukrainian business and civil society leaders, which contains their commitments to protect the environment locally and globally. The Declaration has been accompanied by a series of events, including a promotion campaign for responsible behaviour, an international conference on policy issues and specific actions such as cleaning of neighbourhoods by corporate volunteers. Many business organisations and associations have recently developed specific initiatives aimed at increasing public and business awareness of environmental matters. Among the most active in this area is the International Chamber of Commerce-Ukraine, which has recently put in place a Green Commission, proposing a number of concrete measures to the government to encourage development of environmentally-friendly energy resources and technologies (Box 4.6).

Recent OECD work (OECD, 2010b) shows that, as the pressures on companies to address climate change are growing, companies are increasingly adopting responsible business practices. Companies usually start by measuring their greenhouse gas (GHG) emissions and disclosing their

Box 4.6. **International Chamber of Commerce Green Commission**

The International Chamber of Commerce-Ukraine (ICC-Ukraine) is a non-profit business association. Following a number of internal discussions on *i.a.* the legislation on the feed-in electricity tariffs, the ICC-Ukraine decided to establish in June 2009 a permanent *Commission on Green Investments, Alternative and Renewable Energy Sources*. The Commission's objectives are to develop a position on regulations affecting the business environment in the sphere of environmentally-friendly energy resources and technologies and promote it in fora such as the Entrepreneurs Council under the Cabinet of Ministers of Ukraine and the NAER.

performance in this area. To encourage companies to reduce their emissions, strong incentives, in particular price signals, remain nevertheless critical.

International assistance and programmes for environmental protection in Ukraine

The contribution of international environment-related assistance and programmes has been essential in Ukraine given the country's limited domestic public and private financial resources and the lack of technological and financial know-how in this area. Existing programmes carried out by a number of OECD countries, such as Germany and Sweden, and by international agencies cover a large spectrum consisting of technical assistance with a focus on different aspects of effective environment policy and institutional building as well as on the financing of concrete investment projects for energy savings and the development of renewable energies (Table 4.4). For example, the UNDP helped Ukraine to improve the integration of environmental considerations in different policy areas, including through the implementation of the Strategic Environmental Assessment (SEA). In 2008, the United Nations Office in Ukraine launched promotion campaigns to increase public and corporate awareness of environment protection and encourage environmentally responsible business conduct.

Ukraine is an Annex I country under the Kyoto protocol and declared in 2009 its readiness to take certain international commitments under the post-Kyoto agreement on greenhouse gas emissions. Specifically, the Ukrainian offer consisted of 20% emission reductions by 2020 compared to the 1990 base year. This appears not to be a very ambitious target given that current emission levels are around half of the 1990 baseline year.

The Kyoto Protocol provides for market-based mechanisms allowing countries accepting the commitments under the Kyoto Protocol to fulfil a part

Table 4.4. **Examples of international programmes supporting energy saving and renewable energy**

Institution/ Instrument	Description	Budget	Period
EBRD	A large and diversified project portfolio, including oil and gas production, district heating, electricity grid, hydropower. Ukraine Energy Efficiency Programme (UKEEP): credit lines to local banks to finance energy efficiency improvements in industrial small and medium-sized enterprises and/or the residential sector, etc. Several projects in the pipeline, <i>e.g.</i> : Ukraine Renewable Energy Direct Lending facility: an instrument to extend debt financing for renewable energy projects in Ukraine.	Portfolio of EUR 650 million under the Sustainable Energy Initiative EUR 150 million EUR 50 million	Ongoing 2008-2011 Planned
Climate Investment Funds	Investment Plan for Ukraine prepared in March 2010 with a focus on 1) large scale renewable energy, 2) energy efficiency improvements in the housing sector, 3) smart grids design and implementation and 4) power generation from waste heat recovered from compressors in Ukraine's gas network.	USD 350 million co-financing for projects worth USD 2.6 billion	March 2010: under preparation
World Bank	3 currently running projects on hydropower rehabilitation and power transmission. New projects in the pipeline (<i>e.g.</i> Ukraine Energy Efficiency Project).	USD 366 million	2005-ongoing

Source: Websites of the donor agencies.

of their obligations by actions carried out in other countries. These mechanisms have proved to be an important driver for change in Ukraine. Following the establishment of the domestic institutional framework for Joint Implementation (JI) projects, Ukraine has emerged as one of the countries with the highest number and size of JI projects as measured by the Emission Reduction Units.¹⁷ Many of the current projects target the rehabilitation of district heating systems, energy companies (*e.g.* a coal mine, a gas distribution company) and enterprises from the energy-intensive industrial sectors (*e.g.* cement, steel).¹⁸

The role of foreign investment

Foreign companies can significantly contribute to the development and dissemination of environmentally-sound technologies and procedures, equipment, goods and services as well as organisational and managerial knowhow in Ukraine. These technologies and products can be diffused

Box 4.7. Examples of Kyoto Joint Implementation Projects in Ukraine

A. Rehabilitation of the district heating system in Crimea

The project implemented in 2004-2008 focused on rehabilitating and replacing the existing heat generation and distribution equipment in the Autonomous Republic of Crimea so as to increase the efficiency of the district heating system, contributing to fuel saving and thus also a reduction of greenhouse gas emissions. The main measures included:

- Replacement of inefficient oil-fired boilers with more efficient gas-fired ones;
- Combustion improvement by upgrading the boilers' burners;
- Replacement of heat exchangers;
- Improvement of the network (adding insulation and the installation of new pre-insulated pipes);
- Installation of cogeneration units at five boiler houses;
- Gas extraction at Simferopol city landfill and its utilisation in selected boiler houses.

B. Utilisation of the coal mine methane at the Zasyadko coal mine

The project implemented in 2008-2012 seeks to reduce methane emissions into the atmosphere by collecting methane drained and recovered in the operating mine works, from mine ventilation as well as methane produced by surface wells at the Zasyadko Mine and using it to:

- produce electricity for mine works and the public grid (if there is a surplus);
- replace heat currently produced by coal- and gas-fired boilers, including municipal boilers;
- produce gas for use as a vehicle fuel.

through a variety of channels, including foreign trade, foreign direct investment (FDI) or licensing. In the case of FDI, the following mechanisms can be at play:

- Vertical linkages: multinational enterprises (MNEs) may transfer technology to firms that supply them with intermediate goods, or to buyers of their own products;
- Horizontal linkages: local firms may imitate MNEs' technologies or may be forced to improve their own technologies due to increased competition from MNEs;

- Labour mobility: workers employed and trained by MNE affiliates may transfer their knowledge to other local firms when switching employers or when setting up their own business;
- Internationalisation of R&D: the R&D activities of MNEs, even when predominantly located abroad, may contribute to creating the local knowledge generation capacity.

The potential of FDI to facilitate green technology transfers and contribute to energy savings, the “greening” of the energy sector and the dissemination of environmentally-responsible business practices is important though difficult to quantify.¹⁹ Such potential gains do not materialise automatically but depend on the innovative and absorptive capacities of a host country and on the availability of a technically educated workforce. In these two areas, Ukraine appears to be relatively well positioned, but given increasing international competition, it has continually to support actively its domestic innovation capacity and skill upgrading.

Box 4.8. Foreign investors as the promoters of PPP

In 2007, the local council in the south-central Ukrainian city of Zaporozhia (around 1 million inhabitants), entered into a public-private partnership (PPP) with Remondis, an international water and environmental service company. The PPP aimed to renew the waste collection vehicle fleet, construct new facilities for the separation of recyclable materials, introduce a modern recycling system and bring in a more responsible way of dealing with waste as a resource. The town’s appearance has also benefited because city cleaning, care of green spaces and winter service are also in the hands of the PPP.

Source: Company’s information.

Notes

1. This chapter was prepared in co-operation with Mr. Wojciech Paczynski, Senior Researcher, Center for Social and Economic Research (CASE), Warsaw, with research assistance of Ganna Tsarenko and Viachaslau Herasimovich, acting as external consultants for the OECD Investment Division.
2. Estimates based on 2008 data using the methodology applied in European Commission/CASE (2008).
3. Based on IEA data; the figures reported in Ukrainian statistics are higher owing to a different methodology applied.
4. The 2008 Business Environment and Enterprises Performance Surveys (BEEPS) of Ukraine found that companies operating in Ukraine experience significantly less

power outages per month compared to the average of the Eastern Europe and Central Asia region. However, a typical outage lasted somewhat longer in Ukraine than the regional average. See World Bank (2009).

5. In 2008, Ukraine's TPES/GDP (toe/000 2000 USD) ratio stood at 2.55, compared to the OECD average of 0.18, global average of 0.3 and the former Soviet Union region average of 1.59, IEA (2010a).
6. According to the IEA data, in Poland industry and transport sectors accounted respectively for 26% and 23% of total final energy consumption.
7. As a part of the administrative reform and reorganisation of the government, the Ministry of Coal Industry and the Ministry of Fuel and Energy were merged in December 2010 into the Energy and Coal Industry Ministry.
8. At the beginning of 2011, the Ukrainian government declared that it would seek to postpone indefinitely this 50% increase in prices of natural gas supplied to households.
9. Among sector-specific programmes adopted between 1994 and 2002, the following could be mentioned: Creation of the Nuclear Fuel Cycle (1994); Development of Hydrocarbon Resources in the Ukrainian Sector of the Black and Azov Seas (1996); Energy Conservation (1997); Construction of Wind Power Stations (1997); Oil and Gas of Ukraine until 2010 and Thermal Power Plant Reconstruction (2002).
10. According to the EBRD, Ukraine residential buildings would require some EUR 60 billion, enabling energy savings equivalent to almost 10 billion cubic meters of imported gas or 25% of all Ukraine's natural gas imports. The EBRD technical assistance programme to improve energy performance of private dwellings introduced in 2010 will examine the legal and regulatory framework, general awareness, capacity and low penetration of energy efficient technologies in the country (EBRD, 2010).
11. Law No. 1220-VI "On Amendment of the Law of Ukraine 'On Electrical Energy' Regarding Stimulation of Usage of Alternative Sources of Energy" (1 April 2009).
12. Law of Ukraine No. 1264-XII "On Environmental Protection" (25 June 1991).
13. Ukraine is not covered by the OECD/EEA database on instruments used for environmental policy and natural resources management (www2.oecd.org/econinst/queries/). The available comparison referred to here may underestimate the size of relevant charges in Ukraine given the different classification system of certain environmental fees and charges.
14. According to the state budget data published by the Ministry of Finance, the resources devoted to these objectives declined from USD 6 million in 2007 to USD 1.3 million in 2008 and close to zero in 2009-2010. See *e.g.* Provisions of State Budget of Ukraine for 2008, Appendix 3, State Budget Expenses, http://gska2.rada.gov.ua/pls/zweb_n/webproc4_1?pf3511=31175
15. The competitions were organised in line with the Ministry of Natural Resources of Ukraine, Decree No. 182 (6 April 2007), <http://zakon.nau.ua/doc/?code=z0484-07>.
16. The VAT exemption applies in 2008-2011 and is based on Law No.168/97-VR "On Value-Added Tax" (3 April 1997) and Law No. 760-V "On Amendments to Some Legislative Acts of Ukraine on Encouragement of Energy-Saving Activities" (16 March 2007).

17. Joint Implementation (JI) is one of the Kyoto Mechanisms, together with Emission Trading and the Clean Development Mechanism. Article 6 of the Kyoto Protocol allows a country with an emission level commitment under the Kyoto Protocol (Annex I Party) to earn emission reduction units (ERUs – equivalents of one tonne of CO₂) from a project reducing emissions in another Annex I Party. JI offers Parties more flexibility and allows for more cost-efficient emission reductions. Countries hosting JI projects further benefit from foreign investment and technology transfer. In the case of Ukraine, additional benefits of JI relate to capacity building supporting the country's readiness to participate in international climate policies in the future.
18. The list of projects is available at http://ji.unfccc.int/JI_Projects/ProjectInfo.html.
19. The review of literature studying these points can be found e.g. in OECD (2010), Popp (2009) and WWF (2003).

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